



**Shobhit  
University**

EDUCATION EMPOWERS



Top 101-125 Band  
in Pharmacy

## CRITERION 1 – CURRICULAR ASPECTS

### 1.1.2 PERCENTAGE OF PROGRAMMES WHERE SYLLABUS REVISION WAS CARRIED OUT DURING THE LAST FIVE YEARS

To reduce enormous use of paper and printing the ensure data, sign and a seal by the Competent Authority for all the papers, we have used the Class-3 Digital Signatures where a Registration Authority i.e. Dr. Mahipal Singh, Registrar of our University authenticate the documents and responses claimed in this pdf file.



**SHOBHIT UNIVERSITY, Gangoh**

[Notified by Government of U.P. Act No.3 of 2012, Established u/s 2(f) of UGC Act 1956]  
Adarsh Institutional Area, Babu Vijendra Marg,  
Gangoh, Distt. Saharanpur - 247341, UP

**35** YEARS  
OF ACADEMIC  
EXCELLENCE



# **School of Business Studies and Entrepreneurship**





## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Business Studies & Entrepreneurship**

#### **Ordinances, Regulations & Syllabus**

**For**

#### **Bachelor of Business Administration (MBA) Two Year Programme Semester Pattern**

**(w.e.f. session 2013-14)**

**Approved and adopted in the year 2013 (1<sup>st</sup> meeting ,Board of  
Studies)**

**( SYLLABUS FROM 2013 to 2019)**

**OLD SYLLABUS**

## **Master of Business Administration**

**(WEF Academic Session 2019-21)**

### **Vision**

NICE School of Business aims to become a Centre of Excellence through research and continuous innovation to nurture global managers, leaders and entrepreneurs for sustainable development by synthesizing Indian ethics with modern technology.

### **Mission**

*The Mission of NICE School of Business Studies is:*

- To nurture global talent and develop Industry ready professionals and socially responsible leaders / to face the challenges of fast changing business environment.
- To achieve academic excellence in research, consulting, training and teaching by adopting best practices and cutting edge technologies.
- To promote continuous innovation and entrepreneurship.
- To encourage collaborations, cooperation and partnerships with all stake holders to meet sustainable development goals.

### **Program Educational Objectives (PEOs)**

PEO1: Possess wide spectrum of managerial skills along with competency building qualities in specific areas of management and business studies.

PEO2: Select and apply appropriate tools for decision making required for ill structured managerial problems.

PEO3: Students will be able to independently conduct theoretical as well as applied research.

PEO4: To practice sound knowledge of the entrepreneurial process and inculcate creativity and innovation among students.

PEO5: Analyze ethical implications of business practices using advanced levels of ethical reasoning

### **Program Specific Objectives (PSOs)**

PSO1: To enrich communication, ethical values, team work, professional and leadership skill sets of students.

PSO2: To integrate knowledge, skill and attitude that will sustain an environment of learning and creativity among the students with an assurance for good careers.

PSO3: Analyze the economic, social and environmental issues related to business.

PSO4: Ability to identify, explore and harness opportunities presented by emerging trends and changing business environment.

PSO5: Understand the leadership skills through internship training.



### **Program Outcomes Objectives (POOs)**

PO1: Demonstrate the knowledge of management science to solve complex corporate problems using limited resources.

PO2: Apply ethical principles for making judicious management decisions.

PO3: To develop proactive thinking so as to perform effectively in the dynamic socio-economic and business ecosystem.

PO4: Identify business opportunities, entrepreneurship approach and skill sets.

PO5: Communicate effectively with various stakeholders.

### **MASTER OF BUSINESS ADMINISTRATION (MBA):**

The M.B.A. course aims at providing inputs to the students relevant to the business industry and trade so that they can function in different organizations and face the challenges arising there from. The course not only aims at providing knowledge and skills in different areas of management, but also provides inputs necessary for the overall development of the personality of the students.

The structure of the Course is designed in a way that students have to study the core courses from different functional areas of management that are made compulsory. Later on, specializations are offered in functional areas where the students can opt for any one specialization out of the seven offered: Marketing, Finance, International Business, Operations Management, HRM, Pharma Business Management and Agri-Business Management. Right from the beginning of the course, the focus is on providing relevant inputs through case discussion/ analysis, simulation games, role-plays etc. keeping in mind the current business scenario.

Broadly, the course is of two years divided into four semesters, each semester having eight compulsory papers of 40 sessions each of one-hour duration. The students will have to opt for one functional areas for their specialization, each having five papers (three in third semester and two in the fourth semester from Specialization Papers).

Summer Training for 8/10 weeks is compulsory for every student pursuing the course, which they have to undergo at the end of second semester examination. Comprehensive viva and Research project are part of the course.

### **SUMMER TRAINING PROJECT REPORT:**

1. At the end of second semester examination, every student of MBA will undergo on-the-job practical training in any manufacturing, service or financial organization. The training will be of 8 to 10 weeks duration. The College/Institute will facilitate this compulsory training for students.
2. During the training, the student is expected to learn about the organization and analyze and suggest solutions of a live problem. The objective is to equip the student with the knowledge of actual functioning of the organization and problems faced by them for exploring feasible solutions and suggestions.
3. During the course of training, the organization (where the student is undergoing training) will assign a problem/project to the student.
4. The student, after the completion of training will submit a report to the College/Institute, which will form part of third semester examination. However, the report must be submitted by the end of August during third semester so that it is evaluated well in time and third semester results are not delayed.
5. The report (based on training and the problem/project studied) prepared by the student will be known as Summer Training Project Report. The report should ordinarily be based on primary data. It should reflect in depth study of micro problem, ordinarily assigned by the organization where student undergoes training. Relevant tables and bibliography should support it.

One comprehensive chapter must be included about the organization where the student has undergone training. This should deal with brief history of the organization, its structure, performance products/services and problems faced. This chapter will form part I of the Report. Part II of the Report will contain the study of micro research problem.

The average size of Report ordinarily will be 100 to 150 typed pages in standard font size (12) and double spacing. Three neatly typed and soft bound (paperback) copies of the report will be submitted to the College/Institute. The report will be typed in A-4 size paper.

6. The Report will have two certificates. One by the Head of the Institute/College and the other by the Reporting Officer of the organization where the student has undergone training. These two certificates should be attached in the beginning of the report.

7. The report will be evaluated by two external examiners. It will carry total of 100 marks divided into written report of 50 marks and presentation of 50marks. There will be no internal examiner.

Only such persons will evaluate the project report who has minimum 3 years of experience of teaching MBA classes in a College/University. Experience of teaching MBA classes as guest faculty shall not be counted.

SCHOOL OF BUSINESS STUDIES & ENTREPRENEURSHIP, SHOBHIT UNIVERSITY, GANGOH

8. It is mandatory that the student will make presentation in the presence of teachers and students. The student is expected to answer to the queries and questions raised in such a meeting.

**RESEARCH PROJECT REPORT:**

In fourth semester, candidates will have to submit a Research Project Report on a problem/topic to be assigned by the School of Business Studies under the supervision of a core faculty member of the department. The research project report will carry 100 marks. The evaluation of the project report will be done by two external examiners. The average of the marks awarded by the two examiners will be taken into account for the results.

The report will contain the objectives and scope of the study. Research methodology, use, importance of the study, analysis of data collected, conclusions and recommendations. It will contain relevant charts, diagrams and bibliography. A certificate of the Supervisor and the Head of the MBA program certifying the authenticity of the report shall be attached therewith. The student will submit three copies of the report to the Head of the MBA program. The number of pages in the report will be 75 or more. The report should be typed in A-4 size paper.

**COMPREHENSIVE VIVA:**

The comprehensive viva voce is scheduled at the end of II & IV Semester in order to judge the understanding as well as application of the knowledge gained by the students by the end of 2<sup>nd</sup> & 4<sup>th</sup> Semester of the course. This is also to see the articulation of what is being learnt by them. The idea is to see that students are able to understand what is being taught in two full year and see their relevance not only in the practical field but also their inter relationship. The viva voce is of 100 marks to be conducted by the external examiner appointed by the University.



**Master of Business Administration (MBA)**

PAPER CODE	COURSE STRUCTURE	LOAD ALLOCATION/PER WEEK			CREDIT
		L	T	P	
	<b>SEMESTER I</b>				
BS611	Management Principles and Practice	4	0	0	4
BS612	Managerial Economics	4	0	0	4
BS613	Financial Accounting and Analysis	3	1	0	4
BS614	Statistics for Management	3	1	0	4
BS615	Legal Aspects of Business	4	0	0	4
BS616	Business Environment	4	0	0	4
BS616-A	Nutrition & Well being				
BS616-B	Disaster Management				
BS616-C	Environmental Policy				
BS617	Business Communication	4	0	0	4
BS617-A	Personality Development				
BS617-B	Speaking skills & Leadership				
BS617-C	Effective Writing Skills				
BS618	Computer Applications in Management	3	0	2	4
	<b>TOTAL</b>	<b>29</b>	<b>2</b>	<b>2</b>	<b>32</b>

PAPER CODE	SEMESTER II	L	T	P	CREDIT
BS621	Organizational Behaviour	4	0	0	4
BS622	Management Accounting	3	1	0	4
BS622-A/ BS622B/BS622 C	Analysis & Interpret Data/Fundamentals of Statistics/ Statistics, Computation and Applications				
BS623	Operations Research	3	1	0	4
BS624	Marketing Management	3	1	0	4
BS625	Financial Management	4	0	0	4
BS626	Human Resource Management	4	0	0	4
BS627	Production and Operations Management	4	0	0	4
BS628	Management Information System	2	0	2	4
	<b>TOTAL</b>	<b>27</b>	<b>3</b>	<b>2</b>	<b>32</b>

<b>PAPER CODE</b>	<b>SEMESTER III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
BS631	Strategic Management	4	0	0	4
BS632	International Business	4	0	0	4
BS633/ BS633A/ BS633B	Research Methodology/ Publication Ethics / Emerging Trends in Research	4	0	0	4
BS634	Supply Chain Management	3	1	0	4
BS6H1/M1/F1	Elective I	4	0	0	4
BS6H2/M2/F2	Elective II	4	0	0	4
BS6H3/M3/F3	Elective III	4	0	0	4
BS635	<b>Summer Training Report and Viva Voce</b>				4
	<b>Specialization Group:A Marketing</b>				
BS6M1	Consumer Behaviour				
BS6M2	Sales Management				
BS6M3	Advertising Management				
	<b>Specialization Group:B Finance</b>				
BS6F1	Security Analysis and Portfolio Mngement				
BS6F2	Financial Market and Institutions				
BS6F3	International Financial Mngement				
	<b>Specialization Group:C Human Resource Management</b>				
BS6H1	Industrial Relation and Labour Laws				
BS6H2	Human Resource Planning and Strategic Management				
BS6H3	Training and Development of Human Resoure Management				
	<b>Specialization Group:D Operations Management</b>				
BS6OM1	Facilities Management				
BS6OM2	Production Planning and Control				
BS6OM3	Project Management				
	<b>Specialization Group:E International Business</b>				
BS6IB1	International Business Environment				
BS6IB2	International Marketing				
BS6IB3	Financing Of International Trade				
	<b>Specialization Group:F Agri-Business Management</b>				
BS6AG1	Principles of management in Agri Business				
BS6AG2	Agricultural Marketing				



BS6AG3	Agricultural Export Management				
	<b>Specialization Group:G Agri Pharma Business Management</b>				
BS6PH1	Pharmaceutical Marketing				
BS6PH2	RegulatoryFramework of Pharmaceutical Business				
BS6PH3	Sales Promotion and Brand Management Pharmaceutical Business				
	<b>TOTAL</b>	<b>27</b>	<b>1</b>	<b>0</b>	<b>32</b>

PAPER CODE	SEMESTER IV	L	T	P	CREDIT
BS641	Entrepreneurship Development	4	0	0	4
BS642	Corporate Social Responsibility and Corporate Governance	4	0	0	4
BS643	E-Business	4	0	0	4
BS644	Research Project Report and Viva	2	0	0	2
BS645	Comprehensive Viva	2	0	0	2
BS6H4/M4/F4/OM4/IB4	Elective IV	4	0	0	4
BS6H5/M5/F5/OM5/IB5	Elective V	4	0	0	4
BS6H6/H7, BS6M6/M7, BS6F6/F7	Elective Open Specialization	4	0	0	4
	<b>Specialization Group:A Marketing</b>				
BS6M4	International Marketing				
BS6M5	Services Marketing				
	<b>Open Specialization</b>				
BS6M6	Retail Management				
	<b>Specialization Group:B Finance</b>				
BS6F4	Project Planning and Evaluation				
BS6F5	Corporate Tax Planning				
	<b>Open Specialization</b>				
BS6F7	Management of Banking and Financial Services				
	<b>Specialization Group:C Human Resource Management</b>				
BS6H4	Compensation management				
BS6H5	Negotiation and Counseling				
	<b>Open Specialization</b>				
BS6H7	Organization development & change management				
	<b>TOTAL</b>	<b>28</b>	<b>0</b>	<b>0</b>	<b>28</b>

**MBA**  
**Semester –I**  
**BS-611: Management Principles and Practices**

**Objectives of the Course** - The objective of this course is to achieve organizational goals, optimize resource utilization, improve efficiency, foster communication, encourage innovation, enhance employee development, promote ethical behavior, support effective leadership, facilitate decision-making, and establish accountability. These principles guide managers in creating productive, sustainable, and adaptable organizations.

**Unit 1: Introduction**

**a) Management:** Nature, purpose, and functions; Managerial functions at different levels of organization; Managerial skills and organizational hierarchy; Goals of managers and organization

**b) Evolution of Management Thoughts:** Taylor and scientific management, Fayol's contribution; Hawthorne studies: Recent contributions to management thought System Approach to Management Process: Managerial Transformation Process; Communication system; External variables, Outputs

**C) Functions of Manager:** Planning, Organizing, Staffing, Leading, Controlling: An overview; Coordination: The Essence of Managership

**Unit 2: Planning**

**Types of Plans:** Mission or purposes, Objectives or goals; Strategies, Procedures, Rules, Programme, Budgets Policies; Planning process; Nature of objectives; Setting the objectives; management by Objectives (MBA): Concept, strengths, and weaknesses; Nature and purpose of strategies and policies; Planning process: Inputs to organization, industry analysis, enterprise profile; External and internal environment; Medium and short-range planning and implementation; TOWS Matrix; Alternative strategies; Time dimension and the TOWS Matrix; The Portfolio Matrix; Major kinds of strategies and policies: Porter's generic competitive strategies, planning premises.

**Unit 3: Organising**

Concept; Formal and informal organizations; Organisational division: The department; Span of Management: Concept and issues; Entrepreneurship and intrapreneuring, re-engineering the organization, Rationale of organizing; Territorial departmentation; Customer-group departmentation; Concepts of power and authority, empowerment; Scalar Principle; Line authority and staff relationship; Functional authority and decentralization; Different kinds of decentralization; Delegation of authority; Personal attitudes towards delegation; making delegation effective; Re-centralisation; Concept of organization charts.

**Unit 4: Staffing**

Concept of staffing; The System Approach to human resource management; Factors affecting the number and kinds of managers required; The management inventory; Analysis of the need for managers; An overview of the situational factors affecting staffing: External environment and internal environment factors; An overview of systems approach to selection, recruitment, and promotion; The Peter Principle.



### **Unit 5: Leading and Controlling**

**a) Leading:** Human factors in managing; The importance of personal dignity and the •,, consideration of their whole person; Overview of Motivation concept and Theory X and Theory Y of the Concept of leadership: Motivation ingredients; Principles of leadership; Leadership styles: Autocratic, democratic, and free-reign.

**b) Controlling:** Concept and process, establishment of standards; Measurement of performance, correction of deviations; Critical Control Points: Concept and types; Control as a Feedback System; Real-time Information and control; Feed-forward control; Feed-forward versus feedback systems; Feed-forward in management; Control of overall performance; Profit and loss control: Concept, nature, purpose and limitations; Control through Return on Investment; Bureaucratic and Clan Control.

#### **Suggested Readings:**

1. Heinz, Wehrich, Mark V. Cannice, and Harold Koontz, Management: A Global and Entrepreneurial Perspective, 13th ed., Tata McGraw-Hill, 2010
2. SP Robbins and MA. Coulter, Management, 11th ed., Prentice-Hall of India, 2012
3. Newman, Summer, and Gilbert, Jr., Management, 6th ed., Prentice-Hall of India, 2006
4. Stoner, Freman, and Gilbert, Jr., Management, 7th ed., Prentice-Hall of India
5. Harold Koontz and Heinz Wehrich, Essentials of Management, 8th ed., Tata McGraw-Hill, Noida, 2009
6. Stephen P. Robbins, David A. DeCenzo, Sanghamitra Bhattacharya, and Madhushree Nanda Agrawal, Fundamentals of Management: Essential Concepts and Applications, 6th ed., Pearson Education, 2008

**MBA**  
**Semester –I**  
**BS-612: Managerial Economics**

**Objectives of the Course** - The objectives of managerial economics are to apply economic theory to business decision-making, optimize resource allocation, analyze market trends, evaluate costs and benefits, forecast demand, maximize profitability, and guide managerial strategies. It aims to improve decision-making efficiency, enhance competitive advantage, and ensure sustainable business growth.

**Unit 1: Introduction**

Nature and scope of managerial economics and its relationship with other disciplines; Its role and significance in decision-making; Basic concepts; Positive Vs normative analysis.

**Unit 2: Market Forces: Demand and Supply**

- a) **Demand analysis:** Theory of demand; Objectives of demand analysis and determinants of demand; Theory of consumer behaviour; Elasticity of demand and its measurement methods; Importance in decision-making  
b) **Supply analysis:** Objective of supply analysis; Determinants of supply.

**Unit 3: Production Function and Cost Analysis**

Theory of production and cost analysis; Production function and its managerial uses ; Laws of production and analysis; Empirical estimates of production and cost; Short-run and long-run average cost curves and their analysis; Economies and diseconomies of scale.

**Unit 4: Organisation of the Firm**

Pricing decision; Pricing under different market structure; Perfect and imperfect (monopoly, monopolistic, and oligopoly markets); Pricing strategies; Collusive and non-collusive oligopoly; Baumol's Marries; and O. Williamsons' models.

**Unit 5: Factor Pricing**

Determination of factor pricing; Marginal productivity theory; Richardiaii and modern theories of rent; quasi-rent; Modern theory of wage rate determination; Classical, neo-classical, and Keynesian theory of interest; Modern theory of profit; Welfare economics; Pareto optimality conditions; Social welfare function.

**Suggested Readings:**

1. Crag W. Peterson, W. Cris Lewis, and Sudhir K. Jain, Managerial Economics, Prentice-Hall of India/ Pearson, New Delhi, 2004
2. H.L. Ahuja, Managerial Economics, S. Chand, 2004 Ath
3. DN Dwivedi, Managerial Economics, 4 ed., .Vikas Publishing House, New Delhi, 2006
4. GS Gupta, Managerial Economics, Tata McGraw-Hill Publishing Co. Ltd., New Delhi
5. Joel Dean, Managerial Economics, Prentice-Hall of India, New Delhi
6. Dpminique Salvatore, Managerial Economics in a Global Economy, 4th ed., Thomson Southwestern, Bangalore, 2006
7. Pindyck and Rubinfeld, Micro Economics, Prentice-Hall of India, 6th ed., 2006
8. Koutsoyiannis A., Modern Micro Economics, MacMillan, 2000
9. Paul Samuelson and Nordhaus, Economics, 1 9th ed.Tata McGraw-Hill, New Delhi, 2005

**MBA**  
**Semester –I**  
**BS-613: Financial Accounting and Analysis**

**Objectives**

The objective of this paper is to help students to acquire conceptual knowledge of the financial accounting and to impart skills for recording various kinds of business transactions.

**Course Contents**

**Unit 1: Theoretical Framework**

**a) Accounting:** An introduction, Accounting as an information system. The users of financial accounting information and their needs, Qualitative characteristics of accounting information, Functions, advantages, and limitations of accounting, Branches of accounting.

**b) Nature of Financial Accounting Principles:** Basic concepts and conventions: entity, money measurement, going-concern, cost, realization, accruals, periodicity, consistency, prudence (conservatism), materiality and full disclosure.

**c) Financial Accounting Standards:** Concept, benefits, procedure for issuing accounting standards in India. Salient features of accounting standard: 1 (ICAI)

**Unit 2**

**a) Accounting Process:** The journal, the ledger, and trial balance: Meaning, need, preparation

**b) Business Income:** Measurement of business income-net income: The accounting period, the continuity doctrine and matching concept, Objectives of measurement, Depreciation policy, and Inventory valuation.

**c) Preparation of Final Accounts:**

Difference between Capital and Revenue Expenditure, Trading Account, Profit and Loss Account, Balance Sheet: Meaning, Need, Finance accounts for non-profit organization: An overview.

**Unit 3**

**Royalty Accounts:** Meaning, characteristics, types of royalty, journal entries and its accounting procedure, Hire Purchase System.

**Unit 4: Analysis of financial statements:**

Meaning, need, Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, market capitalization ratios; common size statement.

**Unit 5**

**a) Funds Flow Statement:** Meaning, concept of gross and net working capital, preparation of schedule of changes in working capital, preparation of funds flow statement and its analysis.

**b) Cash Flow Statement:** Various cash and non-cash transactions, flow of cash, preparation of Cash Flow Statement and its analysis.

**Suggested Readings:**

1. Anthony, R.N., David F. Hawkins, and Kenneth A. Merchant, Accounting: Text and Cases, 12th ed., Richard D. Irwin, Inc.
2. Monga, IR., Financial Accounting: Concepts and Applications, Mayoor Paper Backs, New Delhi
3. Shukla, M.C., T.S. Grewal, and S.C. Gupta, Advanced Accounts, Vol. 1, S. Chand & Co., New Delhi
4. Gupta, R.L., and V.K. Gupta, Financial Accounting, Vol. 1, Sultan Chand & Sons, New Delhi, 2006

5. The Institute of Chartered Accountants of India, Compendium of Statements and Standards of Accounting, New Delhi.
6. Bhattacharya, Ashish K., Essentials of Financial Accounting, PHI, New Delhi
7. N. Ramachandran and Ram Kumar Kakani, Financial Accounting for Management, Tata McGraw-Hill Publishing Co., New Delhi, 2011



**MBA**  
**Semester –I**  
**BS-614: Statistics for Management**

**Objectives of the Course** - The objectives of statistics for management are to aid in decision-making through data analysis, identify trends and patterns, improve forecasting accuracy, measure performance, optimize processes, and support risk management. It helps managers make informed, data-driven decisions to enhance operational efficiency, profitability, and strategic planning.

**Unit 1: Introduction**

Definition of Statistics, scope of Statistics; Applications in decision-making in Business, Measures of Central Tendency and Dispersion: Grouped Data, Drawing a Histogram; Unequal Class Intervals; Mean; Median; Mode; Quartiles; Standard and Quartile Deviation; Significance of Measures of Location and Dispersion; Coefficient of Variation. Index Numbers; Index of Retail Prices and Industrial Production.

**Unit 2: Data Collection**

Types of data, primary and secondary data, Census and survey and their relative advantages and limitations; development of questionnaire; Advantages and limitations of interview and postal questionnaire design; Problems of non-response measures.

**Unit 3: Time Series Analysis**

Time series, Moving average to calculate the trend, Plot trend on time series graph, calculate the seasonal factors for either the additive or multiplicative model, Forecasting methods.

**Unit 4: Correlation and Regression**

Definition of correlation and regression, Scatter diagram, Least squares method, Use of regression analysis, Forecasting and its precision, Concept of product moment correlation coefficient, Spearman's rank correlation coefficient and Coefficient of determination.

**Unit 5: Probability and Probability Distribution**

**a) Probability:** Definition, Mutually exclusive events, Addition and multiplication rules of probability, Venn diagram and tree diagram to solve probability problems.

**b) Chi-square distribution, Student's t distribution, F distribution - its significance and simple problems**

**c) Probability Distribution:** Concept of probability distribution, continuous probability distribution, Poisson distribution, Binomial distribution.

**d) Sampling and Sampling Distribution:** Various sampling methods, simple random sampling, stratified random sampling and Cluster sampling.

**Suggested Books:**

1. Richard I., Levin and David S. Rubin, Statistics for Management, 7th ed., Prentice-Hall of India, Pearson Education, 2007
2. T.NSrivastava and SheljaRego, Statistics for Management, Tata McGraw-Hill Publishing Co., New Delhi, 2008
3. Mark L., Berenson and David M. Levine, Basic Business Statistics: Concepts and Application, Prentice-Hall of India
4. GC Beri, Business Statistics, 2nd ed., Tata McGraw-Hill, 2008

**MBA**  
**Semester –I**  
**BS-615: Legal Aspects of Business**

**Objectives of the Course** - The objectives of the legal aspect of business are to ensure compliance with laws, protect intellectual property, manage contracts effectively, minimize legal risks, and resolve disputes. It helps businesses operate within legal frameworks, avoid legal penalties, safeguard organizational interests, and promote ethical practices for long-term sustainability.

**Unit I: The Indian Contract Act, 1872**

Concept of Contract, offer and acceptance; valid contracts and its essential elements; void agreements; classification of contracts; Quasi contract; performance of contract; discharge of contract; remedies for breach of contract. Special Contracts: Indemnity, Guarantee, Bailment, pledge, and agency.

**(8 Sessions)**

**Unit 2: a) The Sale of Goods Act, 1930:** Nature of Contract of Sale; Formation of Contract of sale, agreement to sell, conditions and warranties, transfer of property in goods, performance of the contract of sale, remedies for breach, unpaid seller and his rights, rights of buyers, sale by auction.

**b) The Partnership Act, 1932:** Nature of Partnership, Formulation of Partnership; rights, duties, and liabilities of partners; Dissolution of Partnership Term

**(8 Sessions)**

**Unit 3: The Negotiable Instruments Act, 1881**

Definition, Features and types of negotiable instruments; Methods of negotiation of instruments; holder and holder in due Course; Endorsement and delivery of a negotiable instrument; Presentation of Negotiable Instrument. Banker and Customer: An introduction; Crossing of a cheque; Types of crossing; Bouncing of cheques, Obligations of banker and customer; Dishonour and discharge of negotiable instruments

**(8 Sessions)**

**Unit 4:a) The Consumer Protection Act, 1986:** Basic Concepts: Complaint, Complainant, Consumer, Rights of consumer, Consumer forums, their role, powers and functions, Procedure for consumer grievance redressal, Major decided Cases.

**b) The Competition Act, 2002:** Basic concepts, Powers of Central Government under the Competition Act, Major Provisions of the Competition Act: Role and working of Competition Commission of India.

**(8 Sessions)**

**Unit 5: The Companies Act**

An overview; Nature and kinds of Companies; Formation of a company; Company Management; Company Meetings

**(8 Sessions)**

**Suggested Books:**

- 1) Avtar Singh, Principles of Mercantile Law, 10th ed., Eastern Book Company, Lucknow
- 2) M.C. Kuchhal, Vivek Kuchhal, Business Law, 7th ed., Vikas Publishing House, New Delhi
- 3) Ravindra Kumar, Legal Aspects of Business, Cengage Learning, New Delhi, 2016
- 4) Avtar Singh, Consumer Protection Law, Eastern Book Co., Lucknow, 2006.
- 5) MC Kuchhal, Indian Company Law, Shree Mahabir Book Depot, Delhi, 2008
- 6) The bare acts of relevant legislations.

**MBA**  
**Semester –I**  
**BS-616: Business Environment**

**Objective**

To enable students to learn the concepts of economic environment of business, changes in policies and latest developments in India and abroad.

**Allocation of Periods: 45** (30 Lectures, 5 Tutorials, 10 Practicals)

**Unit 1: Introduction**

Concept, Significance and Nature of Business Environment. Types of environment, Interaction between Internal and External environments, Nature and Structure of Economy, Techniques for Environmental Analysis, Approaches and Significance of Environmental Forecasting.

**(Periods: 6 -1 - 2)**

**Unit 2: Economic Environment**

History of Economic Systems, Market, Planned and Mixed Economy, Planning in India: Emergence and Objective; Planning Monetary Policy, Fiscal Policy. Union Budget as instrument of growth and its Impact on Business, Industrial Policy: Meaning Objective and Recent Developments in New Economic Policy and its Impact on Business.

**(Periods: 7 -1 - 3)**

**Unit 3: Politico-Legal Environment**

Relationship between Business and Government, Economic, Planning, Regulatory, Promotional and Entrepreneurial Roles of Government, Constitutional provisions affecting Business. An overview of major laws affecting business, Consumerism, Social Responsibility of Business.

**(Periods: 6 -1 - 1)**

**Unit 4: a) Technological Environment:** Factors Influencing Technological Environment, Role and Impact of Technology on Business. Transfer of Technology - Channels, Methods and Limitations.

**b) Demographic and Socio-cultural Environment:** Population size, falling birth rate, Changing age structure and its impact on business, Business and Society, Business and Culture, Culture and Organisational Behaviour.

**(Periods: 5 -1 - 1)**

**Unit 5 : WTO:** Salient features and Current Developments; Globalisation: Meaning and dimensions, Features of Current Globalisation, Stages of Globalisation, Multinational Corporation (MNCs) and Transnational Corporations (TNCs), Disinvestments of PSUs, Foreign Direct Investments (FDI) and Regulation of Foreign Trade.

**(Periods: 5 -1 -3)**

**Suggested Readings:**

1. Francis Cherunilam, Business Environment, Himalaya Publishing House, Mumbai.
2. S K Mishra, and V K Puri, Economic Environment of -Business, 3rd Edition, Himalaya Publishing House, Mumbai.
3. Justin Paul, Business Environment Text and Cases, Tata McGraw Hill, New Delhi.
4. Suresh Bedi, Business Environment, Excel Books, New Delhi, 2004.
5. I. C Dhingra, India Economy: Environment and Policy, 23rd ed., Sultan Chand & Sons, New Delhi, 2009.

## SYLLABUS

### MBA-1<sup>st</sup> SEMESTER

#### COURSE TITLE: NUTRITION AND WELL BEING

#### COURSE CODE: MBA-616-A

**Objectives of the Course** - The objectives of nutrition and well-being are to promote healthy eating habits, improve overall physical health, enhance mental well-being, prevent nutritional deficiencies, and support long-term wellness. It aims to educate individuals about balanced diets, healthy lifestyles, and the importance of proper nutrition in maintaining vitality and preventing diseases.

**Unit 1: Introduction to Nutrition:** 10 Hours

Definition and scope of nutrition, Macronutrients and micronutrients their functions and sources. Overview of the digestive system, Digestion and absorption of nutrients, Age-specific nutritional needs (infants, children, adults, and elderly)

**Unit 2: Dietary Guidelines and Eating Patterns:** 10 Hours

Overview of global dietary guidelines (e.g., MyPlate, Food Pyramid, Mediterranean diet), Key principles for healthy eating, Portion control and balanced meals, Plant-based diets, intermittent fasting, ketogenic diets, and their health impacts, Strategies for planning nutritious meals, Cooking methods that preserve nutrients and reduce fat.

**Unit 3: Nutrition and Lifestyle Diseases:** 10 Hours

Causes and health risks of obesity, Effective weight loss strategies (caloric deficit, exercise, behavioral changes), Role of exercise and physical activity in weight management, Nutrition and heart disease prevention (impact of fats, cholesterol, sodium, and fiber), Relationship between diet and type 2 diabetes.

**Unit 4: Nutrition for Optimal Well-Being:** 10 Hours

Nutrients that affect mood, cognition, and mental health (e.g., Omega-3s, B vitamins), The role of diet in stress management and mental well-being, Nutrition for athletes and physical performance, The impact of food choices on the environment, Sustainable diets and their role in promoting global health.

#### RECOMMENDED READINGS

- Mudambi, S.R and Rajagopal, M. V. Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed; 2012; New Age International Publishers
- Mudambi, S. R, Rao, S.M and Rajagopal, M.V. Food Science; Second Ed; 2006; New Age International Publishers
- Srilakshmi, B. Nutrition Science; 2012; New Age International (P) Ltd
- Lakra, P., Singh, M.D. Textbook of Nutrition and Health; First Ed; 2008; Academic Excellence.
- Manay, M.S, Shadaksharaswamy. Food – Facts and Principles; 2004; New Age International (P) Ltd.

**SYLLABUS**  
**MBA-1<sup>st</sup> SEMESTER**  
**COURSE TITLE- DISASTER MANAGEMENT**  
**SUBJECT CODE-MBA-616-B**

**Objective of the Course**

1. To provide basic conceptual understanding of disasters.
2. To understand approaches of Disaster Management
3. To build skills to respond to disaster

**Unit: I -Definition and types of disaster**

Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunamis, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

**Unit: II Study of Important disasters**

Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g Earthquakes, Landside). Social Economics and Environmental impact of disasters.

**Unit: III Mitigation and Management techniques of Disaster**

Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warning Systems, Building design and construction in highly seismic zones, retrofitting of buildings.

**Unit IV Training, awareness program and project on disaster management**

Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management, Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Sikkim and its surrounding areas.

**Text Books:**

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.

## SYLLABUS

### MBA-1 Semester

**Course Title: Environmental Policy**

**Course Code: BS-616-C**

**Objectives of the Course** - The objectives of environmental policy are to protect natural resources, reduce pollution, promote sustainability, and ensure responsible resource management. It aims to mitigate environmental impact, enhance biodiversity, comply with environmental regulations, and encourage eco-friendly practices to safeguard the environment for future generations while supporting economic growth.

#### **UNIT-1: INTRODUCTION**

**10 Hours**

Introduction to environment, Environment and society, Composition of healthy environment, Climate change, Biodiversity and climate change, Natural resource conservation and management. Over Population and its impact on environment.

#### **UNIT-2: WASTE MANAGEMENT**

**8 Hours**

Introduction of waste management, Solid and Liquid waste management. Environmental policy and evolution, Environmental policy and laws in India. National environmental policy.

#### **UNIT-3: ENVIRONMENTAL HAZARD AND NGT**

**10 Hours**

Environmental hazard and risk management, Ministry of environment, forest and climate change, CPCB (Central pollution control board, SPCB (State pollution control board) Roles and their functions. National Green tribunal and key environmental issues.

#### **UNIT-4: AN OVERVIEW OF ENVIRONMENTAL MODELING**

**10 Hours**

**RIO earth summit 1992**, Kyoto Protocol 1997, Sustainable development and Green technology, The Environment (Protection) Act, 1986, Laws concerning wildlife in India, Biological diversity act, 2002, The Air (Prevention and Control of Pollution) Act, 1981, The Water (Prevention and Control Pollution) Act, 1974

#### Books and references

Bhatt, M S; Ashraf, S; and Illiyan, A (Eds.) (2008). *Problems and Prospects of Environment Policy: Indian Perspective*. Aakar Books: Delhi

Divan, S and Rosencranz, A (2001). *Environmental Law and Policy in India* (18<sup>th</sup> Ed.). Oxford University Press: New Delhi.

Dwivedi, O P (1997). *India's Environmental Policies, Programmes and Stewardship*. Palgrave Macmillan: London, UK.

Jaswal, P. S., and Jaswal, N. (2023). *Environmental Law* (2023 Ed.). Allahabad Law Agency.

Krishnamoorthy, B. (2017). *Environmental Management: Text and Cases* (3<sup>rd</sup> Ed.). PHI Learning: New Delhi.

Kulkarni, V and Ramachandra, T V (2006). *Environmental Management*. TERI Press: New Delhi.

**MBA**  
**Semester –I**  
**BS-617: Business Communication**

**Objectives of the Course** - The objectives of business communication are to facilitate clear, effective information exchange, enhance decision-making, foster collaboration, and build strong relationships with stakeholders. It aims to improve organizational efficiency, resolve conflicts, promote transparency, and ensure accurate dissemination of information, ultimately contributing to business growth and success.

**Unit 1: Introduction**

Nature of communication; Myths about communication; Communication process and stages in communication cycle; Barriers to effective communication; Formal and informal communication; Communication channels; Choosing the means of communication, like Letters, memos, reports, fax, e-mail, presentation, telephone, and multimedia; Improving the communication skills and projecting professionalism through various channels of communication; Verbal and non-verbal communication; Organisational culture; Communication and ethics.

**Unit 2: Communication for Managers**

Importance of communication to managers; Internal and external audiences in the organisation; Planning and creating business managers; Analysing the problem and defining the purpose; Analysing business communication situations; Adapting the message to the audience.

**Unit 3: Written Communication**

Planning, writing, and revising business document; Designing documents, slides, and screens; Polishing the writing; Editing for grammar and punctuation; Choosing the right word; Revising sentences and paragraphs, letters, memos; e-mails, and web writing, informative and positive messages, negative messages, persuasive messages; Reports: Types, characteristics of business reports, purposes of reports; Planning and techniques of writing a report.

**Unit 4: Recruitment and Employment Correspondence**

Researching job; Job application letter; Curriculum vitae/ resumes; Employment; Interview; References; Offer of employment; Job description; Letter of acceptance; Letter of resignation.

**Unit 5: Interpersonal Communication**

Listening, working, and writing in teams; Planning, conducting, and recording; Meetings; making effective oral presentations; Overcoming stage fright; Telephonic communication; Conversation and discussion; Public speaking; Seminar presentation; Conference; Group discussion.

**Suggested Readings:**

1. Locker, K.O., and Kaczmarek, S.K., Business Communication: Building Critical Skill, 2nd ed., Tata McGraw-Hill, 2002
2. Bovee, C.L., et al., Business Communication Today, Pearson Education, 2002
3. Taylor, Shirley, Communication for Business, Pearson Education, 2002
4. Lesikar, R.V., and Pettit, Jr., J.D., Business Communication: Theory and Application, Tata McGraw-Hill, 2002
5. James, S.O' Rourke IV, Management Communication: A Case Analysis Approach, 2nd ed., Pearson Education, 2005



## **Course Title: Personality Development**

Course Code: BS617-A

Program & Semester: MBA I

**Objectives of the Course** - The objectives of personality development are to enhance self-awareness, improve communication skills, boost confidence, foster emotional intelligence, and promote positive behavior. It aims to cultivate leadership qualities, strengthen interpersonal relationships, and help individuals achieve personal and professional success by developing a well-rounded and resilient character.

### **Course contents:**

#### **UNIT I**

Introduction to Personality Development The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis.

#### **UNIT II**

Attitude & Motivation Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages –Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self- motivation- Factors leading to de-motivation

#### **UNIT III**

Self-esteem Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self-esteem - Symptoms - Personality having low self-esteem - Positive and negative self-esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.

#### **UNIT IV**

Other Aspects of Personality Development Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management - Work ethics –Good manners and etiquette.

#### **UNIT V**

Employability Quotient Resume building- The art of participating in Group Discussion – Facing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

Total: 45 Periods

#### **Text Books:**

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
2. Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16th Edition: Prentice Hall.

#### **Reference Books:**

1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi. Tata McGraw-Hill 1988.
2. Heller, Robert. Effective leadership. Essential Manager series. D K Publishing, 2002
3. Hindle, Tim. Reducing Stress. Essential Manager series. D K Publishing, 2003
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B . Body Language. Delhi: Rohan Book Company. 2004

**Course Title: Speaking skills & Leadership**  
**Course Code: BS617-B**  
**Program & Semester: MBA I**

**Objectives of the Course** - The objectives of speaking skills and leadership are to enhance effective communication, inspire and motivate others, build confidence, and foster collaboration. It aims to improve public speaking, persuasion, and active listening, while developing leadership qualities that empower individuals to lead teams, make decisions, and drive organizational success.

Course contents:

- UNIT – I 07 Hours  
Speaking Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment
- UNIT – II 07 Hours  
Elements of Communication: Introduction, Face to Face Communication – Tone of voice, Body Language (Non-Verbal Communication), Verbal Communication Physical Communication. Communication Styles: Introduction, The Communication styles Matrix with example for each Direct Communication style, Spirited Communication style, Systematic Communication style, Considerate Communication style.
- UNIT – III 07 Hours  
Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations. Effective Written Communication: Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion Required, Shades of Meaning, Formal Communication.
- UNIT – IV 05 Hours  
Leadership Skills: Purpose of an interview, Do's and Don't's of an interview Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery
- UNIT – V 04 Hours  
Group Discussion: Introduction, Communication skills in group discussion, Do's and Don't's of group discussion

**Recommended Books: (Latest Edition)**

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1 st Edition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1 st Edition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1 st Edition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, GopalaSwamy Ramesh, 5 th Edition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Greenhall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2nd Edition, New arrivals –PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1 st Edition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1st Edition, McGraw Hill Education, 2011
11. Effective communication, John Adair, 4 th Edition, Pan Mac Millan, 2009
12. Bringing out the best in people, Aubrey Daniels, 2 nd Edition, Mc Graw Hill, 1999

**Course Title: Effective Writing Skills**

**Course Code: BS617-C**  
**Program & Semester: MBA I**

**Objectives of the Course** - The objectives of effective writing skills are to convey ideas clearly and concisely, enhance communication, engage the reader, and ensure accuracy. It aims to improve grammar, structure, and style, enabling individuals to write persuasively, professionally, and creatively. Effective writing supports successful business, academic, and personal communication.

**Course contents:**

Effective Writing Skills

- (i) Diary Writing
- (ii) Paragraph Writing
- (iii) Summary/Note making
- (iv) Formal and Informal Letter Writing
- (v) CV/ Resume Writing
- (vi) Report Writing
- (vii) Interview/Feature Article
- (viii) Notice Writing

**Classroom Activity:** Speaking Skills, Listening Skills, Mock Interview, Speech Making Project Work

**Suggested Projects:** Sports Writing, Poetry about Women/Men, Poetry in Translation, Translating a Poem, Telling a Story, Fantasy Writing, Chat Shows, The Menace of Dowry, A Success Story, Creative Writing, Theatre Groups, Interviewing a Celebrity, Writing a Newspaper Article on a Current Topic, Today's Youth and Youth Icons, Leadership and Politics, Examination System and Benefits of Reform, the Epics, Communalism, Gender Discrimination, Social Activism.

**Recommended Reading:** 1. English Communication Skills: AECC under CBCS, HPU. Meenakshi F. Paul and Madhumita Chakraborty. Macmillan, 2017.

**Suggested Readings:**

1. Fluency in English. Part I. Macmillan, 2005.
2. Fluency in English. Part II. OUP, 2006. Unit 1-15.
3. El Dorado: A Textbook of Communication Skills. Orient Blackswan, 2014. Units 1-5.
4. Interchange. Workbook III. Fourth Edition. Cambridge University Press, 2015. Units 1-8.
5. New Headway. Intermediate Student's Book. 3rd Edition. Oxford University Press, 2012. Units 1-6.
6. Write to be Read: Reading, Reflecting & Writing. First South Asian edition. Cambridge University Press, 2014. Units 1-4.
7. Business English. Pearson, 2008. Units 4-6.

**MBA**  
**Semester –I**  
**BS-618: Computer Applications in Management**

**Objectives of the Course** - The objectives of computer applications in management are to enhance data processing, improve decision-making, streamline operations, and automate tasks. It aims to optimize resource management, facilitate real-time communication, support data analysis, and improve efficiency, enabling managers to make informed decisions and drive business growth through technology integration.

**Unit I Conceptual Framework**

**(06 hours)**

Hardware: (a) Input devices - keyboard, printing devices, voice speech devices, scanner, MICR, OMR, Bar code reader, digital camera etc. (b) Output devices - Visual Display Unit, printers, plotters (c) Storage Devices – Magnetic storage devices, Optical storage devices, Flash Memory.

**Unit II: Operating System and Software**

**(06 hours)**

Software: Types of software with examples; Introduction to languages, compiler, interpreter and Assembler, Operating System Functions, Types and Classification, Elements of GUI based operating system.

**Unit III: Communication Technology**

**(08 hours)**

Network and Internet: Types of computer networks (LAN, WAN and MAN), Network topologies, EDI.  
Internet: Netiquettes, Architecture & Functioning of Internet, Basic services over Internet like WWW, FTP, Telnet, Gopher, IP addresses, ISPs, URL, Domain names, Web Browsers, Internet Protocols, Search engines, e-mail.

**Unit IV: Office tools for Business**

**(12 hours)**

Use of MS-Office: Word: Paragraph formatting, Page formatting, Header and footer, Bullets and numbering, Finding and replacing text, Mail merge, Macros. Cell referencing, Ranges.  
Excel: Formulae, Functions, Auto sum, Copying formula, Formatting data, creating charts, creating Database, sorting data, filtering.  
Power Point: Formatting text on slides, Inserting charts, adding tables, Clipping, Slide animation, Slide shows.

**Unit-5 Security and Ethical Challenges of IT**

**(8 hours)**

Concept of Business Ethics, Technology Ethics; Security and Ethical Challenges of IT, Cyber Crime and Privacy Issues, Cyber Laws, IT Act 2000.

**Suggested Readings**

1. Shrivastava-Fundamental of Computer& Information Systems (Wiley Dreamtech)
2. Leon A and Leon M - Introduction to Computers ( Vikas, 1st Edition).
3. ITL ESL – Introduction to Information Technology (Pearson, 2nd Edition).
1. 4 ITL ESL – Introduction to Computer science (Pearson, 2nd Edition).
4. Introduction to Computers, Norton P. (TATA McGraw Hill)
5. Leon - Fundamentals of Information Technology, (Vikas)

**MBA**  
**Semester –II**  
**BS-621: Organisational Behaviour**

**Objectives of the Course** - The objectives of organizational behavior are to understand and improve individual and group dynamics, enhance employee motivation, foster effective communication, and promote teamwork. It aims to improve leadership, increase job satisfaction, manage conflict, and create a positive organizational culture, ultimately improving productivity and organizational performance.

**Unit 1: Introduction**

Conceptual foundations of organizational behaviour; Nature and characteristics; Determinants; Contributing disciplines; Challenges and opportunities for Organisational Behaviour

**Unit 2**

- a) Perception, Attitudes, and Values: Nature, process, importance of perception; Factors influencing perception; Attribution theory of perception; Issues involved in perception: Selective - perception, Halo effect, Contrast effect, Projection, Stereotyping; Applications of perception theories in organization; Concept of Pygmalion effect; An overview of emotions values, beliefs and attitudes with emphasis on their managerial implications.
- b) Learning: Concept; Theories of learning: Classical conditioning, Operant conditioning, Social learning, Methods of shaping the behaviour, Managerial implication of learning theories.
- c) Motivation: Why people work? Concept, major theories and process of motivation: Maslow's need-hierarchy theory; Herzberg's motivation-hygiene theory; McGregor's Theory X and Theory Y; Cognitive evaluation theory; Goal-setting theory; Reinforcement theory; ERG theory; Vroom's expectancy theory; Job design theory; Equity theory; Integrating contemporary theories of motivation; Culture's influence on motivation theories: Managerial implications of various theories; Linking MBO with goal-setting theory; Linking recognition programmes and reinforcement theory; Linking employee involvement programmes and motivation theories.

**Unit 3**

- a) Personality: Concept and determinants; Personality traits; Major personality attributes influencing Organisational Behaviour; Locus of control; Machiavellianism; Self-esteem; Self-monitoring; Risk-taking; Type A and Type B personality; Proactive personality; Personality and national culture; Holland's typology of personality and congruent occupations.
- b) Leadership: Concept and functions; Style and theories of leadership: Traits, behavioural and situational/contingency groups of theories; Inspirational approaches to leadership: Charismatic leadership, Transformational leadership, and transactional leadership, Contemporary leadership roles; Challenges to the leadership construct; Substitutes and neutralizers to leadership.
- c) Stress: Concept; Consequences and sources; Stress Management: Individual approaches and organisational approaches.

**Unit 4**

- a) Group Behaviour: Groups: Concept and classification; Stages of group development; Group structure; Roles and group norms; Premises and issues; Group decision-making: Group vs individual; Groupthink and groups shift; Group decision-making techniques and process
- b) Interpersonal Relationships: Understanding self and others; Developing interpersonal relationships; Transactional analysis; Johari window.
- c) Conflict Management: Concept; Causes of conflict; Types of conflicts; Stages of conflicts; Effects of conflicts; Managing conflicts.

## Unit 5

- a) Organisation power and politics: Concept; Sources and classification; Power tactics; Coalitions; Organisational politics: Concept and people's response to organisational politics, The concept of impression management.
- b) Organisational culture and change: Concept; Dominant culture; Strong vs weak cultures; Creating and sustaining culture; Employees learning of the culture; Creating a customer-responsive culture
- c) Organisational change: Concept and forces for change; Managing planned changes; Resistance to change; Approaches to manage organisational' change; Organisational development; The concept of learning organization; Culture-boundedness of managing the change.

### **Suggested Readings:**

1. Robbins, SP, Stephen P., Timothy Judge, 'and SeemaSanghi, OrganisationalBehaviour, 15th ed., Pearson Education, 2012
2. W. Newstrom, John, OrganisationalBehaviour, 14th ed., Tata McGraw-Hill, 2014
3. Fred Luthans, OrganisationalBehaviour, 12<sup>th</sup>ed., McGraw-Hill, 2013
4. Heresy, Paul, Kenneth H. Blanchard, and Dewey E. Johnson, Management of OrganisationalBehaviour, 10th ed., Prentice-Hall of India, Eastern Economy Edition, 2013
5. SS Khanka, OrganisationalBehaviour, S. Chand & Co., New Delhi, 2013, 4<sup>th</sup> Edition

**MBA**  
**Semester –II**  
**BS-622: Management Accounting**

**Objective**

To provide the students the knowledge about the use of accounting information for planning, control and decision-making in organizations.

**Course Contents**

**Unit 1: Introduction**

Nature, scope, and importance of management accounting; difference between financial accounting and management accounting; difference between cost accounting and management accounting; cost control, cost reduction, and cost management.

**Unit 2: Budget and Budgetary Control**

Concept of budget and budgetary control; objectives, merits, and limitations of budget administration; types of budgets: fixed and flexible budgets, zero-base budget, programme and performance budget.

**Unit 3: Standard Costing**

Concept of standard cost and standard costing; advantages, limitations, and application; variance analysis: calculation of material variances, labour variances, and overhead variances, disposition of variances.

**Unit 4: Marginal Costing and Decision-making**

Concept of marginal costing, differential costing and absorption costing, break-even analysis, use of above costs in decision-making; make or buy, change of product-mix, pricing and determination of shut-down point.

**Unit 5: Responsibility Accounting**

Concept and approaches to responsibility accounting. Steps involved in responsibility centres and their types; Divisional performance measurement — financial measures.

**Suggested Readings:**

1. Charles C. Horngren, Gary L. Sundem, and William O. Stratton, Introduction to Management Accounting, 15th ed., Prentice—Hall of India/Pearson Education, Delhi, 2009
2. Khan, M.Y., and P.K. Jain, Management Accounting, 6th ed., Tata McGraw-Hill, New Delhi, 2013
3. Richard M. Lynch and Robert W. Williams, Accounting and Management: Planning and Control, 3rd ed., Tata McGraw-Hill, New Delhi, 2005
4. Anthony, Robert N., David F. Hawkins, and Kenneth A. Merchant, Accounting: Text and Cases, 13th ed., Tata McGraw-Hill, New Delhi, 2013



**BS-622A: Analysis and Interpretation of Data**

**Objective of the Course:**

To equip students with the fundamental techniques used in data analysis and interpretation, enabling them to effectively analyze business data for informed decision-making.

**Course Contents**

**Unit 1: Introduction to Data Analysis and Descriptive Statistics**

**Periods:** 8-1-2

**Topics Covered:**

- **Nature and Importance of Data Analysis:** Role of data in decision-making, types of data (qualitative vs. quantitative).
- **Types of Data:** Cross-sectional data, time-series data, panel data.
- **Descriptive Statistics:** Measures of central tendency (mean, median, mode), measures of dispersion (range, variance, standard deviation), and measures of shape (skewness and kurtosis).
- **Graphical Representation of Data:** Bar charts, histograms, pie charts, and frequency distributions.

**Unit 2: Probability and Probability Distributions**

**Periods:** 7-1-2

**Topics Covered:**

- **Basic Probability Concepts:** Definition of probability, events, sample spaces, conditional probability.
- **Probability Rules:** Addition rule, multiplication rule, Bayes' theorem.
- **Probability Distributions:**
  - **Discrete Probability Distributions:** Binomial distribution, Poisson distribution.
  - **Continuous Probability Distributions:** Normal distribution, exponential distribution.
- **Applications of Probability Distributions** in business decision-making.

**Unit 3: Inferential Statistics**

**Periods:** 8-1-2

**Topics Covered:**

- **Sampling and Sampling Distribution:** Sampling techniques, Central Limit Theorem, sampling distribution of the sample mean.
- **Estimation:** Point estimation and interval estimation, confidence intervals for population parameters (mean, proportion, variance).
- **Hypothesis Testing:** Formulation of null and alternative hypotheses, types of errors (Type I and Type II), p-value approach, and confidence intervals.
- **Tests of Significance:** z-test, t-test, chi-square test, and F-test.

## Unit 4: Regression and Correlation Analysis

**Periods:** 7-1-2

**Topics Covered:**

- **Correlation Analysis:** Types of correlation (positive, negative, and zero correlation), Pearson's correlation coefficient, Spearman's rank correlation.
- **Simple Linear Regression:** Model formulation, least squares method, interpretation of regression coefficients, assumptions, and limitations.
- **Multiple Linear Regression:** Introduction, model formulation, multicollinearity, interpretation of coefficients, R-squared, and adjusted R-squared.
- **Applications in business:** Predicting sales, forecasting demand, and risk analysis.

## Unit 5: Multivariate Analysis and Time Series Analysis

**Periods:** 8-1-2

**Topics Covered:**

- **Multivariate Analysis:** Introduction to multivariate data, principal component analysis (PCA), factor analysis, cluster analysis.
- **Time Series Analysis:** Components of time series (trend, seasonality, cyclical variations, irregular variations), moving averages, exponential smoothing, and ARIMA models.
- **Forecasting:** Techniques for forecasting in business, time series forecasting, and applications in demand forecasting and sales prediction.

**Suggested Readings:**

1. **"Statistics for Business and Economics"** by Paul Newbold, William L. Carre, and Betty Thorne – Pearson Education, 9th ed., 2013
2. **"Business Statistics: A Decision-Making Approach"** by David F. Groebner, Patrick W. Shannon, Philip C. Fry – Pearson Education, 8th ed., 2010
3. **"Business Analytics: Data Analysis and Decision Making"** by S. Christian Albright and Wayne L. Winston – Cengage Learning, 7th ed., 2019
4. **"Quantitative Methods for Business"** by David R. Anderson, Dennis J. Sweeney, and Thomas A. Williams – Cengage Learning, 12th ed., 2014
5. **"Applied Multivariate Statistical Analysis"** by Richard A. Johnson and Dean W. Wichern – Pearson, 6th ed., 2013
6. **"Statistics for Management"** by Levin, Rubin, and Stinson – Pearson Education, 7th ed., 2014

**MBA**  
**Semester – II**  
**BS-622B: Analysis and Interpretation of Data**

**Objectives of the Course** - The objectives of data analysis and interpretation are to extract meaningful insights, identify trends, make informed decisions, and solve business problems. It aims to improve accuracy, support forecasting, and enhance strategic planning.

**Unit 1: Introduction to Statistics and Data Collection**

- **Introduction to Statistics**
  - Definition and importance of statistics
  - Types of statistics: Descriptive and Inferential
  - Applications of statistics in various fields (e.g., business, social sciences, healthcare, etc.)
- **Types of Data**
  - Qualitative vs Quantitative data
  - Discrete vs Continuous data
  - Levels of measurement: Nominal, Ordinal, Interval, and Ratio scales
- **Data Collection and Sampling**
  - Types of data collection methods (surveys, experiments, observational studies)
  - Sampling techniques: Simple Random Sampling, Stratified Sampling, Systematic Sampling, Cluster Sampling
  - Errors in sampling: Sampling bias, Non-sampling errors
- **Introduction to Data Representation**
  - Frequency distribution tables
  - Graphical representation of data: Bar charts, Histograms, Pie charts, and Line graphs

**Unit 2: Descriptive Statistics**

- **Measures of Central Tendency**
  - Mean: Arithmetic and weighted
  - Median: Calculation and interpretation
  - Mode: Unimodal, bimodal, and multimodal distributions
- **Measures of Dispersion (Spread)**
  - Range: Definition and limitations
  - Variance and Standard Deviation: Calculation for population and sample
  - Coefficient of Variation: Interpretation in comparison
  - Interquartile Range (IQR) and Box Plots
- **Shape of the Distribution**
  - Skewness: Positive, negative, and symmetrical skewness
  - Kurtosis: Leptokurtic, platykurtic, and mesokurtic distributions
- **Exploratory Data Analysis (EDA)**
  - Use of graphical tools (Histograms, Box Plots, Stem-and-leaf displays) to summarize data

**Unit 3: Probability and Probability Distributions**

- **Basic Probability Concepts**

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- Experiment, Sample space, Events, and Outcomes
- Probability of events: Classical, Relative frequency, and Subjective methods
- Addition and multiplication rules of probability
- Conditional probability and the concept of independence
- **Random Variables and Probability Distributions**
  - Discrete Random Variables: Probability mass functions (PMF)
  - Continuous Random Variables: Probability density functions (PDF)
  - Cumulative Distribution Function (CDF)
- **Common Probability Distributions**
  - **Discrete Distributions:**
    - Binomial distribution
    - Poisson distribution
  - **Continuous Distributions:**
    - Normal distribution
    - Exponential distribution
- **The Central Limit Theorem**
  - Importance of the Central Limit Theorem
  - Sampling distributions of sample means and their properties
  - Standard Error

#### Unit 4: Inferential Statistics

- **Sampling and Sampling Distributions**
  - Concept of a sample and population
  - Sampling distribution of the sample mean
  - Standard error and sample size considerations
- **Estimation and Confidence Intervals**
  - Point estimation and interval estimation
  - Confidence intervals for population mean, proportion, and variance
  - Interpretation of Confidence Intervals (e.g., 95% confidence level)
- **Hypothesis Testing**
  - Hypothesis testing framework: Null hypothesis ( $H_0$ ) vs Alternative hypothesis ( $H_1$ )
  - Type I and Type II errors
  - p-value, significance level ( $\alpha$ ), and decision-making
  - One-tailed and two-tailed tests
  - Tests for population mean (Z-test, t-test) and population proportion (Z-test)
- **Chi-Square Test**
  - Chi-square test for goodness of fit
  - Chi-square test for independence
  - Contingency tables

#### Unit 5: Regression, Correlation, and Statistical Analysis

- **Correlation**
  - Definition and types of correlation (positive, negative, no correlation)
  - Pearson correlation coefficient (r): Calculation and interpretation
  - Spearman rank correlation coefficient
- **Simple Linear Regression**
  - Linear regression model:  $Y = \beta_0 + \beta_1 X$
  - Estimation of coefficients (Least squares method)
  - Interpretation of regression coefficients
  - Coefficient of determination ( $R^2$ ): Goodness of fit

- Assumptions in linear regression
  - **Multiple Linear Regression**
    - Model with multiple predictors:  $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \dots + \beta_nX_n$
    - Estimation of coefficients and interpretation
    - Multicollinearity and its effects
  - **Analysis of Variance (ANOVA)**
    - Concept of variance between and within groups
    - One-way ANOVA: Assumptions and application
    - Post-hoc tests: Tukey's HSD
    - F-statistic interpretation
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### Course Summary:

This syllabus provides a comprehensive foundation in both **descriptive** and **inferential statistics**, covering key concepts such as data collection, measures of central tendency, probability distributions, hypothesis testing, regression, and correlation. Practical skills in using statistical tools and methods are developed throughout the course, preparing students for real-world data analysis.

By the end of the course, students should be able to:

1. Collect, organize, and summarize data.
2. Perform basic probability calculations and understand common distributions.
3. Use statistical techniques to make inferences about populations from samples.
4. Conduct hypothesis tests and estimate population parameters.
5. Analyze relationships between variables using correlation and regression.

### Suggestive Readings:

- "Data Science for Business" by Foster Provost
- "The Art of Data Science" by Roger D. Peng
- "Data Analysis for Business Decisions" by Duane J. Ireland.

**MBA**  
**Semester – II**  
**BS-622C: Statistics, Computation and application**

**Objectives of the Course** - The objectives of statistics, computation, and application are to analyze data, model relationships, and make data-driven decisions. It aims to improve problem-solving, forecast trends, optimize processes, and enhance decision-making through statistical methods and computational tools applied in various fields like business, economics, and engineering.

## **Unit 1: Introduction to Statistics and Computational Tools**

### **1.1 Introduction to Statistics**

- Definition and scope of statistics
- Role of statistics in decision making and problem-solving
- Descriptive vs. Inferential statistics
- Applications of statistics in various fields (business, healthcare, engineering, etc.)

### **1.2 Types of Data and Variables**

- Qualitative vs. Quantitative data
- Discrete vs. Continuous data
- Nominal, Ordinal, Interval, and Ratio scales of measurement
- Cross-sectional vs. time-series data

### **1.3 Introduction to Statistical Software**

- Overview of statistical computation tools (e.g., **R**, **Python**, **SAS**, **SPSS**)
- Installation and basic setup of **R** and **Python**
- Introduction to key libraries: numpy, pandas, matplotlib in Python; ggplot2, dplyr in R
- Data input, cleaning, and exploration using computational tools
- Importing datasets and performing basic operations (mean, median, mode, etc.)

### **1.4 Computational Tools for Data Visualization**

- Creating histograms, bar charts, scatter plots, and box plots
- Customizing plots (titles, labels, colors, etc.)
- Visualizing distributions and summary statistics

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## **Unit 2: Descriptive Statistics and Exploratory Data Analysis (EDA)**

### **2.1 Measures of Central Tendency**

- Mean, median, and mode: Definition, calculation, and interpretation
- Weighted mean and trimmed mean

### **2.2 Measures of Dispersion**

- Range, variance, and standard deviation
- Interquartile range (IQR) and boxplots
- Coefficient of variation and its application in comparisons

### **2.3 Data Distribution and Shape**

- Skewness and kurtosis
- Normal distribution and its properties
- Empirical rule for normal distribution
- Outliers: Detection using IQR and Z-scores

### **2.4 Exploratory Data Analysis (EDA)**

- Visual and computational methods for exploring data
- Summarizing data with tables and graphical methods
- Identifying patterns, trends, and relationships in data using plots and summary statistics

### **2.5 Data Cleaning and Preprocessing**

- Handling missing data (imputation, deletion, etc.)
- Outlier detection and treatment
- Transforming variables (log transformation, normalization)

## **Unit 3: Probability Theory and Probability Distributions**

### **3.1 Basic Probability Concepts**

- Sample space, events, and outcomes
- Conditional probability and Bayes' theorem
- Probability rules: Addition, multiplication, and complement

### **3.2 Random Variables and Probability Distributions**

- Definition of random variables: Discrete and continuous
- Probability mass function (PMF) for discrete variables
- Probability density function (PDF) for continuous variables

### **3.3 Common Probability Distributions**

- **Discrete Distributions:**
  - Binomial distribution: Properties and applications
  - Poisson distribution: Applications in rare events
- **Continuous Distributions:**
  - Normal distribution: Standard normal and Z-scores
  - Exponential distribution: Memoryless property
  - Uniform distribution: Properties and applications

### **3.4 The Central Limit Theorem (CLT)**



- Understanding the importance of CLT
- Sampling distributions of the sample mean and sample proportion
- Practical implications of CLT for inferential statistics

### **3.5 Simulation and Monte Carlo Methods**

- Generating random numbers and simulating random processes
  - Using Monte Carlo simulations to approximate probability distributions
  - Applications of simulation in risk analysis and forecasting
- 

## **Unit 4: Inferential Statistics and Hypothesis Testing**

### **4.1 Introduction to Inferential Statistics**

- Estimation and confidence intervals (for means, proportions, and variances)
- Point estimates vs. interval estimates
- Confidence interval for population mean (with known and unknown variance)

### **4.2 Hypothesis Testing**

- Framework of hypothesis testing: Null vs. Alternative hypothesis
- Type I and Type II errors, significance level ( $\alpha$ )
- One-tailed vs. two-tailed tests
- p-value and its interpretation

### **4.3 Parametric Tests**

- Z-test and t-test for means (one-sample, two-sample, paired)
- Hypothesis testing for population proportions (Z-test)
- Analysis of variance (ANOVA) for comparing multiple means

### **4.4 Non-Parametric Tests**

- Chi-square test for goodness of fit and independence
- Mann-Whitney U test, Kruskal-Wallis test for comparing ranks
- Wilcoxon signed-rank test

### **4.5 Practical Computation of Hypothesis Tests**

- Performing hypothesis tests using statistical software (R, Python)
  - Interpreting results and drawing conclusions
  - Application of hypothesis testing to real-world datasets
- 

## **Unit 5: Regression Analysis, Time Series, and Applications**

### **5.1 Simple and Multiple Linear Regression**

- Simple linear regression: Model, assumptions, and interpretation
- Multiple linear regression: Multiple predictors and the regression equation
- Least squares method: Fitting the model and estimating coefficients
- Model diagnostics: Residual analysis, R-squared, and multicollinearity

## **5.2 Logistic Regression**

- Introduction to logistic regression for binary outcomes
- Estimating the odds ratio and interpretation of coefficients
- Model fit and evaluation: ROC curve, AUC

## **5.3 Time Series Analysis and Forecasting**

- Components of time series: Trend, seasonality, and noise
- Autocorrelation and lag plots
- Time series decomposition: Additive and multiplicative models
- Forecasting models: Moving averages, exponential smoothing, and ARIMA models

## **5.4 Applications in Data Science and Machine Learning**

- Data preprocessing and feature engineering
- Introduction to machine learning models: Supervised vs. unsupervised learning
- Introduction to algorithms: Decision trees, k-means clustering, SVM, etc.
- Evaluating models: Accuracy, precision, recall, and F1-score

## **5.5 Case Studies and Applications**

- Applying statistical models to real-world data
- Case studies in business, healthcare, economics, or environmental science
- Using statistical computation tools (e.g., R, Python) for solving practical problems

## **Suggestive Readings:**

- "Statistics for Business and Economics" by Paul Newbold
- "Applied Multivariate Statistical Analysis" by Richard A. Johnson
- "Introduction to Computational Statistics" by James E. Gentle
- "The Elements of Statistical Learning" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman.

**MBA**  
**Semester –II**  
**BS-623: Operations Research**

**Objective of the Course**

To equip the students with the basic understanding of techniques used in operations research, so as to apply them in business decision-making.

**Allocation of Periods: 45 (Lectures-50, Tutorials-5, Practicals-10)**

**Course Contents**

**Unit 1**

**a) Operations Research:** Nature, scope, and applications

**b) Linear Programming:** Mathematical formulation, Graphical Method and Simplex Method of solving LP problem; Special cases: Infeasible Solution, Degeneracy, Unboundedness, and Multiple 'Optimal Solutions; Sensitivity analysis; Duality; Business applications of linear programming.

**(Periods-8-1-2)**

**Unit 2**

**a) Transportation Technique:** Major methods of finding initial basic feasible solution, Stepping-stone and MODI methods for finding optimal solution; Special cases of transportation problem.

**b) Assignment Problem:** Algorithm, Special cases.

**(Periods-6-1-**

**2)**

**Unit 3: Inventory Control**

Concept, functions, and significance of inventory; major decisions; Relevant costs; Classical EOQ model: limitations, extensions of the classical EOQ model; gradual receipt; application of EOQ model in production process; quantity discount; Planned stock-out; Re-order level; ABC analysis.

**(Periods-5-1-**

**2)**

**Unit 4**

**a) Project Management:** PERT and CPM and their applications, PERT/Cost; Resource leveling.

**b) Queuing Theory:** Introduction; Structure of queuing system; characteristics of M/M/I queuing model; Applications of queuing theory.

**(Periods-5-1-2)**

**Unit 5**

**a) Game Theory:** Concept of game; 'two-person', 'zero-sum' games; pure and mixed-strategy games; rule of dominance; major methods of solving game theory problems; Limitations and applications of game theory.

**b) Simulation:** Definition; Types; Advantages and limitations; Phases of simulation model; Applications to PERT problems, investment problem, and inventory problems.

**(Periods-6-1-**

**2)**

**Suggested Readings:**

- 1) Anderson, David R., Dennis J. Sweeney, and Thomas A. Williams, Quantitative Methods for Business, Thomas South-Western, New Delhi, 12th ed., 2004
- 2) Hillier, F.S., and G.J. Lieberman, Introduction to Operations Research, McGraw-Hill Book Co., New Delhi, 10th ed., 2015
- 3) Vohra, N.D., Quantitative Techniques in Management, Tata McGraw-Hill, New Delhi, 4<sup>th</sup> ed., 2011.
- 4) Levin, R.I., D.S. Rubin, J.P. Stinson, and E.S. Gardner, Jr., Quantitative Approaches to Management, McGraw-Hill Book Co., New Delhi, 5th ed., 2005
- 5) Hamdy, A. Taha, Operations Research: An Introduction, Prentice-Hall, New Delhi, 8th ed., 2016.

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**MBA**  
**Semester –II**  
**BS-624: Marketing Management**

**Objectives**

To acquaint the students with the principles and practices of marketing

**Unit 1: a) Marketing Concept** - Marketing management; Nature and scope; Evolution of marketing; Selling vs marketing; Emerging role of marketing; Marketing mix.

**b) Marketing Environment** - Concept; Need for study; Major elements and their impact on marketing decisions.

**Unit 2: a) Consumer Behaviour** - Consumer vs. organisational/ industrial buyer; Their characteristics; Importance of understanding consumer behaviour; Determinants of consumer behaviour; Theories of consumer behaviour; Various buying roles in family; Types of buying behaviour; Consumer decision-making process in buying.

**b) Market Segmentation** - Nature and importance of segmentation; Pre-requisites for effective segmentation; Bases of segmenting consumer markets; Market selection strategies; Positioning.

**Unit 3: Product Decisions**

Concept of product; Classification of products; Product line and Product mix; Branding, packaging, and labeling; Customer services; Development of new product; Product Life-cycle; The new product (Consumer); Adoption process.

**Unit 4: a) Price Decisions** - Pricing as a marketing variable-its role and importance; Price vs. non-price competition; Factors influencing price determination; Price setting in practice; Price policies and strategies.

**b) Distribution Channels and Physical Distribution Decisions** - Why are marketing intermediaries used? Marketing channel functions; Selecting channels of distribution; Determining the intensity of distribution; Channel management decisions-selection, motivation and evaluation of individual middlemen; Manufacturer-distribution relationship; Retailing and wholesaling; Logistics of distribution.

**Unit 5: a) Promotion Decisions** - Nature; Objectives and importance of promotion; Communication process; Promotion mix and methods; Advertising; Personal Selling; Public Relations; and Sales Promotion.

**b) Legal, Ethical, and Social Aspects of Marketing** - Consumerism; Consumer protection measures in India; Recent developments in consumer protection in India.

**Suggested Readings:**

1. Philip Kotler, • Levin Lane Keller, Abraham Koshy, and MithleshwarJha, *Marketing Management: South Asian Perspective*, 13<sup>th</sup> ed., Pearson Education, New Delhi, 2012
2. Michale J. Etzel, Bruce J. Walker, William J. Stanton, and Ajay Pandit, *Marketing: Indian Adaptation*, 14<sup>th</sup> ed., Tata McGraw-Hill, New Delhi, 2009
3. E. Jerome McCarthy and William B. Perrealet, *Basic Marketing: A Managerial Approach*, 15<sup>th</sup> ed., Tata McGraw-Hill, New Delhi, 2009
4. Philip Kotler and Gary Armstrong, *Principle of Marketing*, 14<sup>th</sup> ed., Prentice-Hall of India, New Delhi, 2014
5. *The Consumer Protection Act, 1986*

**MBA**  
**Semester –II**  
**BS-625: Financial Management**

**Objectives of the Course**

This course seeks to help the students in developing their skills for financial decision-making.

**Course Contents**

**Unit 1: Introduction to Financial Management**

Nature, scope, and objectives of financial management; Time-value of money; Concept of risk and return; Valuation of securities: Bonds and Equities; Functions of Finance Management in modern age.

**Unit 2: Long-term Investment Decisions**

Concept and Principles of Capital Budgeting; Methods of capital Budgeting: Payback Method, Accounting Rate of Return, Net Present Value (NPV), Net Terminal Value, Internal Rate of Return (IRR), Profitability Index; Capital budgeting under risk; Certainty-Equivalent Approach and Risk-adjusted Discount Rate

**Unit 3 : Working Capital Management**

Concept of working capital; Planning for working capital, The risk-return trade-off; Management of cash and near-cash assets; Payables management; Management of accounts receivable; Inventory management; Sources, of short-term finance.

**Unit 4 : Long-term Financing Decisions and Cost of Capital**

Capitalisation; Capital structure; Factors affecting the pattern of capital structure; Basic assumptions and theory of capital structure; Estimation of components of cost of capital; Equity capital and external and internal retained earnings; Debt and preference capital; Weighted-Average Cost of Capital (WACC) and marginal cost of capital; Sources of long-term financing: Capital structure; Operating and financial leverage; Determinants of capital structure; Corporate securities.

**Unit 5 : Dividend Decisions**

Concept of dividend; Significance of dividend decision in business; Forms of dividend; Factors affecting dividend policy; Dividend policy theories: Walter's Model; Modigliani-Miller approach; Gordon's Model; Dividend policy in practice.

**Suggested Readings:**

1. James C Van home, Financial Management and Policy, 13th ed., Prentice-Hall of India, New Delhi
2. I.M. Pandey, Financial Management, Vikas Publication, 11 ed., 2015
3. M.Y. Khan and P.K. Jain, Financial Management, Tata McGraw-Hill, 7th ed., 2014
4. V. Sharan, Essentials of Financial Management, Prentice-Hall of India, New Delhi, 6<sup>th</sup> ed., 2010
5. Van Horne and Wachowicz, Jr., Fundamentals of Financial Management, 13th ed., 2015
1. Prentice-Hall of India,
6. Eugene F. Brigham and Joel F. Houston, Fundamentals of Financial Management, concise 9<sup>th</sup> ed. (Indian Edition), Thomson South-western (now Cengage Learning), New Delhi, 2016
7. Ravi M. Kishor, Financial Management, 5th ed., 2018, Taxmann, New Delhi
8. R.P. Rustagi, Financial Management, Galgotia Publishers, New Delhi, 11<sup>th</sup> edition, 2016
9. Lawrence J. Gitman, Principles of Managerial Finance, Pearson Education, 14<sup>th</sup> ed., New Delhi
10. Prasanna Chandra, Fundamentals of Financial Management, Tata McGraw-Hill, 6<sup>th</sup> ed., 2014

**MBA**  
**Semester –II**  
**BS-626: Human Resource Management**

**Objective of the Course**

To enable students to understand procedures, processes and techniques applied in the management of Human Resource in an organisation.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Course Contents**

**Unit 1 : Introduction to Human Resource Management**

Evolution of FIRM (b) Objectives and functions of HRM (c) Role and responsibilities of HR manager (d) Relevance of HRM (e) Systems approach to HRM.

**(Period-6-1-2)**

**Unit 2 : Acquisition of Human Resource Management**

Human Resource Planning: Purpose and process (b) Recruitment and Selection: Sources of Recruitment, Stages in Selection Process (c) Placement, goals analysis: Job description and job specification.

**(Period-7-1-4)**

**Unit 3 : Developing Human Resources**

(a) Training and Development: Training needs, training methods, application of computers in training, developing effective training programmes (b) Concept of HRD (c) Management development programmes

**(Period-4-1-2)**

**Unit 4 : Performance Appraisal**

(a) Concept and objectives of performance appraisal (b) Process of performance appraisal (c) Criteria for performance appraisal (d) Benefits of performance appraisal (d) Limitations and constraints (f) 360 degree performance appraisal (g) Promotion-degree, transfer and separation: Promotion, purpose, principles and types; Transfer: Reasons, principles and types; Separation: Lay-off, resignation, dismissal, retrenchment, voluntary, retirement scheme.

**(Period-4-1-1)**

**Unit 5 : Motivating Human Resources**

(a) Motivation at Work, Major Motivation Theory: An Overview (b) Participative Management (c) Compensation Management, Major Elements of Compensation Management (d) Incentives: Concepts, types of incentives; Incentives schemes in Indian industries; Fringe benefits (e) Discipline and employees' grievance redressal

**(Period-5-1-0)**

**Suggested Readings:**

1. Dessler, Gary, and Biju Varkkey, Human Resource Management, 14<sup>th</sup> ed. Pearson Education, New Delhi, 2015.
2. Gomez-Mejia, et al., Managing Human Resources, 7<sup>th</sup> ed., Pearson Education
3. Ivancevich, Human Resource Management, Tata McGraw-Hill, 8<sup>th</sup> ed., 2000
4. David S. Decenzo and Stephen P. Robbins, Personal/Human Resource Management, 8<sup>th</sup> ed., Prentice-Hall of India, New Delhi, 2015
5. Biswajeet Pattanayak, Human Resource Management, 4<sup>th</sup> ed., Prentice-Hall of India, New Delhi
6. K. Aswathappa, Human Resource and Personnel Management, Tata McGraw-Hill, 6<sup>th</sup> ed.
7. RS Dwivedi, Managing Human Resources in Indian Enterprises, Galgotia Publishing Co., New Delhi, 5<sup>th</sup> ed.

**MBA**  
**Semester –II**  
**BS-627: Production and Operations Management**

**Objective of the Course**

To enable students to understand the techniques of Production and Operations Management, and be able to apply those effectively in the business.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10) Course Contents**

**Unit 1 : Introduction to Production and Operations Management (P&OM)**

(a) Nature, Objectives and Scope of P&OM (b) Evolution of P&OM (c) Transformation System (d) Functions and Responsibilities of Operations Manager (e) Difference between Goods and Services (f) New product development

**(Periods- 4-1-2)**

**Unit 2 : Facilities Management**

(a) Types of Processes (b) Process Selection (c) Importance of Facilities Location (d) Factors Affecting Facilities Location (e) Location Evaluation (f) Facility's Layout: Criteria for Good Layout, Benefits of good layout, Symptoms of Poor Layout, Types of Facility's Layout, Layout planning

**(Periods- 6-1-2)**

**Unit 3 : Production Planning**

(a) Introduction to Production Planning (b) Production Planning Strategies (c) Introduction to Capacity Planning (d) Aggregate Planning (e) Master Production Scheduling (f) Material Requirement Planning (g) Production Scheduling

**(Periods- 6-1-2)**

**Unit 4 : Production Control**

(a) Elements of Production Control (b) Purchase Process (c) Receiving (d) Inventory Management: Graphical, Tabular and EOQ Models of Inventory Control; Economic Production Lot Size (EPLS) (e) Just-In-Time Inventory (f) Selective Control Tools of Inventory.

**(Periods- 6-1-2)**

**Unit 5 :**

**a) Quality Management:** Concepts of Total Quality Management (TQM)

**b) Tools for Lean and Six Sigma:** Value stream map; 7 wastes; Pure and replenishment types; Standardised work; Total Productivity Management (TPM); Just-in-time (JIT)

**(Periods- 8-1-2)**

**Suggested Readings:**

1. Chase, Jacob, Aquilano, and Agarwal, *Production and Operations Management*, 13<sup>th</sup>ed. (TMH, New Delhi), 2009
2. Lee J. Krajwski, *Operations Management: Strategy and Analysis*, 6<sup>th</sup> ed., Pearson Education, N. Delhi
3. Jeffery K. Liver, *Toyota Production Way*
4. Adam Ebert, *Production and Operations Management*, 6<sup>th</sup> ed., Pearson Education, N. Delhi
5. S.N. Chary, *Production and Operations Management*, TMH, New Delhi, 5<sup>th</sup> edition
6. William J. Stevenson, *Operations Management*, 13<sup>th</sup> ed., 2017, McGraw-Hill, New Delhi
7. Muhlemann, Oakland, Lockyer, Sudhir, and Katyayani, *Production and Operations Management*, 6<sup>th</sup> ed., Pearson Education, 2007
8. Elwoods S. Buffa and Rakesh K. Sarin, *Modern Production/ Operations Management*, 8<sup>th</sup> ed., Wiley Student Edition, 2009
9. Joseph S. Martinich, *Production and Operations Management*, 10<sup>th</sup> Reprint, Tata McGraw-Hill, New Delhi/Nbida, 2005
10. Norman Gaither, *Operations Management*, Cengage Learning
11. Ritzman, et al., *Operations Management*, Pearson, 11<sup>th</sup> ed., 2015

**MBA**  
**Semester –II**  
**BS-628: Management Information System**

**Objective of the Course**

To enable students to understand and apply Information Technology and e-commerce in the business decision-making

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Course Contents**

**Unit 1 : Information Systems in Business**

- a) Information Technology, Information System, Information versus data.
- b) Transaction processing system, Process control system.
- c) Electronic Business (e-business), Electronic Commerce (e-commerce), Legacy system
- d) Competitive Advantage, Competitive Strategies, Strategic Information Systems, Reengineering Business Processes, Total Quality Management (TQM), Porter's Competitive Model.

**Unit 2 : Computer Hardware, Software, and Network**

- a) Central Processing Unit (CPU), Primary storage (memory), Secondary storage, Minicomputer (midrange), Automated input devices, Storage devices' Microprocessor' Peripheral devices.
- b) Application-specific programs, general-purpose application software, end-user software, system software, system development software, general purpose vs application specific programming language, machine language.
- c) Digital versus analog network, modem, network topology, Local Area Network (LAN), and Wide Area Network (WAN), fiber optic cable.

**Unit 3 : E-Business Systems**

- a) Batch Processing, On-line (real-time) Systems, Inventory Control.
- b) Cross-Functional Enterprise Applications, Enterprise Application Integration,
- c) Collaboration Systems, Direct Business Model.
- d) Supply Chain Management (SCM), Challenges of SCM, Enterprise Resource Planning (ERP), Challenges of ERP, Customer Relationship Management (CRM), Challenges of CRM, Outsourcing.
- e) Internet, Intranet, and Extranet, B2B e-Commerce, B2C e-Commerce, C2C e-Commerce, Electronic Payment Systems, Electronic Funds Transfer, Access Control and Security.

**Unit 4 : Decision Support System**

- a) Decision Structure, Decision Support system versus management reporting, Reporting alternatives, Data mining, On-line Analytical Processing (OLAP)
- b) Expert System, Level of Management Decision Making, Artificial Intelligence, Neural Network, Virtual Reality.

**Unit 5 : Developing Business/ IT Solutions**

- a) Feasibility Study, Cost/benefit analysis, Functional requirements, Organisational Analysis, Prototype, Systems development life-cycle, Conversion Methods, Tangible versus Intangible Benefits, Post-implementation review, Documentation.
- b) Water-fall Model, Incremental Model, Spiral Model
- c) Data flow diagram, Entity-relationship model

**Suggested Readings:**

1. O'Brien, James, and Marakas, George, Management Information Systems, Tata McGraw-Hill, 2009, 10<sup>th</sup>ed.
2. Abhijit Chaudhury, Abhijit and Jean-Pierre Kuilboer, e-Business and e-Commerce Infrastructure: Technologies Supporting the e-Business Initiative, Mc-Graw-Hill Companies, 2002
3. Jawadekar, W.S, Management information System, Tata McGraw-Hill, 6<sup>th</sup>ed.
4. Bajaj, K.K., and Nag, Debjani, e-Commerce, Tata McGraw-Hill, 2<sup>nd</sup> edition
5. Davis, Olsan, Management Information System, Tata McGraw-Hill, New Delhi, 8<sup>th</sup> ed., 2006
6. Loudan and Loudan, Management Information System, 13<sup>th</sup>ed.



**MBA**  
**Semester –III**  
**BS-631: Strategic Management**

**Objective of the Course**

To acquaint the students with the essentials of formulation, implementation, decision-making, and control strategies in the management of a corporate business organization, in 3. achieving social impact of public and not for profit organizations, global value chain strategies, managing and evaluating entrepreneurship opportunities and start ups, change management, challenges of global businesses, emerging technologies and fostering innovation

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Course Contents**

**Unit 1 : Introduction:** Concept of Strategic Management; Strategic management process; Business policy; Corporate strategy; Mission, vision, objectives; Basic model of strategic management; Strategic decision-making; Role of strategic management in marketing, finance, HRM, and global competitiveness.

**(Periods-2-0-0)**

**Unit 2 : Formulation of Strategy**

- a) Defining the Organisational Mission Triple Bottom-line and Social Responsibility.
- b) External Environment (Analysis and Implications).
- c) The Global Environment: Strategic Considerations for Multinational Firms.
- d) Internal Analysis.
- e) Formulating Long-Term Objectives and Grand Strategies

**(Periods-10-1-2)**

**Unit 3 : Strategic Analysis**

- a) Strategic Analysis and Choice in Single or Dominant Product Business: Building Sustainable Comparative Advantages.
- b) Strategic Analysis and Choice in the Multibusiness Company: Rationalising Diversification and Building Shareholder Value

**(Periods-6-1-2)**

**Unit 4 : Implementation of Strategy**

- a) Implementing Strategy through Short-Term Objectives, Functional Tactics, Reward System and Employee Empowerment, Leadership, and Culture
- b) Managing and Evaluating Entrepreneurship
- c) Change Management and Continuous Improvement.

**(Periods-2-1-2)**

**Unit 5**

- a) Global Value Chain Strategies
- b) Contemporary Issues: Management of Emerging Technologies; Innovations (Research, Development and Applications); Management of Non-Profit Organizations; Business in Volatile Global Environment.

**(Periods-8-2-4)**

**Suggested Readings:**

1. John A Pearce II, Richard B Robinson. Jr., Strategic Management, 11th ed., Tata McGraw Hill, 2015
2. Lawrence R. Gauch & William F. Glueck, Business Policy and Strategic Management, McGraw Hill, 2<sup>nd</sup> edition
3. AzharKazmi, Business Policy of Strategic Management, Tata McGraw Hill, 4<sup>th</sup> edition, 2008.
4. Thomson, Strategic Management: Concept and Cases, Tata McGraw-Hill, New Delhi, 13<sup>th</sup> International edition
5. Gregory G. Dess, GT (Tom) Lumpkin, Alan Eisner, Strategic Management, Tata McGraw-Hill, Noida, 2015
6. Wheeler David and K. Rangarajan, Concepts of Strategic Management and Business Policy, Pearson Education, New Delhi, 13<sup>th</sup> edition
7. Cliff Broman, Business Policy and Strategic Management, PHI, New Delhi, 2014
8. Ohmae, K., The Mind of the Strategist, McGraw-Hill, New York, 1<sup>st</sup> edition
9. Chandler, Alfred, Strategy and Structure, Doubleday, New York
10. Drucker, Peter, The Practice of Management,

**MBA**  
**Semester –III**  
**BS-632: International Business**

**Objective of the Course**

To expose students to the concept, importance, and dynamics of international business and India's involvement with global business operations.

**Allocation of Periods: 45 (Lectures-35, Tutorials-5, Practicals-5) Course Contents**

**Unit 1**

**a) Introduction:** Nature and scope of International business; Rationale of International business; Concept of globalization and its importance; Impact of globalization; International business Vs domestic business.

**b) International business environment:** Economic, Socio-cultural and politic-legal environment; Complexities of International business; Modes of entry into International business; Global trading environment-recent trends in world trade in goods and services; Trends in India's foreign trade.

**Unit 2**

**a) Theories of International Trade:** An overview; Commercial Policy Instruments-tariff and non-tariff measures; Balance of payment account and its components.

**b) International Organisations and Arrangements:** WTO - Its objectives, principles, organisational structure and functioning; An overview of other organizations — UNCTAD, World Bank and IMF; Commodity and other trading agreements.

**Unit 3**

**a) Regional Economic Co-operation:** Forms of regional groupings; Integration efforts among countries in Europe, North America, and Asia.

**b) International Financial Environment:** International financial system and institutions; Foreign exchange markets and risk management; Foreign investments-types and flows; Foreign investment in Indian perspective.

**Unit 4**

**a) Organisational structure for international business operations:** Key issues involved in making international production, finance, marketing and human resource decisions; International business negotiations.

**b) Developments and issues in International business:** Outsourcing and its ' potentials for India; Strategic alliances, mergers and acquisitions; Role of IT in International business; International business and ecological considerations.

**Unit 5**

a) Foreign Trade promotion measures and organizations in India; Special economic zones (SEZs) and 100% export oriented units (EOUs); Measures for promoting foreign investments into and from India; Indian joint ventures and acquisitions abroad.

b) Financing of foreign trade and payment terms.

**Suggested Readings:**

1. Charles, W.L. Hill and Arun K. Jain, International Business, Tata McGraw-Hill, New Delhi, 2011, 6<sup>th</sup> edition
2. Johnson, Derbe, and Colin Turner, International Business — Themes and Issues in the Modern Global Economy, London: Routledge, 2010, 2<sup>nd</sup> edition
3. Cherunilam, Francis, International Business: Text and Cases, Prentice-Hall of India Ltd., 2009, 6<sup>th</sup> edition.
4. John, H. Daniels and Lee H. Radenbaugh, International Business Environments and Operations, Pearson, Delhi, 2009, 12<sup>th</sup> edition
5. Justin, Paul, International Business, Prentice-Hall of India Ltd., 2008, 5<sup>th</sup> edition
6. Michael R. Czinkota, et al., International Business, The Dryden Press, Fortforth, 2002
7. RBI, Report on Currency and Finance, Various issues.
8. Griffin, Ricky, and Michael W. Pustay, International Business — A Managerial Perspective, Prentice-Hall, Upper Saddle River, New Jersey, 2003
9. Bennett, Roger, International Business, Pearson, Delhi, 1999, 2<sup>nd</sup> edition
10. UNCTAD Reports
11. WTO, Annual Report, Various Issue

**MBA**  
**Semester –III**  
**BS-633: Research Methodology**

**Objectives of the Course** - The objectives of research methodology are to provide systematic methods for data collection, analysis, and interpretation. It aims to ensure accuracy, reliability, and validity in research findings, guide researchers in problem-solving, and enable them to draw meaningful conclusions that contribute to knowledge advancement and informed decision-making.

**Unit 1 Concept of Research:** Definition, Meaning, Importance types and Qualities of Research; Research applications in functional areas of Business, Emerging trends in Business research.

Research & the Scientific Method: Characteristics of scientific method. Steps in Research Process

Research Proposal – Elements of a Research Proposal, Drafting a Research Proposal, evaluating a research proposal.

**Unit 2 Research design:** Concept, Features of a good research design, Use of a good research design; Exploratory Research Design: Concept, Types: Qualitative techniques – Projective Techniques, Depth Interview, Experience Survey, Focus Groups, OBS-ervation.

Descriptive Research Designs: Concept, types and uses. Concept of Cross-sectional and Longitudinal Research

Experimental Design: Concept of Cause, Causal relationships, Concept of Independent & Dependent variables, concomitant variable, extraneous variable, Treatment, Control group.

**Unit 3 Scaling & measurement techniques:** Concept of Measurement: Need of Measurement; Problems in measurement in management research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio.

Attitude Scaling Techniques: Concept of Scale – Rating Scales viz. Likert Scales, Semantic Differential Scales, Constant Sum Scales, Graphic Rating Scales – Ranking Scales – Paired comparison & Forced Ranking – Concept and Application.

**Unit 4 Sampling:** Basic Concepts: Defining the Universe, Concepts of Statistical Population, Sample, Characteristics of a good sample. Sampling Frame (practical approach for determining the sample frame expected), Sampling errors, Non Sampling errors, Methods to reduce the errors, Sample Size constraints, Non Response.

Probability Sample: Simple Random Sample, Systematic Sample, Stratified Random Sample, Area Sampling & Cluster Sampling.

Non Probability Sample: Judgment Sampling, Convenience Sampling, Purposive Sampling, Quota Sampling & Snowballing Sampling methods.

**Unit 5 Data Analysis:** Editing, Coding, Tabular representation of data, frequency tables, Construction of frequency distributions, Graphical Representation of Data: Appropriate Usage of Bar charts, Pie charts, Histogram, Leaf and stem, Candle stick, Box plots.

Bi-variate Analysis: Linear Regression Analysis: Meaning and two lines of regression; relationship between correlation and regression co-efficient, Cross tabulations, Chi-square test;

Hypothesis: Qualities of a good Hypothesis –Framing Null Hypothesis & Alternative Hypothesis. Concept of Hypothesis Testing – Logic & Importance.

Test of Significance: Small sample tests: t (Mean, proportion) and F tests, Z test, on-parametric tests: Binomial test of proportion, Randomness test; Analysis of Variance: One way and two-way Classifications, Interpretation of the given data and scenario analysis is expected for appropriate managerial decision inferences to be drawn.

**Suggested Readings:**

1. Business Research Methods, Naval Bajpai, Pearson Education, 2015
2. Research Methodology, C R Kothari, New Age International, 2<sup>nd</sup> edition, 2013
3. Research Methodology, Deepak Chawla, NeenaSondhi, Vikas Publication, 1<sup>st</sup> edition, 2011
4. Business Research Methods by Donald Cooper & Pamela Schindler, TMGH, 12<sup>th</sup> Edition (2013)
5. Business Research Methods by Alan Bryman & Emma Bell, Oxford University Press, 4<sup>th</sup> Edition. (2015)

**MBA**  
**Semester –III**  
**BS-633A: PUBLICATION ETHICS**

**Objectives of the Course** - The objectives of publication ethics are to ensure integrity, transparency, and fairness in the publishing process. It aims to prevent plagiarism, authorship disputes, and data manipulation. Ethical publishing fosters credibility, promotes accurate knowledge dissemination, and upholds academic standards, ensuring research is shared responsibly and contributes to the scientific community.

**Unit 1: Introduction to Publication Ethics**

- **1.1 Definition and Scope of Publication Ethics**
  - What is publication ethics?
  - Importance of ethics in academic publishing and research dissemination
  - Ethical issues in publication: Plagiarism, authorship, conflicts of interest, duplicate publication
- **1.2 The Role of Integrity in Research and Publication**
  - The importance of honesty, transparency, and accountability
  - Ethical principles guiding research and publication
  - Key guidelines from professional bodies: COPE (Committee on Publication Ethics), ICMJE (International Committee of Medical Journal Editors), Elsevier, Springer
- **1.3 Ethical Issues in Scholarly Publishing**
  - Plagiarism: Definition, types, and how to avoid it
  - Fabrication and falsification of data
  - Redundant or duplicate publication
  - Conflicts of interest and how to manage them
- **1.4 Introduction to Ethical Guidelines for Authors**
  - Guidelines on authorship, contribution, and order of authorship
  - The concept of "Ghostwriting" and "Guest Authorship"
  - Ethical responsibility of authors in reporting research findings

**Unit 2: Ethical Standards in the Research Process**

- **2.1 Ethical Issues in Research Design**
  - Importance of ethical considerations in research design
  - Obtaining informed consent and the role of Institutional Review Boards (IRBs) or Ethics Committees
  - Ethical considerations for vulnerable populations in research
- **2.2 Data Management and Ethics**
  - Responsible data collection, storage, and sharing practices
  - Ensuring data accuracy and integrity
  - Avoiding data manipulation or selective reporting
- **2.3 Authorship and Accountability**
  - Criteria for authorship: Who qualifies as an author?
  - Determining the order of authorship
  - Responsibilities of authors, co-authors, and corresponding authors
- **2.4 Ethical Issues in Peer Review**
  - The peer review process and its role in ensuring publication quality
  - Types of peer review: Single-blind, double-blind, open peer review
  - Ethical concerns in peer review: Confidentiality, bias, and conflict of interest
  - Handling reviewer reports and revising manuscripts ethically

### Unit 3: Ethical Publishing Practices

- **3.1 The Publication Process**
  - Steps involved in submitting a manuscript to a journal: Initial submission, revision, acceptance
  - Ethical responsibilities of the editor and the publisher
  - Publisher's role in enforcing ethical publishing standards
- **3.2 Avoiding Publication Malpractices**
  - Plagiarism detection and prevention techniques
  - Self-plagiarism and recycling content across multiple publications
  - Dealing with simultaneous submissions to multiple journals
  - Ethical issues related to the manipulation of impact factors or citation counts
- **3.3 Case Studies of Publication Ethics Violations**
  - Real-life examples of ethical violations in publishing (e.g., retracted papers, fabricated data)
  - The consequences of unethical practices in research and publishing
  - Case studies of journals and researchers who have faced ethical issues
- **3.4 Copyright and Intellectual Property**
  - Copyright laws and their application in academic publishing
  - Licensing agreements and open access publishing
  - The role of Creative Commons in sharing academic work responsibly

### Unit 4: Ethical Challenges in Open Access and Self-Publishing

- **4.1 Open Access Publishing: Ethical Considerations**
  - Definition and models of open access publishing
  - Advantages and ethical concerns in open access publishing
  - Predatory publishers: Characteristics and how to identify them
  - Ethical implications of publishing in paid vs. free access journals
- **4.2 Ethical Challenges in Self-Publishing and Preprints**
  - Risks of self-publishing and ethical issues surrounding it
  - Preprint servers: Benefits and ethical concerns (e.g., early dissemination of unreviewed research)
  - Maintaining academic rigor and transparency in self-publishing platforms
- **4.3 Ethical Issues in Citation Practices**
  - Proper citation practices: Avoiding citation manipulation and inappropriate referencing
  - Citation cartels and the unethical practice of forced citation
  - Ethical implications of citing non-existent or misleading sources
- **4.4 Addressing Unethical Practices in Research**
  - Dealing with research misconduct: Steps for investigation and reporting
  - Reporting ethical violations to journals, publishers, and institutions
  - Whistleblowing ethics and the protection of whistleblowers

### Unit 5: Ethical Decision-Making in Publishing

- **5.1 Ethical Decision-Making Models**
  - Ethical theories and their application in research and publication ethics
  - Utilitarianism, deontology, virtue ethics, and the application in publishing decisions
  - Ethical dilemmas in publishing and how to resolve them
- **5.2 Institutional and Legal Aspects of Publication Ethics**
  - Role of universities, research institutions, and professional organizations in promoting ethical publishing
  - The role of ethics committees in research misconduct investigations
  - Legal frameworks surrounding academic publishing: Libel, defamation, and plagiarism laws

- **5.3 Research Misconduct and Handling Ethical Violations**
  - Types of research misconduct: Plagiarism, falsification, fabrication
  - Procedures for handling allegations of misconduct
  - Consequences of research misconduct for authors and institutions
  - Ethical implications of retraction and correction of published work
- **5.4 Promoting Ethical Publishing in Academia**
  - Training researchers and authors on ethical publishing practices
  - Institutional responsibility for upholding ethical standards
  - Promoting transparency and accountability in academic research
  - Initiatives to support ethical publication practices (e.g., open science, open peer review)

### **Course Summary:**

This course on **Publication Ethics** provides a comprehensive understanding of the ethical standards, practices, and responsibilities involved in academic publishing. It covers everything from the research process to the publication process, peer review, and the ethical challenges posed by emerging trends such as open access publishing. The course also emphasizes how researchers, authors, and publishers can uphold integrity, transparency, and accountability in disseminating research.

### **Learning Outcomes:**

By the end of this course, students should be able to:

1. Understand and apply key principles of publication ethics.
2. Recognize ethical issues in the research and publishing process and handle them appropriately.
3. Maintain research integrity through responsible data management and authorship practices.
4. Navigate the challenges of open access, copyright, and self-publishing in the context of ethical publishing.
5. Address and resolve ethical dilemmas in academic publishing with integrity and professionalism.

### **Suggested Readings:**

1. **Publication Ethics** by Barbara J. Troup (Springer)
2. **Ethical Guidelines for Publication in Scholarly Journals** by COPE (Committee on Publication Ethics)
3. **Research Ethics: A Philosophical Guide to the Responsible Conduct of Research** by Gary Comstock
4. **Research Misconduct in the Health Sciences** by John I. Gallin & Frederick P. Ognibene
5. **Publication Ethics: The Role of Authors and Editors** by H. U. Kambhampati & J. P. Johnso

**MBA**  
**Semester –III**  
**BS-633B: Emerging trends in Research**

**Objectives of the Course** - The objectives of emerging trends in research are to explore innovative methodologies, incorporate advanced technologies, and address contemporary challenges. It aims to foster interdisciplinary collaboration, enhance data-driven insights, and promote sustainable, impactful solutions. These trends drive scientific discovery, improve research efficiency, and contribute to addressing global issues.

**Unit 1: Introduction to Emerging Trends in Research**

- **1.1 Defining Emerging Trends in Research**
  - What constitutes an emerging trend?
  - Importance of staying updated with research trends
  - Factors influencing changes in research practices (technology, globalization, etc.)
- **1.2 Evolution of Research Methodologies**
  - Traditional vs. modern research methods
  - Technological advancements that are transforming research (e.g., big data, artificial intelligence, machine learning)
  - The impact of interdisciplinary research
- **1.3 Role of Digital Tools in Research**
  - Introduction to digital tools for data collection and analysis
  - Research software: Data management systems, qualitative analysis tools, and modeling software
  - The role of cloud computing in research collaboration
- **1.4 Globalization and Its Influence on Research Trends**
  - Cross-border collaboration in research
  - Global research funding trends and priorities
  - International standards and guidelines in research practices

**Unit 2: Big Data and Artificial Intelligence in Research**

- **2.1 Understanding Big Data**
  - Definition and characteristics of big data (Volume, Variety, Velocity, Veracity)
  - Sources of big data in business research (e.g., social media, consumer behavior, sensors, etc.)
  - Big data analytics techniques: Descriptive, Predictive, and Prescriptive Analytics
- **2.2 Role of Artificial Intelligence and Machine Learning in Research**
  - Machine learning algorithms in data analysis (supervised, unsupervised, reinforcement learning)
  - AI-driven research tools for automation of repetitive tasks (data cleaning, summarizing literature, etc.)
  - Case studies of AI applications in business research (predictive modeling, sentiment analysis)
- **2.3 Data Visualization Techniques for Big Data**
  - Visualizing large datasets: Heatmaps, cluster maps, time series, and geospatial visualization
  - Tools for data visualization (e.g., Tableau, PowerBI, D3.js, R, Python libraries)
  - Creating interactive dashboards for business decision-making
- **2.4 Ethical Considerations in Big Data and AI Research**
  - Privacy concerns and data security issues in big data research
  - Bias in machine learning algorithms and ethical implications
  - Responsible AI and fair use of data

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## Unit 3: Digital and Social Media Research

- **3.1 Introduction to Digital and Social Media Research**
  - Impact of digital platforms on research practices
  - Types of data available from digital platforms (social media, blogs, forums, online reviews)
  - Ethical and privacy considerations in digital and social media research
- **3.2 Social Media Analytics**
  - Social media as a research tool: Sentiment analysis, trend analysis, influencer analysis
  - Tools for social media research (e.g., Hootsuite, Brandwatch, Sprout Social, Twitter API)
  - Measuring social media impact and engagement
- **3.3 Text Mining and Natural Language Processing (NLP)**
  - Techniques in text mining: Information retrieval, topic modeling, sentiment analysis
  - Applications of NLP in business research (e.g., analyzing customer feedback, market research)
  - Case studies of successful text mining applications in marketing and customer service
- **3.4 Digital Surveys and Crowdsourcing**
  - Designing and implementing digital surveys using platforms like Google Forms, SurveyMonkey, Qualtrics
  - Crowdsourcing as a method for gathering large-scale research data
  - Ethical concerns in digital surveys and crowdsourcing

## Unit 4: Sustainability and Social Impact Research

- **4.1 Research on Sustainability and Corporate Social Responsibility (CSR)**
  - Importance of sustainability in business research
  - Measuring environmental, social, and governance (ESG) factors
  - Integrating sustainability metrics into business decision-making
- **4.2 Green and Sustainable Business Practices**
  - Emerging trends in eco-friendly business models and practices
  - Research on renewable energy, sustainable supply chains, and waste reduction
  - Role of technology in promoting sustainability in businesses
- **4.3 Social Impact and Social Entrepreneurship Research**
  - The role of social entrepreneurship in addressing global challenges
  - Research methodologies in social impact measurement (e.g., social return on investment, impact assessment)
  - Case studies of businesses with a strong social impact focus
- **4.4 Trends in Corporate Governance and Ethics**
  - New approaches in corporate governance research
  - Ethical considerations and transparency in business research
  - Regulatory changes and their impact on business practice

## Unit 5: The Future of Research: Collaborative and Open Research Practices

- **5.1 Open Science and Open Access Publishing**
  - Definition and benefits of open science: Open data, open methodology, open access journals
  - The rise of open access publishing: Impact on research dissemination
  - Platforms for open access research (e.g., arXiv, Open Science Framework)
- **5.2 Collaborative Research Networks**
  - Benefits of interdisciplinary and international research collaboration
  - Research consortia and academic-business partnerships
  - Platforms for collaborative research (e.g., ResearchGate, Mendeley, Google Scholar)



- **5.3 The Role of Crowdsourcing in Innovation and Research**
  - Crowdsourcing as a method for innovation and problem-solving in research
  - Crowdsourcing in product development, idea generation, and market research
  - Examples of successful crowdsourcing initiatives in business research
- **5.4 Emerging Technologies in Research: Blockchain, IoT, and 3D Printing**
  - The role of blockchain technology in ensuring research data integrity and transparency
  - Internet of Things (IoT) and its potential for gathering real-time business data
  - 3D printing technology in business research and prototyping.

### **Learning Outcomes:**

By the end of the course, students will be able to:

1. Identify and evaluate emerging research trends and their impact on business research.
2. Apply advanced data analytics techniques, including AI and machine learning, to business problems.
3. Understand and leverage digital and social media platforms for research.
4. Explore and conduct research on sustainability, CSR, and social impact.
5. Understand the future of research, including open science, crowdsourcing, and collaborative practices.

### **Suggested Readings:**

1. **Big Data and Business Analytics** by Jay Liebowitz
2. **Research Methods for Business Students** by Mark Saunders, Philip Lewis, Adrian Thornhill (7th Edition, Pearson)
3. **Artificial Intelligence in Business: Research and Applications** by Andreas Kaplan and Michael Haenlein
4. **Digital Research Methods** by Sue McKemmish and Melissa Adler
5. **The Open Access Movement in Research** by Tim Gowers

**MBA**  
**Semester –III**  
**BS-634: Supply Chain Management**

**Objective of the Course**

The objective of the course is to familiarize the students with the mechanism of supply chain planning, design, and operations in the firms. This will help to manage Facilities, inventory, transportation, and information the key drivers of supply chain management

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Contents of the Course**

**Unit 1 : Introduction to Supply Chain Management (SCM)**

(a)Basic Concepts, Scope And Philosophy Of Supply Chain Management, (b) Importance Of Supply Chain Management, (c) Supply Chain Decision, (d) Evolution Of Supply Chain Management.

**(Periods-4-1-2)**

**Unit 2 : Designing the Supply Chain**

(a) Role Of Distribution In Supply Chain, (b) Factors Influencing Distribution Network, (c) Process Of Supply Network Design, (d) Distribution Strategy, (e) Models For Facilities Location And Capacity Allocation, (f) Impact Of Uncertainty In Supply Chain Design, (g) Evaluation Of Supply Chain Design, (h) Demand Chain Management, (i) Strategic Alliances.

**(Periods- 6-1-2)**

**Unit 3 : Performance Measurement and Control**

(a)Concept, Dimensions Of Performance Measurement, (b)Tools For Performance Improvement: Benchmarking: Introduction, Forms Of Benchmarking, GAP Analysis, Benchmarking Study Report; (c)Achieving Strategic Integration, (d)Supply Chain Operations Reference (SCOR) Modeling, SCOR Analysis, (e)Value Chain, (f) Concept Of Configurability, (g)Evaluation Of Supply Chain Performance (Supply Chain Cost Analysis), (h)Impediments To Improved Performance.

**(Periods- 7-1-2)**

**Unit 4 : Logistics Management**

(a)Concept of LOGistics, Inbound And Outbound Logistics, (b) Key Activities of Logistics, (c) Managing The Costs Of Logistics, (d)Application Of Logistics Management, (e)Trade-Offs In Logistics Management, (f)Bull-Whip Effect In Logistics, (g)Third And Fourth Party Logistics, (h)Emergence Of IT In Logistics, (i) International Issues In Logistics, (j)Warehousing, Types Of Warehouses, Site Selection, Layout And Design Of Warehouses.

**(Periods- 7-1-2)**

**Unit 5 : Emerging Trends in Supply Chain Management**

(a)Role Of Information Technology (IT) In Supply Chain Management: Electronic Data Interchange (EDI), E-Customer Relationship Management, Use Of Data Mining Tools, E-Business Framework, (b) Customer Profitability Analysis (CPA), (c) International Issues In Supply Chain Management.

**(Periods- 6-1-2)**

**Suggested Readings:**

1. Chopra, Meindl; Supply Chain Management: Strategic Planning and Operation, 7th ed., Pearson Education, New Delhi, 2016
2. Altekar, Supply Chain Management: Concepts and Cases, Prentice-Hall of India, New Delhi, 10<sup>th</sup> print, 2015
3. BS-Sahay, Supply Chain Management, Macmillan, New Delhi, 2007
4. G. Raghuram , Logistics and Supply Chain Management, Macmillan, New Delhi, 2000
5. Balou, Supply Chain Management, Pearson Education, 5<sup>th</sup> edition, 200

**MBA**  
**Semester –IV**  
**BS-641: Entrepreneurship Development**  
**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Objectives of the Course** - The objectives of entrepreneurship development are to foster innovation, create job opportunities, and promote economic growth. It aims to equip individuals with the necessary skills, knowledge, and resources to start and manage successful ventures. The goal is to enhance entrepreneurial spirit, encourage risk-taking, and drive sustainable business development.

**Course Contents**

**Unit 1 : Foundations of Entrepreneurship Development**

Concept and need of entrepreneurship; Definition of entrepreneur, entrepreneurship, innovation, invention, creativity, business idea; Entrepreneurship as a career; Entrepreneurship as a style of management; The changing role of the entrepreneur; Entrepreneurial traits.

**(Periods-6-1-2)**

**Unit 2 : Theories of Entrepreneurship**

Influences on entrepreneurship development; External influences on entrepreneurship development; Socio-cultural, political, economical, personal entrepreneurial success and failure: reasons and remedies; Women entrepreneurs; Challenge to women entrepreneurs; achievements of women entrepreneurs.

**(Periods-4-1-2)**

**Unit 3 : Business Planning Process**

The business plan as an entrepreneurial tool; Elements of business plan; Objectives; Market analysis; Development of product/idea; Marketing, finance, organization and management; Ownership; Critical risk contingencies of the proposal; Scheduling and milestones

**(Periods-7-1-2)**

**Unit 4 : Project Management**

Technical, financial, marketing personnel, and management feasibility reports; Financial schemes offered by various financial institution, like Commercial Banks, IDBI, ICICI, SIDBI, SFCs.

**(Periods-7-1-2)**

**Unit 5 : Entrepreneurship Development and Government**

Role of Central Government and State Government in promoting entrepreneurship with various incentives, subsidies, grants, etc.

**(Periods-5-3)**

**Suggested Readings:**

1. Khanka, S.S., Entrepreneurial Development, S. Chand, New Delhi
2. Hisrich D. Robert, Michael P. Peters, Dean A. Shepherd, Entrepreneurship, McGraw-Hill, 6th ed.
3. Zimmerer W. Thomas, Norman M. Scarborough, Essentials of Entrepreneurship and Small Business Management, PHI, 4th ed.
4. Holt H. David, Entrepreneurship: New Venture Creation, Prentice-Hall of India, New Delhi, Latest edition.
5. Kuratko, F. Donald, Richard M. Hodgetts, Entrepreneurship: Theory, Process, Practice, Thomson, 7th ed.
6. Desai, Vasant, Dynamics of Entrepreneurial Development and Management, Mumbai, Himalaya Publishing House, Latest edition.
7. Dollinger, Mare J., Entrepreneurship: New Venture Creation, Prentice-Hall of India, New Delhi, Latest edition.
8. Patel, V.G., The Seven Business Crises and how to Beat them, Tata McGraw-Hill, New Delhi, 1995.
9. Roberts, Edward B. (ed.), Innovation: Driving Product, Process; and Market Change, Jossey Bass, 2002.
10. SIDBI Report on Small Scale Industries Sector, Latest edition.

**MBA**  
**Semester –IV**

**BS-642: Corporate Social Responsibility & Corporate Governance**

**Objective:** The course aims to develop student's general theoretical knowledge of corporate social responsibility in contemporary economies and to reflect upon and analysis CSR as an evolving management practice and to gain basic knowledge on Corporate Governance Principles and purpose of good corporate governance

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Unit 1 : Introduction to Corporate Social Responsibility**

**(Periods-6-1-2)**

Definition, Necessity, Demands and Implications of CSR, Global Perspective, Trends and Generation of CSR, Social and ecological responsibility, Forces causing social and ecological responsibility, Corporate Responsibility, Accountability and Sustainability, Integrating Bottom Line Measures in CSR, Indian Approach to' CSR.

**Unit 2 : Corporate Sustainability**

**(Periods-6-0-2)**

Concept of corporate sustainability, Drivers for corporate sustainability, External drivers: Governments, community activists, consumers, customers, market expectations, other corporations, industry associations and non-government organisations. Internal drivers: Corporate leaders and change agents within the company.

**Unit 3 : Corporate Governance**

**(Periods-8-2-3)**

Evolution of Corporate Governance, Narasirnhao Com ittee and other Committee Recommendations on Corporate Governance, Effective Board of Directors and its role, Independent Directors and Audit Committee, Remuneration Committee, Nomination Committee; Corporate and Capital Structures

**Unit 4 : Evaluation of effectiveness of Internal Control**

**(Periods-10-2-3)**

Management Accounting applications and Directors' Responsibility Statement; Going Concern status-financial and other indicators, role of management audit, evaluation of going concern uncertainties; Related party transactions and disclosures; Project management audit and corporate governance; Relevance of Risk Evaluation and Risk management; Evaluation of key financial decisions and disclosures; Management Audit for investors' protection in the context of Corporate Governance, Corporate Governance Norms as prescribed by SEBI,

**Suggested Readings:**

1. May, Steve, George Cheney, and Juliet Roper (eds.) (2006), The Debate over Corporate Social Responsibility, Oxford University Press.
2. Baxi CV, and Prasad Ajit, Corporate Social Responsibility: Concept and Cases, Excel Books, 2006.
3. Dunphy, D., A. Griffiths, and S. Benn, Organisational Change for Corporate Sustainability, London: Routledge, 2003.
4. Laura P. Hartman and AbhaChatterjee, Perspectives in Business Ethics, Tata McGraw Hill, 3rd ed., 2007.
5. John L. Colley, Jacqueline L. Doyle, George W. Logan, and Wallace Stettinius, Corporate Governance, McGraw-Hill, 2003.

**MBA**  
**Semester –IV**  
**BS-643: E- Business**

**Objectives of the Course** - The objectives of e-business are to enhance efficiency, expand market reach, and streamline operations through digital platforms. It aims to improve customer experience, reduce costs, and enable real-time communication. E-business fosters innovation, supports global transactions, and helps businesses gain a competitive edge in a rapidly evolving digital marketplace.

**Unit I** **(8 Sessions)**

Introduction to E-Business: Overview of E-Business; Information Services; Interpersonal Communication; Shopping Services; Virtual Enterprises

E-Commerce: Origin and Need of E-Commerce; Factors affecting E-Commerce; Business dimension and technological dimension of E-Commerce; E-Commerce frame work; Internet as an E-Commerce enabler handling business transactions;

Handling payments: Electronic Fund Transfer System, Digital Token an notational based electronic payment system, smart card, credit card and emerging financial instruments

**Unit II** **(8 Sessions)**

B2B E-Commerce: B2B E-Commerce models: supply oriented, buyer oriented, intermediary oriented; Just-in-time for B2B commerce

Mobile Commerce: Introduction to mobile commerce; Frame required for mobile computing; Challenges emerging in mobile commerce security considerations

**Unit III** **(8 Sessions)**

E-Commerce and Banking: changing dynamics in banking industry; Home banking and its implementation; Management issues in on-line banking

E-Commerce and retailing: On-line retail industry dynamics; On-line mercantile models from customer perspective; Management challenges in on-line retailing

**Unit IV** **(8 Sessions)**

E-Commerce and on-line publishing: On-line publishing approach from customer prospective; Supply chain management fundamentals; Intranets and Supply Chain Management; Managing retail supply chains, Supply chain Application Software

EDI: EDI application in business development; EDI technology; EDI as a re-engineering tool; Financial EDI

**Unit V** **(8 Sessions)**

Indian Perspective: Benefits of E-Commerce; Drawbacks and limitations of E-Commerce; Major requirements in E-Business; Emerging trends and technologies in E-Business; From E-Commerce to E-Business, Web security: Introduction; Firewalls and transaction security.

**Suggested Readings**

1. Bhaskar- E-Commerce (Tata McGraw-Hill)
2. Krishnamurthy- E-Commerce Management: Text and Cases (Vikas)
3. Laudon and Traver- E-Commerce: Business, Technology, Society (Pearson Education)
4. Michel D et al- Business-to-Business Marketing (Palgrave, 2003)
5. Greenstein and Feinman- Internet securities
6. Kalakota and Whinston- Frontiers of electronic commerce (Pearson Education),
7. Kalakota R- Electronic Commerce: A manager's guide (Pearson Education) 2000

**MBA**  
**Semester –IV**  
**MARKETING GROUP**  
**(Electives)**

**Group A**

**BS-6M1: Consumer Behaviour**

**Objective of the Course**

To enable students to understand the Concepts and Strategies of Management of Consumer Behaviour and Branding.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Unit 1 : Introduction**

Defining consumer behaviour; Reasons for studying consumer behaviour, applying consumer behaviour knowledge; Scope of consumer behaviour; Market segmentation; Bases of segmentation, Criteria for effective targeting of market segments

**(Periods-6-1 -2)**

**Unit 2 Consumer as an Individual**

Consumer Motivation; Consumer involvement, Personality and Self Concept; Perception; Consumer Learning and memory; Information processing, Attitudes and Changing Attitudes

**(Periods-7-1-2)**

**Unit 3 Consumers in Social and Cultural Settings**

Reference Groups and Family Influences; Social class, Cultural; Sub cultural and Cross cultural Influences on Consumer Behaviour; Personal influences and Diffusion of Innovations; Impact of Media and Globalization.

**(Periods-7-1-2)**

**Unit 4 : Consumer Decision Process**

Problem Recognition; Search and Evaluating; Purchasing processes; Post-purchase Behaviour; Consumer Behaviour Models; Consumerism; Organisational Buying Behaviour.

**(Periods-4-1-2)**

**Unit 5 : Branding**

(a) Concept of Brand (b) Types of Brand (c) Branding Challenges (d) Products & Brands (e) Brand Image & Personality (f) Brand Equity (g) Association (h) Brand Positioning, Core values, & Brand Mantra (i) Brand Extension (j) Managing Brands (k) Branding in Services. (l) Global Branding.

**(Periods-6-1-2)**

**Suggested Readings:**

1. Schiffman and Kanuk, Consumer Behaviour, Prentice-Hall of India, 2007.
2. H.V. Verma, Brand Management Excel Books -2007
3. Desmond J, Consumer Behaviour, Palgrave, 2007
4. Loudon, D L, Consumer Behaviour, Tata McGraw-Hill, 2007 edition)
5. Blackwell, et al, Consumer Behaviour ,Vikas, 9th edition (Blackwell) 2007.

**MBA**  
**Semester –IV**

**BS-6M2: Sales Management**

**Course Objective**

To enable a students to understand the Processes, Planning and Strategies of Sales and Distribution Management.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Unit 1 : Introduction**

(a)Selling as a part of marketing, Sales management process (b) Role of sales manager, Concept of personal selling, Sales management and salesmanship (c) Theories of personal selling; Process of personal selling.

**(Periods-6-1-2)**

**Unit 2 : Goals in Sales Management**

(a) Goal setting process in sales amangement, Analysing market demand and sales potential (b) Techniques of sales forecasting; Preparation of sales budget (c) Formulating selling strategies (d) Designing sales territories and allocating sales effort, objectives and Quota for sales personnel.

**Periods-(6-1-2)**

**Unit 3 : Sales Force Management**

(a)Organising the sales force, Designing the structure and size of sales force (b) Recruitment and selection of sales personnel, Leading alid motivating the sales force (c)Training the sales personnel, Designing and administering Compensation Plan, Sales contest; Evaluation Programme (d) Sales analysis, Cost analysis.

**Periods-(6-1-2)**

**Unit 4 : Introduction to Distribution Management**

(a)Concept of distribution channel (b) Importance of a channel, Types of channel, Primary and specialized distributors and participants (c) Distributors policies and strategies.

**Periods-(6-1-2)**

**Unit 5 : Channel Management**

(a)Forces of distributing systems (b) Distributor's selections and appointment (c) Channel conflicts and resolutions, Training the distributor's sales team (d) Developing linkages with various teams.

**Periods-(6-1-2)**

**Suggested Readings:**

1. Spiro, Management of the Salesforce, Tata McGraw-Hill, 2007
2. Still,Cundiff and Govoni, Sales Management : Decisions, Strategies and Cases Prentice-Hall of India,5 ed., 2007
3. Coughlan, Anne T , et al.; Marketing Channels ,Prentice—Hall of India, 2007
4. Donaldson B, Sales Management: Theory and Practice, Palgrave, 2007
5. Sahu, P K and Raut K C, Salesmanship and Sales Management, Vikas, 2007
6. Nair & Nair-Sales and Distribution Management, Himalaya Pub. House, 2007

**MBA**  
**Semester –IV**  
**BS-6M3: Advertising Management**

**Objective of the Course**

The purpose of this course is to enable a student gain understanding of the concepts, strategies and issues involved in advertising of products and services.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Unit 1 : Nature and scope of Advertising**

Role of Advertising within Marketing Programme; Role of advertising in communication mix; Process of Advertising

**(Periods-4-1-2)**

**Unit 2 : Determination of Target Audience**

Cultural, Demographic, Social class, Attitudes. Segmentation; Targeting and Positioning strategy; Setting Advertising goals and objectives, DAGMAR approach; Controlled experiments in the field of Advertising Research.

**(Periods-6-1-2)**

**Unit 3 : Developing Advertising Programmes**

Attention and Comprehension; Mean-Ends and Laddering \_analysis; Associations of feelings with Brand; Brand Equity, Image and Personality; Group influence and Word of Mouth Advertising, Creative approaches, Copywriting, Message, Theme, Headline, Layout, Copy, Logo, Appeals; Production process.

**(Periods-8-1-2)**

**Unit 4 : Media Planning and Strategy**

Determining Advertising Budget; Allocation of Media Budgets; Media Class, Vehicle, Scheduling and Timing decisions; Media Buying; Determining Advertising Effectiveness, Opinion and Attitude Tests; Concepts of Recognition and Recall as influencing variables.

**(Periods-8-1-2)**

**Unit 5 : Advertising Organization**

Advertising Agency, Advertising department; Choosing Agency; Ethical, legal and Social Issues in Advertising; Global Marketing and Advertising

**(Periods-4-1-2)**

**Suggested Readings:**

1. Batra, Myers and Aaker, Advertising Management, Prentice-Hall, 5th Ed
2. Belch M A and Belch G E- Advertising and Promotion — An Integrated Marketing Communication Perspective, Tata McGraw-Hill, 2003. 6th ed.
3. David Ogilvy, Ogilvy on Advertising, Longman, London
4. Boarden, William H, Advertising, John Wiley, New York



**MBA**  
**Semester –IV**  
**BS-6M4 International Marketing**

**Objective of the Course**

To enable the students to understand the concept, implications and procedures of. International Marketing and be able to apply those in management of International Business.

**Allocation of Periods: 45 (Lecturer -35, Tutorials- 5, Practicals- 5)**

**Course Contents**

**Unit I**

**a) Introduction to International Marketing:** Meaning, nature, and scope of international marketing; International marketing distinguished from domestic marketing, Exporting, International trade and International business; International marketing management process- an overview.

**b) International Marketing Environment:** Geographic, demographic, economic, political, legal, socio cultural environments- their nature and effects on international marketing operations, Tariff and non tariff barriers; WTO, UNCTAD, Generalized system of preferences (GSP), Regional economic groupings- European Union (EU), NAFTA, ASEAN, etc., Facilities and incentives schemes for exporters.

**Unit 2**

**a) International Product/ market Selection and Entry Modes:** Selecting products, Selecting Market, Various modes of entry into international markets and their evaluation, Export licensing/ franchising,.contracting, Joint Venture, setting up wholly owned suBS-idiary.

**b) International Product Planning:** Product in international context, standardization vs. adoption decision, other considerations; Packaging, Branding, after Sales Services, ISO 9001: 2000 quality system standard

**Unit 3**

**a) International Pricing:** Factors influencing price, pricing methods, Decisions and Pricing process, Price quotations and related considerations.

**b) International Distribution:** Types and Functions of Foreign Distribution Channels, Selection of middlemen, Distribution logistics- transportation and warehousing decisions

**Unit 4 : International Promotion**

International advertising- Standardization vs. Adaptation, Selection of Media, Selection of Agency, Measuring Advertising Effectiveness.

**Unit 5 : Import and Export Procedures**

(a) ICD's, Dry Port, Wet Port (b)Domestic Procedures (c)International Procedures (d)Procedures Specific of other country.

**Suggested Readings:**

1. Vern Terpestra, *International Marketing*, Southwest publication, 2005
2. Varshney RL and B, Bhattacharya, *International Marketing- Indian Perspective*, Sultan chard Publication 2006
3. Fayerweather, J, *International Marketing Management*, Sage Publication, 2006
4. Cateriao, R, Phylip, *International Marketing*, Tata McGraw Hill, 2006
5. Jain Subash, *International Marketing Management*, Southwest Publication, 2005

**MBA**  
**Semester –IV**  
**BS-6M5: Services Marketing**

**Objective of the Course**

To enable students to understand the Conceptual Aspects of Services Marketing

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Unit 1 : Introduction to Services Marketing**

**(Periods-3-1-2)**

Service as a Marketing Concept; Factors for the growth of service sector; Characteristics of Services; Dimensions of services; Classification of services; Managing customer expectations: Levels of expectations; Zone of tolerance; Segmentation, targeting, and positioning of service.

**Unit 2 : Services Marketing-Mix**

**(Periods-7-1-2)**

Product: Service package, core, and supplementary Services; Product levels, service levels, and delivery; Price: Pricing concepts and issues in pricing, pricing policy, pricing approaches, price and customer values; Promotion: Internal and external communication, issues in services promotion; Place: Service distribution, channel options, service distribution strategy; People: Types, role, staff selection and training and motivation; Process: Use of technology and way of delivery of service; Physical Evidence: Importance and role, physical evidence strategy.

**Unit 3 : Service Design**

**(Periods-4-1-2)**

Essentials of a service system; Components of services; Designing the service package; Front office interface; Back office interface; Operations system; Service delivery system; Customer satisfaction and conflicts; Service recovery system; Service Quality: Concept of service quality, Measuring service quality; SERVQUAL system; Concept of CRM: CRM objectives, technology impact on services, concept of e-CRM.

**Unit 4 : Globalisation of Services**

**(Periods-4-1-2)**

Stages of globalization; International marketing of services; Emerging trends; Principal driving forces in global marketing of services; Key decisions in global marketing; Services strategy and organizing for global marketing.

**Unit 5 : Marketing of Financial and Hospitality Services**

**(Periods-4-1-2)**

Financial Services: Deciding the service quality; Understanding the customer expectations; Segmenting, targeting and positioning of financial services; Marketing mix strategies with reference to credit cards; Home loans; Insurance policies and Banking services; Marketing of hospitality products; Factors affecting hospitality experience; Classification of hospitality products; Types of tourism; Factors affecting demand tourism; Functional framework of tourism; Segmentation in tourism market; Marketing strategies for tourism marketing

**Suggested Readings:**

1. Zeithaml, Gremler, Bitner, and Ajay Pandit, Services Marketing, Tata McGraw-Hill, 4th ed., 2008.
2. Lovelock, Services Marketing: People, Technology and Strategy, Pearson Education, 511' edition, 2007.
3. Baron S and Harris K, Services Marketing: Text and Cases., Palgrave, 2003
4. RajendraNargundkar, Services Marketing: Text and Cases, Tata McGraw-Hill, 2nd ed., 2007
5. Harsh V Verma, Services Marketing: Text and Cases , Pearson Education, 2008
7. Rama MohanaRao, Services Marketing, Pearson Education
7. GovindApte, Services Marketing ,Oxford Univ. Press

**MBA**  
**Semester –IV**  
**Open Specialization**  
**(Marketing)**  
**BS-6M6: Retail Management**

**Objective of the Course**

The purpose of this course is to enable students gain understanding of the conceptual framework and issues like economics, competitive interaction and business models in retailing industry.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Course Contents**

**Unit I : Introduction to retailing**

Functions of retailing; Drivers of growth; Building and sustaining relationships; Strategic planning.

**(Periods-6-1-2)**

**Unit 2 : Identifying and understanding customers:**

Information gathering and processing in retailing; Retail institutions classification; Store and non-store based retailing

**(Periods-6-1-2)**

**Unit 3 : Trading area analysis**

Site selection; Retail organization and HRM; Financial dimension; Operations management

**(Periods-6-1-2)**

**Unit 4 : Developing merchandise plans**

Category management; Implementing merchandise plans; Logistics; Inventory management; Retail pricing

**(Periods-6-1-2)**

**Unit 5 : Retailers' image; Visual merchandising**

Retail store atmospherics; Retail promotion; Integrating and controlling retail strategy

**(Periods-6-1-2)**

**Suggested Readings:**

1. Barry Berman and Joel R. Evans, Retail Management: A Strategic Approach, Pearson, 10th Edition.
2. Michael Levy and Barton AWeitz, Retailing Management, Tata McGraw-Hill, 2006 edition.
3. Pradhan, Swapna, Retailing Management-Text & Cases, Tata McGraw-Hill, 2006 edition.
4. Bajaj, Chetan, SrivastavaNidhi V, Tuli Rajesh, Retail Management, Oxford, 2005.

**MBA**  
**Semester –IV**  
**BS-6M7: Rural Marketing**

**Objective of the Course**

To enable students to understand the Conceptual Aspects of Rural Marketing.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Contents of Course**

**Unit 1**

- a) Introduction to Rural Marketing: Concept; Importance; Nature of Market; Peculiarities, Opportunities and Constraints of Rural Marketing, (Infrastructure, Culture, Needs, Myths, Preferences and Practices: and Their Effects on Marketing)
- b) Environment Scanning of Rural Marketing: Demographic; Economic; Socio-Cultural; Government Policy; Communications.

**Unit 2**

- a) Strategy for Rural Marketing: Product; Pricing; Advertisement; Sales Distribution; Financial Investment and Recovery
- b) Rural Consumer Behaviour: Rural Consumer Behaviour, Influencing Factors and their effect on marketing; Management of influence factors of consumer behaviour; Techniques and processes of management of consumer behaviour in rural marketing.

**Unit 3**

- a) Segmentation of Rural Markets: Rural Market Segmentation; Targeting of Rural Market Product; Positioning of Rural Market Product
- b) Product Planning and Pricing for Rural. Markets: Product Planning for Rural Products; Branding and Packaging of Rural Products; Pricing Methods and Strategies for Rural Products

**Unit 4 : Marketing Communication in Rural Markets**

- (a) Role of Advertising and Sales Promotion in Rural markets (b) Challenges in Media Planning (b) Evaluation and Selection of Media Mix for Promotion (d) Sales Force Management in Rural Markets.

**Unit 5 : Distribution in Rural Markets:**

- (a) Types of Rural Channels (b) Special Characteristics of Rural Channels (c) Selection and Management of Channels (d) Factors Influencing Channel Decisions (e) Managing Physical Distribution in Rural Markets - Storage, Warehousing and Transportation.

**Suggested Readings:**

1. BalramDogra, KarminderGhuman, Rural Marketing, 4 ed., TMH, New Delhi.

**MBA**  
**Semester –IV**  
**FINANCE GROUP**  
**(Electives)**

**Group B**

**BS-6F1 Security Analysis and Portfolio Management**

**Objective of the Course**

To enable the students to gain an insight of different Investment Alternatives, Structure of Indian Securities Market and Valuation of Risk and Return of various Corporate Securities.

**Allocation of Periods- 45 (Theory- 30, Tutorial-5, Practical-10)**

**Course Contents**

**Unit 1 : Introduction of Investment**

(a) Meaning and Objective of Investment (b) Investment Decision Process (c) Categories of Investment (d) Phases of Security Analysis

**(Periods-6-0-1)**

**Unit 2 : Introduction of Capital Market**

(a) Meaning and Nature of Capital Market (Primary Market and Secondary Market) (b) Functions and limitations of Capital Market (c) Trading of securities (d) SEBI guidelines

**(Periods-6-0-2)**

**Unit 3 : Introduction to fundamental Analysis**

(a) Technical Analysis and Efficient Market Hypothesis (b) Dividend Capitalization Model (c) Price-Earning Multiplier Approach

**(Periods-8-3-3)**

**Unit 4 : Portfolio Analysis**

(a) Portfolio Analysis and Selection (b) Risk and Return Analysis (c) Beta (d) Markowitz Model. (e) Capital Asset Pricing Model. (f) Arbitrage Pricing Theory

**(Periods-5-2-3)**

**Unit 5 : Portfolio Revision and Evaluation**

(a) Portfolio Revision and Portfolio Evaluation (b) Constant Rupee Value Plan (c) Constant Ratio Plan (d) Sharpe and Treynor Measures (e) Mutual Fund Industry

**(Periods-5-1-1)**

**Suggested Readings:**

1. Fischer, Donald, E. and Ronald J. Jordan, Security Analysis and Portfolio Management, Prentice Hall India, New Delhi, 6th ed.
2. Chandra, Prasanna, Investment Management, Tata McGraw Hill, New Delhi.
3. Sharpe, William, F. Alexander, and Bailey, Investment, Prentice Hall Of India, 5th Edition.
4. Kevin, S. Portfolio Management, Prentice Hall India, New Delhi.
5. Avadhani, V.A, Investment and Security Market In India, Himalaya Publishing House, 3rd Edition.

**MBA**  
**Semester –IV**  
**BS-6F2 : Financial Markets and Institutions**

**Objectives of the Course**

To acquaint the students with the essentials of Financial System and Services in India

**Allocations of Periods- 45 (Theory -30, Tutorial-6, Practical-9) Course Contents**

**Unit 1 : Financial System**

a) Nature and Role of Financial System; Structure/ organisation of financial system; Functions of financial sector; Indian Financial System- an overview; Globalisation of Financial Markets.

b) Regulatory Framework for Non-banking Financial Institutions; Primary markets; Secondary markets; Money Markets

**(Periods 6-1-1)**

**Unit 2 : Management of Commercial Banks**

An overview, Management of Banking Institutions; negotiable Instruments; Working Capital Management; Project Financing, including Infrastructure Projects; Prudential Norms prescribed by Regulators; Management of Non-Performing Assets; Capital Adequacy Norms; Basel II Framework; Risk-Rating Agencies; Regulatory framework for Banks.

**(Periods 8-1-3)**

**Unit 3 : Risk of Financial Inter-mediation**

Introduction; Interest Rate Risk/Re-financing Risk; Re-investment Risk; Market Risk; Credit Risk; Operational Risk; Liquidity Risk

**(Periods 3-1-0)**

**Unit 4 : Risk Management in Financial Institutions**

Managing credit risk; Liability and Liquidity Management; Managing Interest Risk; Managing Operational Risk; Managing risk through Sale of Assets and Securitisation, Derivatives

**(Periods 7-2-4)**

**Unit 5 : Management of Non-Banking Financial Institutions**

Securitisation: Concept, nature, scope, and their implications; DFIs in India: NABARD, State Level Institutions — PCF, IDFC, REC

**(Periods 6-1-1)**

**Suggested Readings:**

1. Anthony Saunders, Financial Markets and Institutions, 4th ed., McGraw-Hill Publishing Company, New Delhi.
2. K Sasidharan, Financial Services and System (2008), McGraw-Hill Publishing Company, New Delhi.
3. Clifford Gomez, Financial Markets, Institutions and Financial Services, Prentice-Hall of India, 2008.
4. M.Y. Khan, Financial Services, 4th ed., McGraw-Hill Publishing Company, New Delhi, 2008.
5. Anthony Saunders, Financial Institutions Management- A Risk Management Approach, 6th ed., McGraw-Hill Publishing Company, New Delhi.
6. M.Y. Khan, Indian Financial System, 6th ed., McGraw-Hill Publishing Company, New Delhi, 2008.
7. Sharma, Management of Financial Institutions: With Emphasis on Bank and Risk Management, Prentice-Hall of India, New Delhi.
8. L.M. Bhole, Financial Institutions and Markets, 4th ed., McGraw-Hill Co., New Delhi, 2008

**MBA**  
**BS-6F3: International Financial Management**

**Objective of the Course**

To enable the students to understand the working of International Financial Institutions, balance of payment and exchange transactions.

**Allocation of Periods: 45 (Theory-30, Tutorial-5, Practical-10)**

**Course Contents**

**Unit 1 : Introduction**

Nature of international financial functions; Growth of international financial functions in recent decades; International flow of funds; Balance of payments — structure; Adjustments in the balance of payments.

**Unit 2 : IMF**

A brief idea of pre-IMF system of exchange rate; IMF and fixed, parity system; The present exchange rate scenario -fixed, floating, target-zone arrangement, dollarisation, currency board arrangement, crawling peg; IMF and international liquidity; Exchange rate mechanism: quotation of exchange rate; bid and ask spread, cross rate, spot and forward rates; Forward rate differential; Determination of exchange rate in spot market and the factors influencing spot exchange rate; Interest Rate Parity theory and the determination of forward market rates; Covered interest arbitrage.

**Unit 3 : Features of foreign exchange market**

Arbitrage, hedging, and speculation in foreign exchange market; Market for currency derivatives; Currency futures, hedging, and speculation in market for currency futures; Currency options — types of option market, types of options contract, gains, and losses to options buyers and sellers, hedging in option market, speculation in options market spreads, straddles, and strangles; Exchange rate risk: translation, transaction, and real operating exposure; Assessment of the size of exposure; Management of exposure.

**Unit 4 : International capital budgeting**

A brief idea of project evaluation criteria; Computation of cash flow from the view point of parent unit and the subS-idiary; Adjusted present value technique; Real options and International capital budgeting; Financial evaluation of international M & As; International portfolio investment: expected return and risk, capital assets pricing model; Benefit and problems of international investment; Optimal international portfolio of assets.

**Unit 5 : International working capital management**

Management of cash in different units — assessment and optimization of cash need, investment of surplus cash; Credit policy — inter-firm and intra-firm sales; Stockpiling and international inventory management; International financial market: A brief review of changing scenario in international financial market; Euro-currency market — financial intermediation and credit creation; international securities market — international bonds, medium term euro notes, euro notes, and euro commercial papers; Financial swaps; Concept of interest rate risk; Management of interest rate risk

**Suggested Readings:**

1. P.G. Apte, International Financial Management, Tata McGraw-Hill, New Delhi, latest ed.
2. J. Madhura, International Financial Management, West View Press Sharan, International Financial Management, Prentice-Hall of India, New Delhi, latest ed.
3. DK Eitemen, Multinational Business Finance, Pearson Education
4. RM Levich, International Financial Markets, McGraw-Hill-Irwin
5. MadhuVij, International Financial Management
6. Alan C. Shapiro, Multinational Financial Management, Prentice-Hall of India, latest ed.
7. Moffett, Stonehill, and Eiteman, Essentials of Global Finance, Pearson/ Addison Wesley, latest ed.
8. RBI Notifications issued from time to time available on its website
9. V. Sharma : International Financial Management, PHS Learning, New Delhi, 2008.

**MBA**  
**BS-6F4 : Project Planning and Evaluation**

**Objective of the Course**

To enable students to understand not only the theoretical aspects of project management but also its applicability in its totality and to develop skill among them to formulate and shape the corporate investment strategies.

**Course Contents**

**Unit 1 : Project Planning and Analysis**

Introduction to concept of project management; An overview of project appraisal and capital budgeting; Resource allocation framework; Generation and screening of project ideas: Market and demand analysis, technical analysis, financial analysis.

**(Periods-7-2-3)**

**Unit 2 : Project Selection and Implementation**

Project cash flows; Cost of capital; Appraisal criteria; Special decision situation; Risk analysis; Social cost benefit analysis; Qualitative factors; Strategic aspects and organisational considerations; Implementations of projects; network techniques for project management; Evaluation of infrastructure projects; Public-private partnership; Types of infrastructure financing; BOT, BOOT, Annuity basis; Escrowing of/Cash profits

**(Periods-8-2-3)**

**Unit 3 : Project Monitoring, Reporting Techniques and/Evaluation**

Management techniques for project • Management; Project monitoring; Management reporting; Management Information System (MIS); Project management self-assessment guide

**(Periods-5-0-1)**

**Unit 4 : Project Review and Administrative Aspects**

Initial review; Performance evaluation; Abandonment analysis; Behavioral issues; Administrative aspects of capital budgeting; Evaluating capital budgeting system

**(Periods-6-1-2)**

**Unit 5 : Management of Public Enterprises**

Organisational issues of public enterprise; Operational issues of public enterprises

**(Periods-4-0-1)**

**Suggested Readings:**

1. Chandra, Prasanna, Projects, Planning, Planning Analysis, Selection, Implementation and Review, Tata McGraw-Hill, 4th ed., 2008
2. Goel, BB, Project Management: Principles and Techniques, Deep and Deep Publications



**MBA**  
**BS-6F5: Corporate Tax Planning**

**Objective**

To provide basic knowledge of India's tax laws and their impact on business decision

**Course Contents**

**Unit 1: Basic Concepts**

Tax planning; Tax management; Tax evasion; Tax avoidance; Money laundering; An overview of taxation in India: Direct and Indirect taxes; Customs Act; Central Excise Act; Service tax; Sales tax; VAT and Goods and Service Tax (GST); Income tax; Wealth tax; Gift tax; and Central gain tax

**Unit 2 : Corporate tax in India**

Types of companies; Residential status of companies and tax incidence; Tax liability; Taxation of Not-for-Profit organisations; Tax on distributed profits.

**Unit 3 : Tax Planning**

Tax planning with reference to setting up of a new business: Location aspect, nature of business, form of organization; Tax planning with reference to financial management decision-capital structure, dividend including deemed dividend and bonus shares; Tax planning with reference to specific management decisions,- Make or buy, own or lease, repair or replace; Tax planning with reference to employees' remuneration; Tax planning with reference to sale of scientific research assets; Tax planning with reference to receipt of insurance compensation; Tax planning with reference to distribution of assets at the time of liquidation

**Unit 4 : Special provisions relating to non-residents**

Double taxation relief; Provisions regulating transfer pricing; Advance ruling Direct Tax Code 2009 and tax planning

**Unit 5 : Tax planning with reference to business restructuring**

Merger, Amalgamation, Acquisition, Demerger, Slump sale, Conversion of sole proprietary concern/partnership firm into company, Transfer of assets between holding and subsidiary companies

**Suggested Readings:**

1. Ahuja, Girish, and Ravi Gupta, Corporate Tax Planning and Management, Bharat Law House, Delhi
2. Singhanian, Vinod K., Kapil Singhanian, and Monica Singhanian, Direct Taxes Planning and Management, Taxmann Publications Pvt. Ltd., New Delhi
3. Pagare, Dinkar, Direct Tax Planning and Management, Sultan Chand and Sons, New Delhi
4. SP Goyal, Direct Tax Planning, Sahitya. Bhawan, Agra
5. Bare Acts of relevant enactments

**MBA**  
**Open Specialization (Finance)**  
**BS-6F6: Management of Banking and Financial Services**

**Objective of the Course**

To enable students to understand the roles, structure, and functioning of Banks and management of the banking services

**Course Contents**

**Unit 1 : Introduction to Banking**

Evolution of Banks; Role and Objectives of Banks; Types of Banks; Reserve Bank of India and its functions; Performance evaluation and monitoring of bank.

**Unit 2 : Money and Capital Market Institutions**

Money Market Institutions (Central Bank, Commercial Banks, Indigenous Financial Agencies, Discounting Houses, Accepting Houses); Capital Market Institutions; Investment Banks; Merchant Banks; Development Banks; and Mutual Funds

**Unit 3: Banking Services**

Concept of Banking Services; Types of Banking Services; Factors and Principles Governing Banking Services\

**Unit 4 :Organisation and Control Structure of Banks**

International Level, National Level; State Level; Co-operative Level; Private Banking Organization, Banking at International Level: IMF, IBRD, ADB, IDA.

**Unit 5**

a) Contemporary Issues in Banking: Analysis of Banking Performance; Banking 3) Risk (Credit Risk, Liquidity Risk, Market risk, Interest rate Risk, Operational Risk); Non-performing Assets (Concept of Non-performing Asset, Asset Classifications, 3) Capital Adequacy Norms, Disinvestment)

b) Recent Developments in Banking Industry: Universal Banking; e-Banking; Mobile Banking

**Suggested Readings:**

1. Khan, M.Y., Indian Financial System, Tata McGraw-Hill.
2. Farman, ML, Banking Law and Practice, Indian Law House.
3. Bhole, L.M., Financial Institutions and Markets, Tata McGraw Hill 4th ed. (2004).
4. Kohn, Meir, Financial Institutions and Markets, Tata McGraw Hill (2000).
1. 5 Mishkim, Frederics, Eakins, Stanley, G, Financial Markets Institutions, Prentice Hall,5th ed. (2006).

**MBA**  
**BS-6F7: Insurance and Risk Management**

**Objective of the Course**

To develop an understanding among students about identifying analyzing and managing various types of risk and to understand principles of insurance and its usefulness in business.

**Allocation of Periods: (Theory-30, Tutorials-10, Practicals-5)**

**Course Contents**

**Unit 1 : Introduction**

Concept of risk; Objective of risk management; Need for a risk management; Types of risk; Identification and measurement of risk; Risk evaluation and prediction

**(Periods-4-2-2)**

**Unit 2 : Risk Aversion and Risk Management**

Risk aversion and demand for insurance by individual; Business risk management and demand for insurance; Expected utility; Application of statistical techniques in risk avoidance; Disaster risk management; Insurability of risk; Contractual provisions and legal doctrines; Premium loading; Moral hazards; Deductibles and claim processing costs; Aggregated and Disaggregated risk management; Resolving coverage disputes; Risk retention and transfer; Loss exposure; Legal aspects. of insurance contract; Principle of indemnity; Estoppels; Endowment; Insurance

**(Periods-4-2-0)**

**Unit 3 : Types of Insurance**

Fire and motor insurance; Health insurance; Social insurance; Home-owners insurance; Life insurance and annuities; Term insurance; Endowment insurance; Whole life insurance; Life insurance pricing; Employees benefits group; Medical coverage; Retirement plans; Marine insurance; Ships and goods policy; Marine risk-institute cargo clauses reinsurance.

**(Periods-6-1-1)**

**Unit 4 : Assessment and Control**

Control of malpractices; Negligence, Loss assessment and loss control; Exclusion of perils, actuaries, computation of insurance premium

**(Periods-4-1-1)**

**Unit 5 : Globalization of Insurance Sector**

Globalisation of insurance sector; Regulation of risk reduction by IRDA; Reinsurance; Coinsurance assignment

**(Periods-6-1-0)**

**Suggested Readings:**

1. Scott Harrington and Gregory Niehaus, Risk Management and Insurance, 2nd ed., Tata McGraw-Hill, 2004
2. Dorfman, Risk Management and Insurance, PHI
3. Gupta, PK, Insurance and Risk Management, Himalya Publishing House, 2004
4. Mishra, MN, Principles and Practices of Insurance, S.Chand and Co., 2004
5. Panda, GS, Principles and Practices of Insurance, Kalyani Publications, 2004
6. Jeevanandam, C., Risk Management, Sultan Chand and Sons, 2005

**MBA**  
**HUMAN RESOURCE GROUP**  
**(Electives)**  
**Group- C**  
**BS-6H1: Industrial Relations and Labour Laws**

**Objective of the Course**

To enable students to learn the concepts of industrial relations including Trade unions, collective bargaining, discipline and various labour enactments.

**Allocation of Periods: 45 (30 Lectures, 5 Tutorials, 10 Practicals)**

**Course Contents**

**Unit I:Industrial Relations**

Concept of Industrial Relations; Nature of Industrial Relations; Objectives of IR; Factors affecting IR in changing Environment , Evolution of IR in India ; Role of State; Trade Union; Employers' Organisation; Human Resource Management and IR, Role of I.L.O in Industrial Relations, International Dimensions of IR

**(Periods: 6 -1-1)**

**Unit 2:Trade Union**

Trade Union: Origin and growth, unions after independence, unions in the era of liberalization; Factor Affecting Growth of Trade Unions in India, Multiplicity & Recognition of Trade Unions; Provisions of Trade Union Act 1926.

**(Periods: 5 -1- 2)**

**Unit 3: Collective Bargaining and Workers' Participation in Management**

(a)Collective Bargaining: Meaning, Nature, Types, Process and Importance of CB-prerequisites issues involved. Status of Collective Bargaining in India, Functions and role of Trade Unions in collective bargaining; b) Workers' Participation in Management: Concept- practices in India works committees, Joint management councils. Participative Management and co-ownership; Productive Bargaining and Gain Sharing

**(Periods: 4- 1-2 )**

**Unit 4:Discipline and Grievance Redressal**

Discipline - Causes of Indiscipline - Maintenance of discipline and misconduct, Highlights of Domestic enquiries - Principles of Natural Justice; Labour turnover; ABS-enteeism Grievance - Meaning of Grievance, Grievance redressal machinery in India- Grievance Handling Procedure; Salient features of Industrial Employment (Standing Orders) Act, 1946.

**(Periods: 7 -1- 3)**

**Unit 5**

**a) The Industrial Disputes Act, 1947:** Definitions of Industry, Workman and Industrial Dispute - Authorities under the Act —Procedure, Powers and Duties of Authorities — Strikes and Lock outs — Lay off and Retrenchment — Special Provisions relating to Layoff, Retrenchment and Closure.

**b) The Factories Act, 1948:** Provisions relating to Health, Safety, Welfare facilities, Working hours, Employment of young persons Annual Leave with wages etc.

**(Periods: 8 - 1 - 2)**

**Suggested Readings:**

1. C.S VenkataRatnam — Industrial Relations , Oxford University Press, 2nd Edition, March 2006
2. B.D Singh- Industrial Relations and Labour Laws, Excel Books, New Delhi, 2008
3. K Aswathappa- Human Resource Management, Tata McGraw-Hill, 7th Edition, 2013
4. P.L Malik - Handbook of Labour and Industrial Law (EBC) (12th Edition, 2009)
5. M.V Pylee, Workers Participation in Management, Vikas Publishing House Pvt. Ltd. 2004
6. C.S VenkataRatnam, PravinSinha, Trade Union Challenges at the beginning of 21st Century (Excel Books), 2000

**MBA**  
**BS-6H2: STRATEGIC HUMAN RESOURCES PLANNING**

**Course Objective:**

This course is aimed at providing the students the inputs on how to link the HRM functions to the corporate strategies to understand HR as a strategic resource.

**UNIT- 1**

Introduction: The changing economic, business, technological, socio-cultural and political environment and its implications for managing organisations and human resources; Business and organizational restructuring and its implications for human resource management; Corporate Strategy and human resource management.

**UNIT-2**

The HRM and approaches to HRM; HRM in personnel management; work organisation and systems; social organisation of the work place and its strategic importance; Human resource policies; Integrating Human Resource Strategies with corporate strategies; Human Resource Management as an approach to organisation design and the role of HRM in organisation management

**UNIT-3**

Human Resource Management in other countries; Human Resource Planning and it's linkage to corporate planning; HR planning process, techniques/methods; HR planning in an ongoing organisation; integrating HR plans with other plans and management functions; Future directions of HR planning; Developing HR information system.

**UNIT-4**

Managing Human Resources inflow- Resourcing plans; Recruitment and selection strategies; alternative to recruitment; selection methods and techniques; role of consultants and assessment centers in recruitment and selection and retention policies. Developing Human Resources ñ Concept of HRD; HRD as a strategic approach to employee performance: HRD and TQM; HRD experience in different industries; corporate training and development strategies.

**UNIT-5**

Strategic management of employee relations, HRM approach to employee relations: HRM values and employee relations; change management; creating employee commitment through the HRM Approach; HRM and culture management; employees involvement and participation in decision- making and management of organization; negotiating employee relations: HRM and trade unions: HRM changes in management control systems: HRM accounting.

**Suggested Readings:**

1. Kenneth Andrew, A Concept of Corporate Strategy.
2. HRM by Gary Dessler
3. HRM by Decenzo and Robbins

**MBA**  
**BS-6H3: Training & Development of Human Resources**

**Objective of the Course**

To enable students to understand, the Purpose, Processes and Methodology of Planning and Conduct of Training and Development of Human Resource in an Organisation.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Course Contents**

**Unit 1 : Training and Development in Organisation:**

(a) Relationship between Training and Development (b) Objectives of Training (c) Purpose, (d) Aligning of Training to Organisation needs and Strategies. (e) Budgeting for Training in Organisation (f) Benefits of Training.

**(Periods- 6-1-2)**

**Unit 2 : Process of Training in Organisation**

(a) Identifying and Analyzing Training Needs in Organisation (b) Designing Training and Development Programme (c) Implementation of the Training Programme (d) Evaluation of the Programme.

**(Periods-5-1-1)**

**Unit 3 : How to Conduct Training Effectively in Organisation** (a) Involvement of Top Management (b) Dedication of Trainers (c) Motivation of Trainees (d) Quality Infrastructure for Training (e) Availability of Time (f) Environment for Teaching-Learning.

**1)**

**(Periods-5-1-1)**

**Unit 4 : Trends of Training in Modern Organisations**

(a) Concept of Learning Organisations (b) Training for Team Work (c) Training for Effective Communications (d) Training for Management of Cultural Diversity in Organisations (e) Training for Total Quality Management (f) Training for Management of MNCs.

**(Periods-7-1-3)**

**Unit 5 : Human Resource Development**

(a) Concept and Historical Perspective (b) Objectives of HRD, (c) Aim and Problems in Learning, (d) Challenges and Methods of Adult Learning, (e) Shaping Individual Response to Development (Johari Window, Transactional Analysis), (f) Career Planning (g) Succession Planning (h) Employee Appraisal and Counseling (i) Employee Mentoring

**(Periods-7-1-3)**

**Suggested Readings:**

1. Blanchard, Effective Training, PHI Publications
2. Singh R P, Management of Training Programmes, Anmol Publications, New Delhi, 2000.
3. Lynton R P and Pareek U, Training for Organizations Transformation Sage Publications, New Delhi, 2004.
4. Dessler Gary, Human Resource Management, Prentice-Hall of India, New Delhi, 2005.

**MBA**  
**BS-6H4: Performance and Compensation Management**

**Objective of the Course**

To enable students to learn the strategies & management of wages, salary and compensation in an organisation & the legal provisions involved there in.

**Allocation of Periods: 45 (30 Lectures, 5 Tutorials, 10 Practicals)**

**Unit 1 : Introduction**

**(Periods: 7 - 1 - 2)**

Compensation meaning, Importance, Components & types of compensations, Factors Influencing Compensation, Challenges of Compensation, Theory of wages, Wages - Living wage, Fair wage and Minimum wage. Related Case Laws. Difference between Wages and salary, Wages Plans, Compensation Management: Role of Trade Unions, Government and Other Stake Holders.

**Unit 2 :**

**(Periods: 5 - 1 - 1)**

Internal alignment, Factors influencing internal structure, Strategic choices in defining internal structure, Job analysis: procedure and design. Job evaluation- definition, Purpose of job evaluation, Job based structures, its role in determining the compensation system, categories of job evaluation- analytical, non-analytical and market pricing; developing and maintaining job evaluation schemes.

**Unit 3 : Individual and Team Pay**

**(Periods: 6 - 1 - 2)**

Types of grade and pay structure, developing grade and pay structure, individual contingent pay, performance and competency related pay, contribution related pay; Team rewards- developing team pay, profit sharing, ESOPs, Recognition schemes, Role of performance appraisal in compensation decisions.

**Unit 4 Legal Aspects of Wages & Salary**

**(Periods: 7 - 1 - 3)**

Administration International Labour Standards & Norms for Wage determination, Salient features of Payment of Wages Act 1936, Minimum Wages Act 1948, Employees Provident & Misc. Provisions Act, Latest developments in Govt pension schemes, Equal Remuneration Act.

**Unit 5 : International pay systems**

**(Periods: 5 - 1 - 2)**

Managing variations, The social contract, culture, National systems: Comparative compensations. Future trends in compensation management, case studies.

**Suggested Readings**

1. George T Milkovich, Jerry Newman, C.S VenkataRatnam - Compensation (McGrawHill) Ninth Edition.
2. Michael Armstrong- A Handbook of Employee Reward Management & Practice, Kogan Page 2/e
3. Dipak Kumar Bhattacharyya -Compensation Management — Oxford University Press 2009
4. P.L Malik - Handbook of Labour and Industrial Law (EBC) (12th Edition, 2009)
5. Richard I Henderson, Compensation Management in a Knowledge- Based World, Pearson education, 10/e, 2009
6. K Aswathappa- Human Resource Management- Tata McGraw Hill Fifth Edition. 5/e, 2008

**MBA**  
**BS-6H5: Negotiation and Counseling**

**Objective of the Course:**

To understand the concepts of conflict, negotiation, counselling and their significance for modern business. To enable students to identify the patterns of negotiations and counselling and also the influence of various factors and issues that have bearing on effective negotiations and counselling.

**Course Contents**

**Unit 1 : Conflict**

Concept, sources, types, stages of conflict. Classification of conflict- intra-individual, inter-personal and inter-group; strategies for conflict - individual, organisational. Role of Communication in conflict, stimulating conflicts in organisations.

**Unit 2 : Negotiation**

Concept, resolving conflict through negotiations, critical elements of negotiations, strategy and tactics of distributive bargaining and integrative negotiations. Strategies of negotiations, importance of perception and cognition in negotiation, cognitive biases in negotiations, communication and negotiations, gender and negotiations

**Unit 3**

- a) Important Factors and Emotions in Negotiation: Creativity, BATNA, Role of emotions.
- b) International and Cross Culture Negotiations: Environmental and cultural context. Influence of culture on negotiations.
- c) Role of Third Party in Negotiations: benefit and liability of third party interventions, types of third party interventions, formal intervention methods -mediation, arbitration, process consultation and combination. Latest developments in the field of Alternative dispute resolutions.

**Unit 4**

- a) Counselling: Concept and definition of counselling, emergence and growth of counselling, counselling psychotherapy, instructions and counselling,
- b) Approaches to Counselling- psychoanalytical, behaviouristic and humanistic approach;

**Unit 5**

Goals of counselling, characteristics of counsellor, values in counselling, 5 D model of counselling process, phases of counselling, procedures of counselling, core conditions of counselling, principles and techniques of counselling, Organisational applications of counselling, concepts of mentoring, ethics in counselling

**Suggested Readings:**

1. Roy, J, Levick, David M. Saunders, Bruce Barry Negotiation, Tata McGraw Hill, New Delhi, 5/e, 2008.
2. Kavita Singh, Counselling skills for managers, Pearson Education, New Delhi, 1/e, 2006.
3. Steven Cohen -- Negotiating skills for managers, Tata McGraw Hill, New Delhi, 1/e, 2008.
4. Richard Welson, Jones, Introduction to Counseling skills -- Texts and Activities, Sage Publications, 2000.
5. Barbara A. Budge, Corvete, Conflict Management: A Practical Guide to Developing Negotiation Strategies, Pearson Education, New Delhi, 2007.



**MBA**  
**Open Specialization**  
**BS-6H6: Corporate Leadership**

**Objective of the Course**

To enable students to understand Basic Concepts, Values and Implications of Total Quality Leadership.

**Allocation of Periods: 45 (Lecture-30, Tutorials-5, Practicals-10)**

**Contents of the Course**

**Unit 1 : Concept, Implications and Quality of Leadership**

(a) Concept and Roles of Leadership. (b) Leadership and Management. (c) Leader and Controlling Authority. (d) Leader, Organisation and People. (e) Leadership, Competitors, Competence and Performance. (f) Leadership and Self-Care. (g) Leadership Responsibilities. (h) Leadership Dilemma and Priorities. (j) Leadership and Success. (k) Effectiveness of Leadership. (l) Leadership and Quality.

**(Periods-3-0-0)**

**Unit 2 : Academic Thoughts on Leadership Effectiveness**

(a) Trait Approach. (b) Leader- Group — Situation Approach. (c) Behavioural Style Approach. (d) Motivational Approach. (e) Skill Approach. (f) Systems Approach.

**(Periods-6-1-2)**

**Unit 3 : Values, Ethics and Leadership**

(a) Genesis of the Philosophy of Values and Ethics. (b) Definition and Relationship between Values and Ethics. (c) Scope, Implications and Criteria of Ethical Values of the Leadership. (d) Role of Leadership in Cultivation of the Values and Ethics.

**(Periods-2-1-2)**

**Unit 4 : Approach to the Values, Ethical Philosophy and Role Model of Total Quality Leadership**

(a) Prevalent Thoughts on Leadership Values, Ethics and Role Model. (b) Analysis of the Prevalent Thoughts on Leadership Values, Ethical Philosophy and Role Model. (c) Approach to the Selection of the Values and Ethics and of Total Quality Leadership.

**(Periods-2-1-2)**

**Unit 5**

Leadership Values Advocated in the Ancient Scriptures, Values Practised by the Great Leaders, Leadership Values Cherished in the Modern Era, Ethical. Application of the Values of Total Quality Leadership.

**(Periods-6-0-4)**

**Suggested Readings:**

1. Bombay Chamber of Commerce and Industry, Value Based Leadership- A Compendium of Lectures on Leadership (2001-2002), 2001-2002.
2. Chibber, M.L., How to be a successful Leader, Natraj Publishing House, New Delhi, 1986.
3. Chibber, M.L., Sai Baba's Mahavakya on Leadership. Sri Sathya Sai Books and Publications Trust, Prasanthi Nilayam, Anantapur District, (A.P.), India, 1992
4. Dhody, Chandan Lal, (1987) The Gospel of Love, An English Rendering of Tulasi 'sShri Ram Charita Manasa. Sidharth Publications, New Delhi.
5. Growse, F.S. (1983): Eternal Ramayana, the Ramayana of Tulasi Das. Interprint, New Delhi.
6. Gangadharan, N. (1985) The Agni Purana, Parts-I (1984), II (1985), III (1986), IV (1987). Motilal, Banarasi Dass, Delhi.
7. Lal Bahadur Shastri, National Academy of Administration, Mussoorie, India, Publication: Selected Readings, Ethical Issues in Today's Administration (September 18 to 22, 2000), Volumes IV.
8. Puryear, Edgar F. Jr. (2003): Nineteen Stars. A Study in Military Character and Leadership. Lancer International, New Delhi.
9. Posner, Barry Z. and Schmidt, Warren H7 (1991): Values. and the American Managers, An update. In California Management Review, Vol. XXVI, No.3, Spring 1991.
10. J.R. Bhatti, Total Quality Leadership (Concept Values, Ethical Philosophy and Role Model, New Age International Publishers, 2007.

**MBA**  
**BS-6H7: Organisational Development and Change Management**

**Objective of the Course**

To enable students to understand the organisational structure, importance of change, nature of change process, effective handling of change vis-à-vis organisational objectives and key aspects of organisational development.

**Course Contents**

**Unit 1 : Introduction**

- a) Concept of organisational structure, organisational culture, organisational design and change; importance of organisational design and change; organisational environment-specific and general.
- b) Organisational effectiveness- Internal systems approach, external resources approach and technical approach of organisational effectiveness, measuring effectiveness in terms of organisational goals; organisation and ethics; creating an ethical organisation. technology and organisational effectiveness.

**Unit 2**

- a) Challenges of organisational design: organisational roles, functions and divisions, balancing, differentiations and integrations.
- b) Designing organisational structure: functional, divisional (geographic and market), matrix structure; network structure and boundary less organisations, organisational design and strategy in changing global world-environment.

**Unit 3 :Organisational Change**

Concepts and targets of change, planned and unplanned change, stimulating factors for organisational change, resistance to organisational change- organisational and individual, Lewin's force field theory of change, evolutionary and revolutionary change in organisation, concept of Total quality management, developments in revolutionary change - re-engineering, restructuring.

**Unit 4**

- a) Concept of Organisational Development, history of organization development, phases and foundations of organisational development, values, assumptions and beliefs in O.D
- b) Managing changes: Action research - diagnosing the organisation, determination of desired future state, implementing action, evaluating action, institutionalizing action research,

**Unit 5**

- a) Organisational transformation- Birth, growth, decline and death, institutional theory of organisational growth, Greiner's model of organisational growth. O.D techniques to deal with resistance to change, O.D techniques to promote change;
- b) O.D. intervention- human process interventions, structure and technological interventions and strategy interventions - sensitivity training - survey feedback, process consultation - team building - inter-group development - innovations -learning organisations.

**Suggested Readings:**

1. Wendell L. French Cecil H. Bell, Jr.: Organisational Development , McGraw-Hill. 6 Ed, 2009.
2. Barbara Senior, Jocelyne Fleming - Organisational Change, Pearson Education, New Delhi 3Ed, 2009.
3. Gareth R., Mary Mathew - Organisational Theory, Design, and Change, Pearson Education, New Delhi 5 Ed, 2008.
4. Ian Palmer, Richard Dundford, Gib Akin,/Managing Organisational Change: A Multiple Perspectives Approach, McGraw Hill, 2/e, 2009.

**BS-60M1: Facilities Management**

**Objective of the Course**

To enable students to understand the processes and methodology of operational management of facilities.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Contents Course**

**Unit 1 : Product Selection and Design**

(a)Product selection process, (b) development of products (Goods and Services), (c)sources of product innovations, (d) design for customer (quality fune on deployment), (e)value analysis / value engineering, (1) measuring product development performance.

**(Periods- 6-1-2)**

**Unit 2: Production Process Management**

(a)Introduction, factors affecting process selection, (b) classification of processes: based on materials management and customer order type, (c) process flow design, (d) process analysis, (e) product-process strategy.

**(Periods- 6-1-2)**

**Unit 3:Operations Technology**

(a)Definition of technology, (b)types of technology, (c)factors affecting technology selection decision, (d)misalignments in technology implementation, (e)level of automation, (f)technology development process, (g)Technologies for processes: Computer Integrated Manufacturing (CIM), CNC/ DNC machines, Computer Aided Manufacturing (CAM), Computer Aided Engineering (CAE),Office Automation, Electronic Data Interchange (EDI), and Internet, evaluation of technology investments.

**(Periods- 6-1-2)**

**Unit 4 : Facilities Location**

(a)Importance, factors affecting facilities location, (b)methods for evaluating, (c) facilities location: factor rating system, multiplant location method, locating facility within a network, dimensional analysis, methods for locating service outlet, (d)cost-volume analysis of facilities location.

**(Periods- 6-1-2)**

**Unit 5 : Facilities Layout**

(a)Importance of facility layout, (b)criteria for good layout, (c)symptoms of poor layout, (d) types of facility layout: product layout, process layout, cellular layout, mixed layout, fixed position layout, retail service layout, office layout, (e)flow and activity analysis, (f) layout design procedure: assembly line balancing, designing based on closeness rating, (g) computerized layout planning, (h)evaluating, and implementation of layout design.

**(Periods- 6-1-2)**

**Suggested Readings**

1. Chase, Aquilano, Jacob, Production and Operations Management, 8111 Ed. (TMH, N Delhi). 2. Lee J Krajwski, Operations Management: Strategy & Analysis, 6th Ed. (Pearson Education) Delhi).
2. S.N Chary, Production and Operations Management, (TMH, N Delhi).
3. Adam Ebert, Production and Operations Management, 6th Ed. (Pearson Education, N. Delhi).

**MBA**  
**Semester –IV**

**BS-6OM2: Production Planning and Control**

**Objective of the Course**

Production Planning and Control are the two important components of the management process. The subject will enable the consideration of all input variables to achieve defined output goals and control will help in corrective action taken to meet the planned output.

**Course Contents**

**Unit 1 : Strategic Capacity Planning**

Concept, importance and objectives of capacity planning, (b) Type of capacity, Issues related to capacity planning, (e) Process of capacity planning: demand identification (qualitative and quantitative methods), assessment of capacity, alternative ways of altering capacity (make or buy decision), evaluation of alternatives.

**(Periods-7-1-2)**

**Unit 2 : Aggregate Planning**

(a) Concept of Aggregation, Aggregate Planning Environment, (b) Aggregation Techniques, Planning Product Mix (Simple Application of Linear Programming), Process Of Aggregate Planning, (c) Mixed Strategy, (d) Mathematical Planning Models, (e) Performance Measures.

**(Periods- 4-1-1)**

**Unit 3 : Master Production Schedule and Material Requirement Planning (MRP)**

(a) Concept Of Master Production Schedule (MPS), (b) Importance Of MPS, (c) Process Of Preparing MPS, (d) Rough-Cut Planning, (e) Importance Of Material Requirement Planning (MRP), (f) Process Of Material Requirement Planning (MIP), Elements Of Material Requirement Planning (MRP), Bill of Materials.

**(Periods- 5-1-2)**

**Unit 4 : Job Scheduling and Sequencing**

Introduction To Types Of JoBS- In Organization, (b) Methods Of Job Scheduling: One Machine- N JoBS-, Two Machines- N JoBS-, N Machines- N JoBS-, M Machines- N JoBS-, Project Scheduling , Network Diagrams (PERT And CPM), (c) Job Sequencing, Job Sequencing In Service Organization (Application Of Simulation).

**(Periods- 7-1-3)**

**Unit 5 : Production Control System**

Concept, Function, and importance of production control, (b) centralization and decentralization, (c) documents and procedures used in production control: work order, material requisition, control sheet, internal delivery note, progress note, machine load chart.

**(Periods- 7-1-2)**

**Suggested Reading:**

1. J L Riggs, Production System Planning, Analysis, and Control, John Willy & Sons, New York
2. Lee J Krajwski, Operations Management: Strategy & Analysis, 6th Ed. (Pearson Education, N. Delhi).
2. Buffa, Sarin, Production and Operations Management, Willey- Publication, New Delhi.
3. Adam Ebert, Production and Operations Management, 6th Ed. (Pearson Education, New Delhi).

**MBA**  
**BS-6OM3: Project Management**

**Objective of the Course**

This subject will help the students to understand importance of job design and productivity and its role in organizations. The subject will also enable students to learn about various processes of the organization to improve organisation's productivity.

**Course Contents**

**Unit 1 : Productivity**

(a)Concept of productivity, (b)Measures of productivity, (c)Methods for productivity enhancement, (d)Productivity in manufacturing and service organization, (e)Principles of motion economy.

**(Periods-5 -1-2)**

**Unit 2 : Job Design**

(a)Concept of job simplification and job standardization, (b) Specialization and automation, (c) Approaches to job design, (d) Behavioral considerations of job design, (e)Work analysis and work measurement, (f)Time-study methods: work sampling, stop-watch method, man-machine charts, calculation of allowances, normal time, and standard time; (g) Compensation, legal and ethical consideration.

**(Periods- 8-1-2)**

**Unit 3 : Project Management**

(a)Project planning, objective of project management, (b) Classification of projects, (c) Project planning tools, GANTT charts, Milestone Charts, Network Analysis: PERT and CPM, finding critical path, earliest and latest activity time, (d) Time-Cost trade offs, (e) multilevel scheduling system.

**(Periods- 9-2-4)**

**Unit 4 : Maintenance and Safety Management**

(a)Concept, objectives and importance of maintenance, (b) maintenance strategies, (c)maintenance economy, (d)Total productivity maintenance (TPM), (e)Measurements of maintenance performance; (f)Plant Safety: plant and equipments conditions, accidents' costs, approaches for accidents prevention, risk management.

**(Periods- 8-1-2)**

**Suggested Readings:**

1. Lee J Krajwski, Operations Management: Strategy & Analysis, 6th Ed. (Pearson Education, N. Delhi.
2. S.N Chary, Production and Operations Management, 11th Ed., (TMI-I, N Delhi)
3. Adam Ebert, Production and Operations Management, 6th Ed. (Pearson Education, N. Delhi)

**MBA**  
**BS-6OM4: Materials Management**

**Objective of the Course**

To enable the students to maximize materials productivity by well coordinated and integrated approach towards various process involving decision making with respect to materials.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Contents of Course**

**Unit 1 : Purchase Management:**

Concept, objectives, and role of purchase function, (b)Inputs to procurement process, (c)Restrains and functions affecting purchase decision, (d)Procurement decisions: supplier selection, timing of purchase, price, quality and quantity of material, (e)Evaluation of procurement process, (f)Purchasing in government departments.

**(Periods- 8-1-2)**

**Unit 2 : Inventory Management:**

(a)Introduction To Inventory System: Concept, Costs Associated With Inventory, Functions Of Inventory, Types Of Inventory, (b)Splective Control Of Inventory: ABC, VED, FNSD, GOLF, HML, (c)Models Of Inventory Control, Determination Of Economic Order Quantity (EOQ): Graphical , Tabular, And Mathematical Models (For Deterministic And Probabilistic Demand), Safety Stock, Reorder Level, (d)Concept Of Just In Time (JIT) System.

**(Periods- 10-2-3)**

**Unit 3 : Stores Management:**

(a)Introduction, (b)Functions Of Stores, (c)Organization. Of Store, (d)Types Of Stores, (e)Stores System And Procedures, (f)Decentralization V/S Centralization, (g)Control Of Spare Parts, (h)Codification And Classification Of Materials, (i)Stores Audit System, (j)Store's Location And Layouts.

**(Periods- 6-1-1)**

**Unit 4 : Waste Management:**

(a)Concept Of Waste Management, Importance Of Waste Management, (b)Concept Of Productivity And Wastivity, Gross And Net Wastivity, Wastivity As. Performance Measurement, (c)Wastivity V/S Productivity, (d)Classification of Waste Management, (e) Waste Reduction Methods, (f)Treatment of Waste In Cost Accounting.

**(Periods- 6-1-2)**

**Suggested Readings:**

1. JR Tony Arnold, et al, Introduction to Material Management, 5th Ed., Pearson,
2. N K Nayar, Resource Management, Vikas Publication, New Delhi
3. AK Citall et al, Materials Management : Text and Cases, .TMH, N Delhi
4. AK Datta, Materials Management: Procedure, Text and Cases, PHI, 2nd , N Delhi.

**MBA**  
**BS-6OM5: Total Quality Management and Quality Standards**

**Objective of the Course**

To enable students to understand the Concept, Principles and Strategies Applied in Total Quality Management.

**Allocation of Periods: 45 (Lectures-30, Tutorials-5, Practicals-10)**

**Contents of the Course**

**Unit 1 : Total Quality Management (TQM) Concept and Fundamentals**

(a) Definition, Basic Approach, (b) TQM Framework, (c) Principles of TQM, (d) Philosophies Of Quality Gurus: Deming's 14 Points, Crosby's Four Absolutes, Juran's Trilogy, Feigenbaum's Total Quality Control, The Total Quality Triad, (e) Evolution of TQM. **(Periods- 6-1-2)**

**Unit 2 : Human Aspect of Total Quality Management (TQM)**

(a) The human factor: The fundamental prerequisite for success, (b) TQM's human elements, (c) Motivating people for total quality, (d) Resistance to change, (e) Characteristics of quality leaders, (f) Role of quality leaders, (g) Teams for TQM, (h) On-the-job satisfaction and quality, (i) Participative management, (j) Compensation system, (k) Ergonomics.

**(Periods- 5-1-1)**

**Unit 3 Strategic Quality Planning**

(a.) Strategic quality management, (b) Quality statement, culture, product quality cycle, (c) TQM planning environment, (d) Role of quality control department, (e) Planning for productivity, (f) Quality and re-engineering, (g) The cost of quality (Direct & Indirect cost), (h) Evaluating the cost of TQM, (i) Quality index, (j) The total quality cost curve, (k) Standardization.

**(Periods- 7-1-3)**

**Unit 4: Total Quality Management (TQM) Practices**

(a) TQM technologies, (b) TQM practices: policy deployment, benchmarking, backtracking, cross-functional teams, QFD, Taguchi Method, failure-mode and effect analysis, the Poka-Yoke concept, concurrent engineering, (c) Malcolm Baldrige award, European Quality award, (d) TQM Implementation Process.

**(Periods- 5-1-2)**

**Unit 5 : Quality Management Standards**

(a) Concept and need of quality standards, (b) National quality standard organizations: Bureau of Indian Standards (BIS), Agmark Grading of agriculture and allied commodities, Quality council of India; (c) International Organisation for standardization (ISO), ISO standards: ISO 9000 and 14000 series, integration of ISO 14000 with ISO 9000, (d) Process of ISO certification, (e) Implementing the system, (f) Post certification.

**(Periods- 7-1-3)**

**Suggested Readings:**

1. Dale, Carol, Glen, Mary, Total Quality Management, 3rd ed., Pearson Education, New Delhi
2. Ross, Total Quality Management: Text, Cases, and Readings, 2nd ed. St. Lucie Press.
3. H Lal, Total Quality Management: A practical approach, New Age International, New Delhi.
4. Hand Book for- ISO certification.

## MBA

### BS-6OM6: Productivity Management

**Objectives of the Course** - The objective of productivity management is to optimize the use of resources, improve efficiency, and maximize output. It focuses on streamlining processes, reducing waste, and enhancing employee performance. The goal is to achieve higher productivity levels, improve profitability, and ensure sustainable growth while maintaining quality standards and customer satisfaction.

#### **Contents of the Course:**

**Unit 1:** Nature, Objectives and Scope of Productivity Management, Evolution of PM, Functions and Responsibilities of Production Manager, New product development

**Unit 2:** Process analysis, design for manufacturing and service operations, capacity planning, facility location and layout.

**Unit 3:** PPC: Job, batch, Mass (assembly) and continuous and Master Production Schedule. Product control systems, Gantt Charts, Bar Charts.

**Unit 4:** Elements of Production Control, Purchase Process, Inventory Management: Graphical, Tabular and EOQ Models of Inventory Control; Just-In-Time Inventory, Selective Control Tools of Inventory.

**Unit 5 :**Concepts of Total Quality Management (TQM), Pure and replenishment types; Standardised work; Total Productivity Management (TPM).

#### **Suggested Readings:**

1. Chase, Jacob, Aquilano, and Agarwal, *Production and Operations Management*, 13<sup>th</sup>ed. (TMH, New Delhi), 2009
2. Lee J. Krajwski, *Operations Management: Strategy and Analysis*, 6<sup>th</sup> ed., Pearson Education, N. Delhi
3. MartandTelsang, "Industrial Engineering and Production Management", S. Chand and Company, First edition, 2000.
4. Jeffery K. Liver, *Toyota Production Way*
5. Adam Ebert, *Production and Operations Management*, 6<sup>th</sup> ed., Pearson Education, N. Delhi
6. S.N. Chary, *Production and Operations Management*, TMH, New Delhi, 5<sup>th</sup> edition
7. William J. Stevenson, *Operations Management*, 13<sup>th</sup> ed., 2017, McGraw-Hill, New Delhi



## MBA

### BS-6OM7: World Class Manufacturing

**Objectives of the Course** - The objectives of world-class manufacturing are to achieve superior product quality, operational efficiency, and cost competitiveness. It aims to optimize production processes, reduce waste, enhance customer satisfaction, and foster innovation. The goal is to implement best practices, adopt cutting-edge technologies, and ensure continuous improvement for long-term success.

#### **Contents of the Course:**

**Unit 1:** Information Age and Global Competitiveness: The Emergence of Information Age; Competition and Business Challenge; Operating Environment; Globalization and International Business; Global Competitiveness and Manufacturing Excellence; World Class Manufacturing and Information Age Competition; Manufacturing Challenges, Problems in Manufacturing Industry

**Unit 2:** Cutting Edge Technology & Philosophy of World Class Manufacturing: Value Added Engineer in - Hall's Framework; Schonberger's Framework of WCM; Gunn's Model; Maskell's Model Evolution of WCM; Ohno's View on WCM; Principles and Practices; Quality in WCM; Deming's & Shingo's Approach to Quality Management; Culmination of WCM, Generic Manufacturing Strategies for Information Age; Planning Methodology and Issues in Strategic Planning of WCM; Performance Measurement - PO-P System, TOPP System and Ambite System.

**Unit 3:** System and Tools for World Class Manufacturing: The Integration Imperative; Overview of Systems and Tools; Information Management Tools - Product and Process Design Tools, Bar Code Systems, Kanban: A Lean Production Tool, Statistical Quality Control (SQC),

**Unit 4:** Material Processing and Handling Tools; Assessment of Manufacturing Systems and Tools. Function of maintenance management, dynamics of maintenance organization/ departments, types of maintenance system, maintenance planning and scheduling, universal maintenance practices, total productivity maintenance.

**Unit 5:** Competitive Indian Manufacturing Performance and Competitiveness – Indian Firms: Manufacturing Objectives and Strategy; Usage of Management Tools and Technologies; Manufacturing Management Practices; IT Infrastructure and Practices; Strategic Intent Framework; Breadth and Integration of IT Infrastructure.

#### **Suggested Readings:**

1. World Class Manufacturing- A Strategic Perspective by BS-Sahay, KBS-Saxena & Ashish Kumar, Publisher: Rajiv Beri for Macmillan India Ltd.
2. Making Common Sense Common Practice – Models for Manufacturing Excellence by Ron Moore, Publisher: Butter Worth Heinemann
3. The Toyota Way by Jeffrey K.Liker, Publisher: Tata McGraw Hill
4. Managing Technology & Innovation for Competitive Advantage by V. K. Narayanan, Publisher: Prentice Hall
5. World Class Manufacturing - The Lesson of Simplicity by Richard J Schonberger, Publisher: Free Press - A Division of Simon and Schuster

## MBA

### BS-6IB1: International Business Environment

#### Objective:

The purpose of this paper is to enable the students learn nature scope and structure of International Business, and understand the influence of various environmental factors on international business operations

#### UNIT 1

Introduction to International Business: Importance nature and scope of International business; modes of entry into International Business internationalization process and managerial Implications. Environmental Context of International Business: Framework for analyzing international business environment

#### UNIT 2

Domestic, foreign and global environments and their impact on international business decisions-Global Trading Environment: World trade in goods and services – Major trends and developments; World trade and protectionism – Tariff and non-tariff barriers; Counter trade.

#### UNIT 3

International Financial Environment: Foreign investments -Pattern, Structure and effects; Movements in foreign exchange and interest rates and then impact on trade and investment flows.

#### UNIT 4

International Economic Institutions and Agreements: WTO, IMF, World Bank UNCTAD, Agreement on Textiles and Clothing (ATC), GSP, GSTP and other International agreements; International commodity trading and agreements. Emerging Developments and Other Issues: Growing concern for ecology; Counter trade; IT and international business.

#### **Suggested Readings:**

1. Bennet, Roger, International Business, Financial Times, Pitman Publishing, London, 1999.
2. Bhattacharya, B., Going International: Respon se Strategies of the Indian Sector, Wheeler Publishing, New Delhi, 1996.
3. Czinkota, Michael R., et. al., International Business, the Dryden Press, Fortworth, 1999.
4. Danoes, John D. and Radebaugh, Lee H., International Business: Environment and Operations, 8th ed., Addison Wesley, Readings, 1998.
5. Griffin, Ricky W. and Pustay, Michael W, International Business: A Managerial Perspective, Addison Wesley, Readings, 1999.
6. Hill, Charles W. L., International Business, McGraw Hill, New York, 2000.

**MBA**  
**BS-6IB2: International Marketing**

**Objectives:** To understand the principles & concepts in Marketing, to provide the knowledge of marketing management in the international perspective to develop marketing strategies for the dynamic international markets.

**UNIT-1**

The importance and scope of marketing - Evolution of marketing: From transaction-based to relationship marketing- Marketing research and Decision support systems .Market Segmentation, Targeting and Positioning.

**UNIT-2**

Product Mix - Product management decisions, Product Life Cycle strategies - New Product Development - Pricing considerations and approaches, pricing strategies.

**UNIT-3**

Distribution channels and physical distribution. Marketing communication and Promotion mix Strategies. Nature of international marketing: meaning, Framework for International Marketing-Barriers for International Marketing.

**UNIT-4**

International Marketing Decisions: Product Planning, Designing and Development for international markets- Pricing Decisions: Pricing Strategies and Price setting For International Markets.

**UNIT-5**

Distribution: Channel Management and Physical distribution Management in International Marketing. Promotion: International Advertising Programs, Sales Management and Sales Promotion for Foreign Markets.

**Suggested Readings**

1. Philip Kotler, (2010), Marketing Management- The South Asian Perspective, Pearson
2. Warren J. keegan (2010): Global Marketing Management' Pearson Education
3. SvendHollensen (2010): Global Marketing: A Decision-Oriented Approach- 3rd Edition, Pearson Education.
4. Ramasamy, Namakumari (2010) Marketing Management, McMillan Publishers
5. Saxena: Marketing Management (Tata McGraw-Hill)

**BS-6IB3: Financing Of International Trade**

**Objectives:** To familiarize the students with the basic documents required and financing techniques of foreign trade.

**UNIT-1**

Methods of payment- Cash, Open account, Cash against Documents, Documents on acceptance, Advance payment, Bills of exchange and Letter of Credit (LoC), International commercial terms- Contract terms for carriage by sea transport – FAS–FOB–CFR–CIF–DES–DEQ–contract terms for carriage by any mode of transport – EXW-FCA-CPT-CIP-DAF-DDP-DDU. Procedure for drawing various LoC and their operations - Types of Letter of Credit – Discrepancies, Letter of credit - UCP- 600

**UNIT – II**

Pre-shipment Credit: Meaning, Procedure, rates and documents needed, Post Shipment Credit: Definition and features– Various applications of post shipment finance and their procedure, Negotiation of export bills, Bills purchased discounted under limits granted to customers. Advances against claims for export incentives, deferred payment export credits.

**UNIT – III**

Export credit insurance: Role of ECGC – Standard policies – Risks covered: Commercial Banks, Political Risks – Risks not covered, how to obtain a policy and file claim - Maximum liability and credit, Guarantees for covering export finance. Insurance policies and bank Guarantees and Special Schemes. FEMA: Exchange control, regulations and procedure in India

**Unit – IV**

Export, import trade control procedure, Processing of an export order: Customs and Port clearance. Procedure and documents relating to quality control, Export contracts, Basic Principles of Insurance: Marine insurance – types of policies, perils covered, EXIM Banks – Objectives, Organizations Functions of EXIM Bank – Export financing programmes.

**UNIT-5**

Relevant Case studies

**Suggested Readings**

1. Nabhis, 'Export's manual and documentation' Nabhi Publications
2. G.S. Lal, 'Finance of foreign trade and foreign exchange' H.P.J Kapoor Publications
3. S.C. Jain, 'Export Procedure and documents' Nabhi Publications
4. Current Export and import policies
5. Paras Ram, 'Export What, Where, and How' Anupama Publishers

**MBA**  
**BS-6IB4: Export Management And Documentation**

**Objectives:** It gives an understanding on the India's trade Position in the World and the various trade procedures involved in an international business. It gives an insight to the various documents required for trading.

**UNIT-1**

International Trade: Need and importance of International Trade – Recent Trends in World Trade – Leading players – India's Foreign Trade – Commodity composition and Destination – India's position in World merchandise trade and services – India's Foreign Trade Policy.

**UNIT-2**

Export Procedure: Starting an export firm – Selection of an export product – Market selection – Buyer selection - Registration procedure with Sales Tax, Central Exercise and various Boards and councils – Exim code number – Elements of export contract- Incoterms – Terms of payment and Letter of Credit.

**UNIT-3**

Export Documentation: Types of documents – Transport, Negotiation and Insurance documents.

**UNIT-4**

Export Finance: Sources of Finance - Role of commercial bank, EXIM Bank, ECGC and others – Export promotion Schemes – Insurance for Export – Types – export credit insurance – Risk Management – Types of risks – mitigation methods.

**UNIT-5**

Import Procedure and Documentation: Global sourcing – Types of global procurement – Tender – Negotiation – Contract and others – Customs regulations and import clearance formalities – Types of import licenses Export Promotion Capital Goods Scheme (EPCG) license- Duty exemption scheme – Duty Entitlement Pass Book Scheme (DEPBS-)- Import formalities for 100% EOUs and SEZs - Import Risk Management.

**Suggested Readings:**

1. Aseem Kumar "Export and Import Management", Excel Books, 2007
2. David Stewart, "International Supply chain Management", Cengage publications, 2008
3. Jeevanandam C "Foreign Exchange : Practices Concepts and control" Sultan chand Publications, 2002.
4. Foreign Trade Policy: Hand book of Export Procedure and Annual of the Ministry of Commerce, Government of India.
5. Export and Import Manual, Nabhi Publications, New Delhi.
6. World Development Indicator, World Bank Publication

**MBA**  
**BS-6IB5: International Logistics Management**

**Objective:** The course provides the analytical framework for understanding the logistic models and supply chain techniques in an international perspective.

**UNIT-1**

Logistics Management: Concepts – Importance – Elements of the logistic System – Marketing and logistic mix – Logistics and marketing interface – Value-chain and production efficiency.

**UNIT-2**

Shipping Industry: Types of ships – Shipping systems: linear, Tramp, conference, chartering, Baltic freight exchange – Shipping intermediaries: agent , forwarder, brokers and others – containerization – types of containers – ICDs – CFS – CONCOR.

**UNIT-3**

Air Transport: Air transport – Air freight – IATA – Cargo handling – Designing the International Information system – system modules – Distribution and Transportation.

**UNIT-4**

**Supply chain:** Definition – scope and importance of supply chain – supply chain drivers and metrics - efficient and responsive supply chain - Designing supply chain network: Distribution network – Factor influencing distribution - Transportation decision in supply chain management.

**UNIT-5**

Forecasting and planning in supply chain management – Pricing in supply chain management- Role of IT in supply chain management - co-ordination in supply chain management.

**Suggested Readings:**

1. David P, “International Logistics” Biztantra, New Delhi , 2006.
2. Donald J BowersoxDavi J Class” Logistics Management, Tata Mc.GrawHill,New Delhi.
3. David Stewart,”International Supply chain Management”, Cengage publications,2008.
4. RejiIsmail,“Logistics Management” Excel Books, 2008.

**MBA**  
**BS-6IB6: International Contract Management**

**Objectives of the Course** - The objectives of international contract management are to ensure compliance with legal and regulatory requirements, mitigate risks, and protect the interests of all parties. It aims to establish clear terms, manage cross-border agreements efficiently, and ensure timely delivery of goods/services, while maintaining strong relationships and resolving disputes effectively.

**Unit-1:**

The Scope, Schedule, Budget, Resources relationship for projects Project delivery systems and International contract management.

**Unit-2:**

Ethics When Dealing with Contractors, why ethics are important to the Contract, Unlawful activity, basic requirements for a contract.

**Unit-3:**

General Conditions of Contract, Special Conditions of Contract, Pricing & Proposal Information, Technical Specifications, Drawings and Amendments.

**Unit-4:**

Contract requirements, Monitoring techniques, S-Curves including baseline, target and actual Earned, Value Analysis.

**Unit-5:**

Due Diligence, Cost of workplace injuries, Daily activity reports, Daily activity report uses, Daily activity report contents, Interface responsibilities of the Contract Manager, Meetings Planning, mediating, interferences, Schedule and procurement coordination, Substantial and Final Completion.

**Suggested Readings:**

1. John Murdoch & Will Hughes, "Construction Contracts - Law and Management" Spon Press, Taylor & Francis Group.
2. Gajera, G.T., "Law relating to Building and Engineering Contracts in India" Butterworths.
3. Govt of India, Central Public Works Department, "CPWD Works Manual 2003."
4. Govt of India, Central Public Works Department, "Analysis of Rates for Delhi (Vol 1 & 2)." and "Delhi Schedule of Rates."
5. Govt of India, Central Public Works Department, "CPWD 7/8: General Conditions of Contracts."

**MBA**  
**BS-6IB7: Cross Culture Management**

**Objectives:** To provide a thorough understanding of the impact of an international context on management practices based on culture.

**UNIT-1:** Basic framework of Cross Cultural Management: Factors influencing Decision Making – Using Culture – Cross Cultural and International Management – Implications for the Manager. Comparing Cultures. Shifts in the Culture – Organizational Culture – Culture and Communication – Needs and Incentives – Dispute Resolution and Negotiation.

**UNIT-2:** Structure of Cross Cultural Management: Formal Structures – Functions – Bureaucracy – Culture and Bureaucracy – Implications. Informal Systems – Informal Relationships – Patronage, Society and Culture – Government-Business Patronage – Guanxi – Managing Informal Systems – Implications.

**UNIT-3:** Globalization & Cross Cultural Management: Planning Change: Meaning – Planning for Change – Planning in Different Culture – Planning in an Unstable Environment – Implications. International Strategies – Globalization and Localization – Defining Globalization – Roots – Global Local Contradictions – Implications.

**UNIT-4:** Models of Cross Cultural Management: Family Companies: The Anglo Model: Environment, Culture and Management. The Chinese Model: Environment and Culture. The Chinese Model: Management. Changes in the Chinese model – Implications.

**UNIT-5:** Strategy of Cross Cultural Management: Designing and Implementing Strategy: Formal Strategy Planning – Analyzing Resources and the Competition – Positioning the Company – Implementation – Emergent Strategy – Implications. Head Quarters and Subsidiary: Risk for the Multinational – Control – Implications.

**Suggested Readings**

1. Helen Deresky , International Management: Managing across Borders and Cultures, 5th Edition, Pearson Education, 2009
2. Richard M. Hodgetts & Fred Luthans, (2005), International Management, 3rd Edition, Tata McGraw Hill Publications, New Delhi
3. Hodgetts ,R.,M.,& Luthans F, (2005), International Management , Tata McGraw Hill Publications, New Delhi.
4. Hill, C. (2007) International Business: Competing in the Global Marketplace. (6th ed) Tata McGraw-Hill.



**MBA**  
**AGRI - BUSINESS MANAGEMENT**  
**GROUP-F**  
**BS-6AG1: Principles of Management in Agri Business**

**Objectives of the Course** - The objectives of principles of management in agribusiness are to optimize resource use, enhance productivity, and ensure sustainable growth. It focuses on effective planning, organizing, and controlling agricultural operations, improving decision-making, fostering innovation, and adapting to market demands, while promoting financial stability and environmental responsibility in agribusiness management.

**Unit-1:** Nature of Agri-Business, Evolution of Changing Dimensions of Agri-Business in India. Application of management principles in agri-business. Type, pattern and scope of Agri-Business.

**Unit-2:** Characteristics of Production, consumption and Marketable surplus of Agri Business in India. Rural Marketing, Distribution system, Marketing of Agriculture inputs, Marketing by the Govt., functioning of selected procurement agencies. Location factors and other problems in processing of Agricultural products.

**Unit-3:** Management of Agro industries. Locational Factors and other problems faced by Agri. industries and other industries related to Agri-business, Management of water shed and development projects, management of irrigation system, farm power and machinery mgt., food technology mgt., environmental mgt.

**Unit-4:** Nature, scope and functions of farm business management, working out existing and alternative farm plans. Farm labour, farm capital and farm machinery. Decision making process in farm management

**Unit-5:** Advanced concepts in Agricultural production: Technology Management for Livestock products, Quality Management in food industry, Agricultural inputs supply management, Vegetable seeds production management, Crop seed production management, Fertilizer management, Management of veterinary hospitals.

**Suggested Readings:**

1. Koontz, H. and Wehrich, Horticulture Management, 10th edition New York McGrawhill 1995
2. Stoner, J.etc., Horticulture Management, 6th ed., N. Delhi, Prentice Hall Of India, 1996.
3. J.D. Drilon Jr., Introduction to Agribusiness Management
4. John, N. David and Ray, Concept of Agribusiness Management
5. Kenneth D. Dull, Principles of Management in Agri-Business, Western Publication

**MBA**  
**BS-6AG2: Agricultural Marketing**

**Objectives of the Course** - The objectives of agricultural marketing are to connect farmers with markets, ensure fair pricing, and reduce post-harvest losses. It aims to promote efficient distribution channels, improve product quality, and enhance market access. Agricultural marketing seeks to support farmers' incomes, meet consumer demand, and contribute to the agricultural economy's growth.

**Unit-1:** Concept of Agricultural Marketing, Study of organization and function of agricultural marketing in India.

**Unit-2:** Methods of Grading farm products, Magnitude and dimensions of marketing & marketable surplus in agricultural communities.

**Unit-3:** Efficiency of marketing storage, Transportation and Financial Management in Agriculture.

**Unit-4:** Marketing: Perishability, seasonality and processing of agricultural products.

**Unit-5:** Various models and theories of agricultural marketing with their critical evaluation.

**Suggested Readings:**

1. John, N. David and Ray, Concept of Agribusiness Management
2. Kenneth D. Dull, Principles of Management in Agri-Business, Western Publication
3. Agriculture Marketing Management
4. Acharya, S.S, Dr. N.L. Agarwal, Agricultural Marketing In India, 6/E Oxford &Ibh, 2017
5. Kohls, Marketing of Agriculture Products 9e Pearson Education India; Ninth edition (2015)

**MBA**  
**BS-6AG3: Agricultural Export Management**

**Objectives of the Course** - The objectives of agricultural export management are to expand global market access, ensure compliance with international trade regulations, and enhance product quality. It aims to increase revenue through exports, strengthen supply chain efficiency, foster strategic partnerships, and promote sustainability, ultimately boosting the competitiveness of agricultural products in global markets.

**Unit1:** Definition and Nature of Export Management, Scope of Export Management in Agri business, Export Opportunities In Agriculture Products, review performance of exports, competitiveness, direction of trade and policy initiatives for Agricultural exports from India.

**Unit 2:** Steps in Export of Agri business products, Selection of Market and Channels of Export.

**Unit 3:** Issues related to the Export of Agribusiness products, Legal requirements for Export of Agribusiness products. WTO and India's Agricultural Exports.

**Unit4:** Financing of Agribusiness exports, Role of Govt. in promotion of Exports.

**Unit 5:** Export documentation and procedure, External Agencies for promotions of Export.

**Suggested Readings:**

1. Varshney R.L., Bhattacharya. B., International Marketing Management, Sultan Chand & Sons (2012)
2. Albaum, International Marketing and Export Management, 7e Pearson Education India; Seventh edition (2012)
3. Kapoor D.C., Export Management, Vikas Publishing House; First edition (2002)
4. Sharma Manoj, Agricultural Exports of India: A Post Reforms Analysis, LAP Lambert Academic Publishing 2015
5. YeledhalliRajashekhar, India Agricultural Exports and SAARC, LAP Lambert Academic, 2012
6. AlamDastgir, The World Trade Organisation and India's Agricultural Exports, 2011
7. Joshi Rakesh Mohan, International Marketing, Oxford University Press; 2 edition (2014)

**MBA**  
**BS-6AG4: Management of Cooperatives**

**Objectives of the Course** – The objectives of management of cooperatives are to ensure effective governance, promote member participation, and achieve financial stability. It focuses on improving service delivery, enhancing resource utilization, and fostering mutual benefits. The goal is to support cooperative principles, enhance community development, and provide sustainable economic opportunities for members.

**Unit-1:**

Nature of cooperative principles, Management principles and their applications to cooperative organizations, structure and functions of various types of cooperatives.

**Unit-2:**

Managerial problems of cooperatives, consumer stores, role of consumer stores, role of Government in the development of cooperatives.

**Unit- 3:**

Financing of cooperatives, staffing in cooperatives and training methods in cooperatives and efficiency criteria.

**Unit 4:**

marketing Public accountability, price, output and profit and policies of cooperatives; Special problem of cooperatives in agricultural and industrial sectors.

**Unit-5:**

Management practices of successful cooperatives in India: selected case studies.

**Suggested Readings:**

1. Ramkishen Y, Management of Co-operatives, JAICO Publishing House.
2. K. M. Rai. Cooperative Societies And Rural Development', Mittal Publication, New Delhi

**MBA**  
**BS-6AG5: Farm Management**

**Objectives of the Course** - The objectives of farm management are to optimize resource use, improve productivity, and ensure financial sustainability. It focuses on effective planning, budgeting, and decision-making to enhance crop and livestock performance. Farm management aims to reduce costs, maximize profits, and promote sustainable agricultural practices for long-term success.

**Unit 1:** Introduction, Definitions, Objectives of farm Management, Scope of Farm Management, Economic theory and farm management science, what makes a successful farm manager? Relationship of farm management with other sciences, Farm management problems under Indian conditions

**Unit2:** Economic Principles applied to Farm management: Principle of Variable proportion, Cost principle, principle of factor substitution, law of equi-marginal returns, Opportunity cost principle, principle of combining enterprises, Principle of comparative advantage, Time Comparison principle, Limitations of principles of farm management.

**Unit 3:** Farm Planning, Budgeting and Programming: Farm planning, Farm budgeting, Steps of Complete budgeting, Programming Techniques.

**Unit 4:** Systems of Farm Organization: Different systems of farming, Peasant farming, Corporate farming, State farming, Co-operative farming, Collective farming, Criteria for choice in India, Suitability of alternative systems.

**Unit 5:** Farm Size and Practices: Measurement of size of farm, Pattern of farm holdings in India, Factors determining economic holdings, Farm size practices – Large scale and small scale farming, Specialized and diversified farming, Mixed farming, Extensive and intensive farming.

**Suggested Readings:**

1. Dhondyal, S.P. (2007) Farm Management: An Economic Analysis
2. Broadway and Broadway (2009), Agri-Business Management.
3. Johl and Kapur (2005) Farm Business Management

**MBA**  
**BS-6AG6: Management of Dairies and Live Stock**

**Objectives of the Course** - The objectives of management of dairies and livestock are to optimize animal health and productivity, ensure efficient resource utilization, and maximize profitability. It focuses on improving breeding, feeding, and health practices, while maintaining sustainability. Effective management aims to enhance milk and meat production, reduce costs, and ensure animal welfare.

**Unit1:**

Issues in establishment and management of dairy projects, Important dairy projects in India.

**Unit 2:**

Sourcing milk and other raw materials, milk and milk products processing and technology, processing equipment and facilities for selected products.

**Unit 3:**

Managing plant operations, quality management and standardization, dairy products marketing, product development, packaging, branding, pricing, promotion, marketing channels and logistics, Export marketing of dairy products, and trends in Indian Dairy industry.

**Unit 4:**

Farm production-breed selection, feeding, disease control and quality management.

**Unit5:**

Purchases and inventory management, output marketing-market targeting, working capital management, cost-volume-profit analysis.

**Suggested Readings:**

1. J.D. Drilon Jr., Introduction to Agribusiness Management.
2. John N. Devid and Ray, Concept of Agri-Business Management.

**MBA**  
**BS-6AG7: Plantation Management**

**Objectives of the Course** - The objectives of plantation management are to optimize land use, increase productivity, and ensure sustainable cultivation practices. It focuses on improving crop yields, managing resources efficiently, and maintaining environmental balance. Plantation management aims to enhance profitability, reduce risks, and support long-term growth through effective planning and resource utilization.

**Unit 1:** Current scenario of major plantation industries in India, plantation field operations in estates of Tea, Coffee, Rubber, Spices, etc (cultivation, harvest management, post harvest management).

**Unit 2:** Manufacturing/processing operations in estates, quality control aspects, estate management and labour relations, legal aspects of plantation business, sustainable management in terms of environmental, social and economic aspects, managing technological innovation in terms of cultivation and processing in Tea, Coffee, Rubber, Spices and other relevant plantation crops.

**Unit 3:** Marketing of plantation crops marketing channels, product development, branding, pricing and promotion.

**Unit 4:** Export environment for plantation crops, logistics management-purchase, stores and transport, Financial management in plantations, cost-volume-profit analysis.

**Unit 5:** Relevant promotional agencies and cooperatives, problems and prospects of the major plantation sectors.

**Suggested Readings:**

1. David, A. Avant, Plantation Management.
2. Pankaj Kumar, Practical Manual of Plantation.
3. P. Sudarshan, Plantation Management.

**MBA**  
**BS-6PH1: Pharmaceutical Marketing**

**Objectives of the Course** - The objectives of pharmaceutical marketing are to promote products effectively, increase market share, and ensure compliance with regulations. It aims to build strong relationships with healthcare professionals, enhance brand awareness, and educate consumers. Pharmaceutical marketing focuses on driving sales, ensuring product accessibility, and supporting health outcomes through targeted strategies.

**Units 1:** Fundamentals of Pharmaceutical Marketing: the 4 'Ps' in a regulated Pharma market, the Strategic Triangle; Market Segmentation in the pharmaceutical context, conceptual difference with consumer products market segmentation

**Unit 2:** PLC Management, reinforcing and revitalizing pharmaceutical brands, line-extensions. Product-mix Optimization

**Unit 3:** Promotional-mix Optimization: Portfolio Analysis by factoring key determinants, BCG Matrix, brand building decisions; leveraging the Promotional-mix for Brand Building. Designing Marketing Programs for New Product launch

**Unit 4:** The Pharmaceutical Industry: India and Global Scenario: Essential differences between domestic Marketing in India and International Marketing; generic products dominated market vis-à-vis patented products dominated markets

**Unit 5:** Role of pharmacies in dispensing products, role of mass media in product advertisements and social campaigns for market expansion; Structure and role of field management and product management, India Vs. Global

**Suggested Readings:**

1. Kotler, Philip, Marketing Management: Analysis, Planning, Implementation, and Control Latest Edition, Prentice Hall
2. Best, Roger J., Market-Based Management – Strategies for Growing Customer Value and Profitability (3rd Edition), Prentice Hall
3. Lehmann, Donald R. and Russell S. Winer, Product Management (2005 4th Edition). McGraw-Hill/Irwin.
4. Philip Kotler(2003). Marketing Management: Eleventh Edition, New Delhi: Pearson Education.



**BS-6PH2: Regulatory Framework of Pharmaceutical Business**

**Objectives of the Course** - The objectives of the regulatory framework of the pharmaceutical business are to ensure product safety, efficacy, and quality. It aims to protect public health by enforcing compliance with standards, preventing fraudulent practices, and ensuring transparency. The framework regulates production, distribution, and marketing to maintain ethical practices and industry integrity.

**Unit 1:** Law of Contract - Agreement - Offer - Acceptance - Consideration - Capacity of Contract Contingent Contract - Quasi Contract - Performance - Discharge - Remedies to breach of Contract

**Unit 2:** Partnership - Sale of Goods - Law of Insurance - Negotiable Instruments - Notes, Bills, Cheques - Crossing - Endorsement - Holder in due course - Holder in value - Contract of Agency.

**Unit-3:** Company - Formation - Memorandum - Articles - Prospectus - Shares - Debentures -Directors - Appointment - Powers and Duties - Meetings - Proceedings – Management - Accounts - Audit - Oppression and Mismanagement - Winding up.

**Unit-4:** Intellectual Property Rights & Regulations: Overview of Intellectual Properties, their types and importance of intellectual property protection. Patents: Requirement of patenting, patent specifications and claims, Indian Patent act 1970 and amendments. Patent search, analysis, drafting and stages of filing patent at national level.

**Unit-5:** International Treaties & IPR Organizations: Paris Conventions, Patent Cooperation Treaty (PCT) – introduction, application and general rules. Introduction to concept behind WIPO / WTO / TRIPS / GATT / GATS system & Uruguay Round.

**Suggested Readings:**

1. Pathak, LEGAL ASPECTS OF BUSINESS, Tata McGraw- Hill Publishing Company Limited, New Delhi
2. M.M. Sulphrey&Az-harBasheer, LAWS FOR BUSINESS, PHI Learning Pvt. Ltd. New Delhi
3. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and IsaderKaufer, Marcel Dekker series, Vol.143, Pharmaceutical Regulatory Process, Edited by Ira R. Berry Marcel Dekker Series,Vol.144
4. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.19

**MBA**  
**BS-6PH3: Sales Promotion and Brand Management in Pharmaceutical Business**

**Objectives of the Course** - The objectives of sales promotion and brand management in the pharmaceutical business are to increase product visibility, stimulate demand, and enhance brand recognition. It aims to build trust with healthcare professionals and consumers, differentiate products in the market, and drive long-term customer loyalty, while ensuring compliance with industry regulations.

**Unit 1:** Strategic decision making using IMS-Health and C-MARC data for sales and market trend analysis; Using Medical Databases, PubMed and Standard Treatment Algorithms to build brand communication strategies; IFPMA Code of Ethics – Guidelines for Pharmaceutical Promotion

**Unit 2:** Developing content and designing of Scientific Promotional Literatures, Visual Aids and Journal Advertisements; Preparing the Promotional Budget as a part of the Marketing Budget; Monitoring & Controlling long-term projects, field-force activities and promotional-expense budget; Training Skills

**Unit 3:** Brand Name, Brand Image, Brand Value and Brand Awareness, Concept of Brand Equity, difference with brand valuation, Five dimensions of Brand Equity, key influencers of each dimension, prescription loyalty, prescriber coverage frequency, brand exposure through field-force promotion

**Unit 4:** Quality indicators, Promotional-mix, Benefits of building Brand Equity. Brand Management as a strategic marketing function: role of a Pharmaceutical Brand Manager, the ‘Little CEO’ concept, ‘Science meets Commerce’ concept

**Unit 5:** Essential differences between managing Pharmaceutical Brands and Consumer Brands, types of Pharmaceutical Brand Management organization structures, challenges of a Brand Manager; relation of Product Management Teams vis-à-vis Sales Force in Pharmaceutical companies

**Suggested Readings:**

1. Harsh Verma . Brand Mmanagement, Second Edition, Excel Publication.
2. Aaker,D.; Managing Brand Equity. RamanujMajumdar (1999) Product Management in India. New Delhi: Prentice Hall.
3. PranK.Chaudhary (2001), Successful Branding, Hyderabad: University Press Hill.

## MBA

### BS-6PH4: Pharmaceutical Retail Management

**Objectives of the Course** - The objectives of pharmaceutical retail management are to ensure efficient inventory management, provide quality customer service, and optimize sales. It focuses on maintaining compliance with regulatory standards, improving product accessibility, managing pricing strategies, and enhancing customer satisfaction. The goal is to drive profitability while promoting health and wellness in communities.

#### Unit 1: Retailing

An Overview, Understanding, Scope and Benefits of pharmaceutical retailing, Overview of Pharmaceutical retailing

#### Unit2: Retail Strategies

Classification of Retailers, Understanding the Retail Customer Population, demographic and geographic analysis, Retail Market Strategy, Strategic Planning Process, Pharmacies as retail outlets for switched drugs, Building Sustainable Competitive Advantage, Marketing Strategies, Product mix and assortment planning process Merchandising and store management Branding strategies.

#### Unit3: Retail of OTC drugs

Historical development of the OTC market, Major players within the OTC market, Rx-to-OTC switching: The changing role of the consumer, Consumer buying behavior for OTC drugs, Growth potential within the OTC market, Merchandise assortment planning, Organizing the buying process by categories, Merchandise purchasing process.

#### Unit4: Store Management

Store layout, design and visual merchandise, Store interior, exterior and security, Visual Merchandising for OTC drug retailing, Future Drivers of OTC Pharmaceuticals, The impact of technology on the drugs market, OTC pharmaceuticals: growth or maturity : in India and global Market Development in Pharmaceutical Marketing

#### Suggested Readings:

1. Barry Berman and Joel R. Evans, Retail Management: A Strategic Approach, Pearson,
2. Michael Levy and Barton AWeitz, Retailing Management, Tata McGraw-Hill,
3. Pradhan, Swapna, Retailing Management-Text & Cases, Tata McGraw-Hill)
4. Bajaj, Chetan, Srivastava Nidhi V, Tuli Rajesh, Retail Management, Oxford,

**MBA**  
**BS-6PH5: Supply Chain Management in Pharmaceutical Industry**

**Objectives of the Course** - The objectives of supply chain management in the pharmaceutical industry are to ensure timely and efficient delivery of products, maintain product quality, and optimize inventory levels. It aims to minimize costs, ensure regulatory compliance, enhance traceability, and improve collaboration across stakeholders, ensuring continuous availability of medications while safeguarding patient safety.

**Unit 1 Introduction to supply chain management (S.C.M)**

(a) Basic Concepts, Scope And Philosophy Of Supply Chain Management, (b)Importance Of Supply Chain Management, (c)Supply Chain Decision, (d)Evolution Of Supply Chain Management.

**Unit 2 Designing the Supply Chain**

(a)Role Of Distribution In Supply Chain, (b)Factors Influencing Distribution Network, (c)Process Of Supply Network Design, (d)Distribution Strategy, (e)Models For Facilities Location And Capacity Allocation, (f)Impact Of Uncertainty On Supply Chain Design, (g)Evaluation Of Supply Chain Design, (h)Demand Chain Management, (i)Strategic Alliances.

**Unit 3 Performance Measurement and Control**

(a)Concept, Dimensions Of Performance Measurement, (b)Tools For Performance Improvement: Benchmarking: Introduction, Forms Of Benchmarking, GAP Analysis, Benchmarking Study Report; (c)Achieving Strategic Integration, (d)Supply Chain Operations Reference (SCOR) Modeling, SCOR Analysis, (e)Value Chain, (f)Concept Of Configurability, (g)Evaluation Of Supply Chain Performance (Supply Chain Cost Analysis), (h)Impediments To Improved Performance.

**Unit 4 Logistics Management**

(a)Concept of Logistics, Inbound And Outbound Logistics, (b)Key Activities of Logistics, (c)Managing The Costs Of Logistics, (d)Application Of Logistics Management, (e)Trade-Offs In Logistics Management, (f)Bull-Whip Effect In Logistics, (g)Third And Fourth Party Logistics, (h)Emergence Of IT In Logistics, (i)International Issues In Logistics, (j)Warehousing, Types Of Warehouses, Site Selection, Layout And Design Of Warehouses.

**Unit 5 Emerging Trends in Supply Chain Management**

(a)Role Of Information Technology (IT) In Supply Chain Management: Electronic Data Interchange (EDI), Use Of Data Mining Tools, E-Business Framework, (b)Customer Profitability Analysis (CPA), (c)International Issues In Supply Chain Management.

**Suggested Readings:**

1. Chopra, Meindl; *Supply Chain Management: Strategic Planning and Operation*, 2nd ed., Pearson Education, New Delhi.
2. Altekar, *Supply Chain Management: Concepts and Cases*, Prentice-Hall of India, New Delhi
3. BS-Sahay, *Supply Chain Management*, Macmillan, New Delhi.
4. G. Raghuram, *Logistics and Supply Chain Management*, Macmillan, New Delhi
5. Balou, *Supply Chain Management*, Pearson Education

**MBA**  
**BS-6PH6: Marketing of Medical Devices**

**Objectives of the Course** - The objectives of marketing medical devices are to increase market awareness, educate healthcare professionals, and promote product benefits. It aims to ensure regulatory compliance, build brand trust, and expand market reach. Effective marketing drives sales, supports customer loyalty, and enhances patient outcomes by providing innovative, high-quality medical solutions.

**Unit 1:** Marketing management; Nature and scope; Evolution of marketing; Selling vs marketing; Emerging role of marketing in medical devices; Marketing mix.

**Unit 2:** Market Segmentation of Medical Devices: Nature and importance of segmentation; Pre-requisites for effective segmentation; Bases of segmenting consumer markets; Market selection strategies; Positioning.

**Unit 3:** Product Decisions of Medical Devices: Concept of product; Classification of products; Product line and Product mix; Branding, packaging, and labeling; Customer services; Development of new product; Product Life-cycle.

**Unit 4:** Price Decisions of Medical Services: Pricing as a marketing variable-its role and importance; Price vs. non-price competition; Factors influencing price determination; Price setting in practice; Price policies and strategies.

Distribution Channels and Physical Distribution Decisions: Marketing channel functions; Selecting channels of distribution; Determining the intensity of distribution; Channel management decisions-selection, motivation and evaluation of individual middlemen; Manufacturer-distribution relationship; Retailing and wholesaling; Logistics of distribution.

**Unit 5:** Promotion Decisions - Nature; Objectives and importance of promotion; Communication process; Promotion mix and methods; Advertising; Personal Selling; Public Relations; and Sales Promotion. India as an emerging market for medical devices, Recent developments in marketing of medical devices.

**Suggested Readings:**

1. Terri Wells, Medical Device Marketing: Strategies, Gameplans & Resources for Successful Product Management, Kindle Edition
2. Michale J. Etzel, Bruce J. Walker, William J. Stanton, and Ajay Pandit, *Marketing: Indian Adaptation*, 14<sup>th</sup> ed., Tata McGraw-Hill, New Delhi, 2009
3. E. Jerome McCarthy and William B. Perrelet, *Basic Marketing: A Managerial Approach*, 15<sup>th</sup> ed., Tata McGraw-Hill, New Delhi, 2009
4. Philip Kotler and Gary Armstrong, *Principle of Marketing*, 14<sup>th</sup> ed., Prentice-Hall of India, New Delhi, 2014

**MBA**  
**BS-6PH7: Strategic Procurement**

**Objectives of the Course** - The objectives of strategic procurement are to optimize sourcing, reduce costs, and ensure the timely availability of high-quality goods and services. It focuses on building strong supplier relationships, managing risks, and aligning procurement decisions with organizational goals. Strategic procurement aims to enhance operational efficiency and drive long-term business success.

**Unit 1:** Importance of purchasing and sourcing management in pharmaceutical industry, role the supply function plays on the competitive success and profitability of modern organizations.

**Unit 2:** Function of Strategic Procurement in pharmaceutical industry, role in a company as well as its influence and interdependencies with other corporate functions, such as R&D, manufacturing, accounting, finance, etc.

**Unit 3:** Importance of the procurement function in supply chain design and function through its responsibility for the firm's sourcing strategy, strategic sourcing process

**Unit 4:** Supplier performance management methodologies, supplier identification, selection, and development, total costs, materials management, transportation and inventory decisions, and environmental and social responsibility issues.

**Unit 5:** Role of global sourcing and the procurement process in supply chain management, ethical, contractual, and legal issues faced by procurement professionals

**Suggested Readings:**

1. Benton, W C Jr. (2007) Purchasing and Supply Management, McGraw-Hill/Irwin, New York, USA.
2. Handfield, R B, Monczka, R M, Giunipero, L C and Patterson, J L (2009) Sourcing and Supply Chain Management, 4th edn, South-Western, Cengage Learning, Canada.
3. International Trade Centre (2000) Module 10: Managing Logistics in the Supply Chain, International Purchasing & Supply Management Modular Learning System, UNCTAD/WTO.
4. Leenders, M R, Johnson, P F, Flynn, A E and Fearon, H E (2006) Purchasing and Supply Management: With 50 Supply Chain Cases, 13th edn, McGraw-Hill/Irwin, USA.
5. Lysons, K and Farrington, B (2006) Purchasing and Supply Chain Management, Pearson Education Limited, England.



## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Business Studies & Entrepreneurship**

#### **Ordinances, Regulations & Syllabus**

**For**

#### **Bachelor of Business Administration (MBA) Two Year Programme Semester Pattern**

**(w.e.f. session 2013-14)**

**Revised and Approved in the year 2020 (15<sup>th</sup> meeting, Board of  
Studies)**

## **Master of Business Administration**

**(WEF Academic Session 2020-22)**

### **Vision**

NICE School of Business aims to become a Centre of Excellence through research and continuous innovation to nurture global managers, leaders and entrepreneurs for sustainable development by synthesizing Indian ethics with modern technology.

### **Mission**

*The Mission of NICE School of Business Studies is:*

- To nurture global talent and develop Industry ready professionals and socially responsible leaders / to face the challenges of fast changing business environment.
- To achieve academic excellence in research, consulting, training and teaching by adopting best practices and cutting edge technologies.
- To promote continuous innovation and entrepreneurship.
- To encourage collaborations, cooperation and partnerships with all stake holders to meet sustainable development goals.

### **Program Educational Objectives (PEOs)**

PEO1: Possess wide spectrum of managerial skills along with competency building qualities in specific areas of management and business studies.

PEO2: Select and apply appropriate tools for decision making required for ill structured managerial problems.

PEO3: Students will be able to independently conduct theoretical as well as applied research.

PEO4: To practice sound knowledge of the entrepreneurial process and inculcate creativity and innovation among students.

PEO5: Analyze ethical implications of business practices using advanced levels of ethical reasoning

### **Program Specific Objectives (PSOs)**

PSO1: To enrich communication, ethical values, team work, professional and leadership skill sets of students.

PSO2: To integrate knowledge, skill and attitude that will sustain an environment of learning and creativity among the students with an assurance for good careers.

PSO3: Analyze the economic, social and environmental issues related to business.

PSO4: Ability to identify, explore and harness opportunities presented by emerging trends and changing business environment.

PSO5: Understand the leadership skills through internship training.



### **Program Outcomes Objectives (POOs)**

- PO1: Demonstrate the knowledge of management science to solve complex corporate problems using limited resources.
- PO2: Apply ethical principles for making judicious management decisions.
- PO3: To develop proactive thinking so as to perform effectively in the dynamic socio-economic and business ecosystem.
- PO4: Identify business opportunities, entrepreneurship approach and skill sets.
- PO5: Communicate effectively with various stakeholders.

### **MASTER OF BUSINESS ADMINISTRATION (MBA):**

The M.B.A. course aims at providing inputs to the students relevant to the business industry and trade so that they can function in different organizations and face the challenges arising there from. The course not only aims at providing knowledge and skills in different areas of management, but also provides inputs necessary for the overall development of the personality of the students.

The structure of the Course is designed in a way that students have to study the core courses from different functional areas of management that are made compulsory. Later on, specializations are offered in functional areas where the students can opt for any one specialization out of the seven offered: Marketing, Finance, International Business, Operations Management, HRM, Pharma Business Management and Agri-Business Management. Right from the beginning of the course, the focus is on providing relevant inputs through case discussion/ analysis, simulation games, role-plays etc. keeping in mind the current business scenario.

Broadly, the course is of two years divided into four semesters, each semester having eight compulsory papers of 40 sessions each of one-hour duration. The students will have to opt for one functional areas for their specialization, each having five papers (three in third semester and two in the fourth semester from Specialization Papers).

Summer Training for 8/10 weeks is compulsory for every student pursuing the course, which they have to undergo at the end of second semester examination. Comprehensive viva and Research project are part of the course.

### **SUMMER TRAINING PROJECT REPORT:**

1. At the end of second semester examination, every student of MBA will undergo on-the-job practical training in any manufacturing, service or financial organization. The training will be of 8 to 10 weeks duration. The College/Institute will facilitate this compulsory training for students.
2. During the training, the student is expected to learn about the organization and analyze and suggest solutions of a live problem. The objective is to equip the student with the knowledge of actual functioning of the organization and problems faced by them for exploring feasible solutions and suggestions.
3. During the course of training, the organization (where the student is undergoing training) will assign a problem/project to the student.
4. The student, after the completion of training will submit a report to the College/Institute, which will form part of third semester examination. However, the report must be submitted by the end of August during third semester so that it is evaluated well in time and third semester results are not delayed.
5. The report (based on training and the problem/project studied) prepared by the student will be known as Summer Training Project Report. The report should ordinarily be based on primary data. It should reflect in depth study of micro problem, ordinarily assigned by the organization where student undergoes training. Relevant tables and bibliography should support it.

One comprehensive chapter must be included about the organization where the student has undergone training. This should deal with brief history of the organization, its structure, performance products/services and problems faced. This chapter will form part I of the Report. Part II of the Report will contain the study of micro research problem.

The average size of Report ordinarily will be 100 to 150 typed pages in standard font size (12) and double spacing. Three neatly typed and soft bound (paperback) copies of the report will be submitted to the College/Institute. The report will be typed in A-4 size paper.

6. The Report will have two certificates. One by the Head of the Institute/College and the other by the Reporting Officer of the organization where the student has undergone training. These two certificates should be attached in the beginning of the report.
7. The report will be evaluated by two external examiners. It will carry total of 100 marks divided into written report of 50 marks and presentation of 50marks. There will be no internal examiner.  
Only such persons will evaluate the project report who has minimum 3 years of experience of teaching MBA classes in a College/University. Experience of teaching MBA classes as guest faculty shall not be counted.
8. It is mandatory that the student will make presentation in the presence of teachers and students. The student is expected to answer to the queries and questions raised in such a meeting.

#### **RESEARCH PROJECT REPORT:**

In fourth semester, candidates will have to submit a Research Project Report on a problem/topic to be assigned by the School of Business Studies under the supervision of a core faculty member of the department. The research project report will carry 100 marks. The evaluation of the project report will be done by two external examiners. The average of the marks awarded by the two examiners will be taken into account for the results.

The report will contain the objectives and scope of the study. Research methodology, use, importance of the study, analysis of data collected, conclusions and recommendations. It will contain relevant charts, diagrams and bibliography. A certificate of the Supervisor and the Head of the MBA program certifying the authenticity of the report shall be attached therewith. The student will submit three copies of the report to the Head of the MBA program. The number of pages in the report will be 75 or more. The report should be typed in A-4 size paper.

#### **COMPREHENSIVE VIVA:**

The comprehensive viva voce is scheduled at the end of II & IV Semester in order to judge the understanding as well as application of the knowledge gained by the students by the end of 2<sup>nd</sup> & 4<sup>th</sup> Semester of the course. This is also to see the articulation of what is being learnt by them. The idea is to see that students are able to understand what is being taught in two full year and see their relevance not only in the practical field but also their inter relationship. The viva voce is of 100 marks to be conducted by the external examiner appointed by the University.

**Master of Business Administration (MBA)**

<b>PAPER CODE</b>	<b>SEMESTER I</b>	<b>CREDITS</b>
MBA -101	Management Practices & Organization Behaviour	4
MBA -102	Economics Analysis for Business	4
MBA -103	Accounting for Managers	4
MBA -104	Quantitative Techniques for Managers	4
MBA -105	Legal Aspect of Business	4
MBA -106	Business Ethics	4
MBA -107	Personality Development & Communication Skills	4
MBA -107-A	Stress Management	
MBA -107-B	Introduction to Psychology	
MBA -107-C	Art of Happiness/ Yoga & Meditation	
MBA -108/ MBA-108A/ MBA-108B/ MBAC	Information Systems/ Fundamentals of Computer/ Data Analysis/Statistics, Computation and Applications	4
	<b>TOTAL</b>	<b>32</b>

<b>PAPER CODE</b>	<b>SEMESTER II</b>	<b>CREDITS</b>
MBA-201	Marketing Management	4
MBA-202	Financial Management	4
MBA-203	Human Resource Management	4
MBA-204	Production and Operations Management	4
MBA-205/MBA-205A	Research Methodology/ Publication Ethics	4
MBA-206	Business Environment	4
MBA-206-A	Nutrition & Well being	
MBA-206-B	Disaster Management	
MBA-206-C	Environmental Policy	
MBA-207	Corporate Image Building	4
MBA-208	Comprehensive Viva	4
	<b>TOTAL</b>	<b>32</b>

PAPER CODE	SEMESTER III	CREDIT
MBA- 301	Strategic Management	4
MBA- 302	International Business	4
MBA- 303	Supply Chain Management	4
MBA: 3MK1/HR1/FM1	Elective I	
MBA: 3MK2/HR2/FM2	Elective II	
MBA: 3MK3/HR3/FM3	Elective III	
MBA-304	<b>Summer Training Report and Viva Voce</b>	<b>8</b>
	<b>Specialization Group:A Marketing</b>	<b>4</b>
MBA-3MK1	Consumer Behaviour & Sales Management	
MBA-3MK2	Marketing of Non Profit Organization	
MBA-3MK3	Integrating Marketing Communication	
	<b>Specialization Group:B Finance</b>	<b>4</b>
MBA-3FM1	Security Analysis & Portfolio Management	
MBA-3FM2	Financial Markets & Services	
MBA-3FM3	Corporate Tax Planning	
	<b>Specialization Group:C Human Resource Management</b>	<b>4</b>
MBA-3HR1	Knowledge Management	
MBA-3HR2	Organizational Change & Development	
MBA-3HR3	Performance Management & Competency Mapping	
	<b>TOTAL</b>	<b>32</b>

PAPER CODE	SEMESTER IV	CREDIT S
MBA-401	Entrepreneurship Development	4
MBA-402	Corporate Social Responsibility and Corporate Governance	4
MBA-403	E-Business	4
MBA-4MK4/HR4/FM4/AG4/IB4/OM4/PH4	Elective I	4
MBA-4MK5/HR5/FM5/AG5/IB5/OM5/PH5	Elective II	4
MBA-4OP4	Innovation Management and Startup Ecosystem	4
MBA-404	Research Project Report and Viva- Voce	4
MBA-405	Comprehensive Viva- Voce	4
	<b>TOTAL</b>	<b>32</b>

Specialization Group: Marketing	
<b>COURSE CODE</b>	<b>COURSE NAME</b>
MBA-4MK4	International Marketing
MBA-4MK5	Rural Marketing
<b>Specialization Group: Finance</b>	
<b>COURSE CODE</b>	<b>COURSE NAME</b>
MBA-4FM4	International Financial Management
MBA-4FM5	Project Planning and Evaluation
<b>Specialization Group: HRM</b>	
<b>COURSE CODE</b>	<b>COURSE NAME</b>
MBA-4HR4	Industrial Relations and Labour Laws
MBA-4HR5	Compensation Management
<b>Specialization Group: International Business</b>	
<b>COURSE CODE</b>	<b>COURSE NAME</b>
MBA-4IB4	Export Management and Documentation
MBA-4IB5	International Logistics Management
Specialization Group: Agri - Business Management	
<b>COURSE CODE</b>	<b>COURSE NAME</b>
MBA-4AG4	Management of Cooperatives
MBA-4AG5	Plantation Management
<b>Specialization Group : Operations Management</b>	
<b>COURSE CODE</b>	<b>COURSE NAME</b>
MBA-3OM4	Materials Management
MBA-3OM5	Total Quality Management and Quality Standards

# SYLLABUS

## MBA I Semester

**Course Title :**Management Practices &Organisation Behaviour

**Course Code: MBA-101**

L	T	P	C.U.
32	8	0	3

**Programme& Semester:** MBA I

**Pre-requisites:** Basic knowledge of general management, student must have basic understanding of general management. (Covered by bridge course)

**Course Description:** The main objective of this course is to help the students to acquire and develop skill to take rational decisions in the process of O.B. People have always been regarded as important in managing organizations. This course covers the explanations about the human behavior in the organizational context. It details the impact of individual, group and organizational factors on human behavior. The course also focuses on understanding the behavior of the employees working in the organization. The approach taken in this course will expose students to psychological theories that will enable them to gain insight into behavior in organizations. The use of case studies will provide students the opportunity to apply theories to real life organizational issues and analyze the contributions and limitations of relevant theories.

**Course Objectives:** The objective of the course is to acquaint students develop an understanding of the basic management concepts and behavioral processes in organizations and organizational behavioral dynamics which are important to adapt in the changing corporate environment.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO1- Define the nature, functions, skills and roles of managers

CO2- Describe the foundations of individual behavior with an understanding of human personality, perception, learning and emotions.

CO3- Appraise how managers can use the models to enhance motivational levels of employees and basic dynamics of interpersonal relationships.

CO4- Illustrate the organization of teams and groups in organizations.

CO5- Developing conceptual understanding of change and its implementation

### Course Contents:

#### Unit 1: Introduction

**8 Hours**

Concept of Management, Management: Art and Science, Management Vs Administration, Levels of Management, Functions of management, Management as a Profession, Management skills, Qualities and characteristics of managers. Evolution of Management thought: Early contributions: Taylor and Scientific Management, Fayol's Administrative Management, Bureaucracy, Human Relations, and Modern Approach, Social responsibility of managers, Managerial Ethics.

#### Unit 2 Functions of Management:

**8 Hours**

Concept of **planning**, Significance and Classification of planning: Strategic plan, Tactical plan and Operational plan, Process of planning, Barriers to effective planning. MBO, Management by Exception. Decision Making: Strategies of decision making. **Organizing**: Principles and Process of Organizing, Types of organizational structure, Span of control, Centralization vs. Decentralization of authority. **Staffing**: Concept, Objective of staffing, System approach to staffing, Manpower planning. **Directing**: Concept, Techniques of directing and supervision, Types of

supervision, Essential characteristics of supervisor. Leadership vs Management, Process of Leadership, Importance of leadership, Characteristics of an effective leader. **Controlling:** Concept, Importance of controlling, Types of control, Steps in control process.

**Unit 3 Foundations of Organizational Behaviour-**

**8 Hours**

Introduction to OB – Organizing Process – Organization design and structure - Departmentation Types – Making Organization Effective - Understanding Individual Behavior – Perception – Learning – Personality Types – Theories of Personality- Determinants of Personality Learning and Theories of Learning- Johari window- Transactional Analysis

**Unit 4 Group Dynamics & Motivation –**

**8 Hours**

Benefits of Groups – Types of Groups – Group Formation and Development, Motivation – Concept of Motivation - Motivational Theories of Maslow, Herzberg, David Mc Clelland, and Porter and Lawler. Emotions-Meaning- Characteristics-Emotions in Context of OB.

**Unit 5 Leadership and Organizational Culture and Climate:**

**8 Hours**

Leadership – Traits Theory – Managerial Grid – Transactional Vs Transformational Leadership – Qualities of good Leader, Change Management – Conflict Management. Organizational Stress-Definition and Meaning- Sources of stress- Types- Stress Management Techniques.

**Text Book (s):**

1. Luthans, F. (2015). Organizational Behaviour: An Evidence Based Approach(13th ed.).McGraw-Hill Irwin.
2. Luthans, F. (2015). Principles and Practices of Management (13th ed.).McGraw-Hill Irwin.

**Suggested Readings:**

1. Koontz Harold &Weihrich Heinz – Essentials of management (Tata McGraw Hill, 5th Edition,2008)
2. L.M.Prasad, Principles and Practice of Management, 7Ed, S.Chand Publishers, 2007.
3. Robbins, S. P., & Judge, T.A. & Vohra, N. (2015). Organizational Behaviour(16th ed.).New Delhi: Pearson Education.
4. Nelson, D. L., Quick, J.C., &Khandelwal, P. (2016).ORGB: A South Asian Perspective (2nd ed.).Cengage Learning India Pvt. Ltd.
5. Nelson, D L, Quick, J.C., &Khandelwal. P,(2013).Organizational Behaviour: A South Asian Perspective(7th ed.). Cengage Learning India Pvt. Ltd.
6. Mullins, L., Christy, G. (2013). Management &OrganiztaionalBehaviour (10<sup>th</sup>ed.). United Kingdom: Pearson Education
7. Pareek, U. and Khanna, S. (2016).Understanding Organizational Behaviour(4th ed.). New Delhi: Oxford University Press.

**Course Title:**Economic Analysis for Business

**Course Code:** MBA-102

L	T	P	C.U.
32	8	0	3

**Programme& Semester:** MBA I

**Pre-requisites:** Basic knowledge of general management, student must have basic understanding of general management. (Covered by bridge course)

**Course Objectives:**

1. To equip the students of management with time tested tools and techniques of economic analysis to enable them to appreciate its relevance in decision making.
2. To explore the economics of information and network industries and to equip students with an understanding of how economics affect the business strategy of companies in these industries

**Course Outcome: On completion of the course student will be able to:**

CO1: Understand tools and techniques of managerial economics to enable them to appreciate its relevance in decision making.

CO2: Explore the economics of information and network industries

CO3: Understand how economics affect the business strategy of companies in these industries.

CO4: Develop economic way of thinking in dealing with practical business

**UNIT I INTRODUCTION**

**8 Hours**

The themes of economics – scarcity and efficiency – three fundamental economic problems – society’s capability – Production possibility frontiers (PPF) – Productive efficiency Vs economic efficiency – economic growth & stability – Micro economies and Macro economies – the role of markets and government – Positive Vs negative externalities.

**UNIT II CONSUMER AND PRODUCER BEHAVIOUR**

**8 Hours**

Market – Demand and Supply – Determinants – Market equilibrium – elasticity of demand and supply – consumer behaviour – consumer equilibrium – Approaches to consumer behaviour – Production – Short-run and long-run Production Function – Returns to scale – economies Vs diseconomies of scale – Analysis of cost – Short-run and long-run cost function – Relation between Production and cost function.

**UNIT III PRODUCT AND FACTOR MARKET**

**8 Hours**

Product market – perfect and imperfect market – different market structures – Firm’s equilibrium and supply – Market efficiency – Economic costs of imperfect competition – factor market – Land, Labour and capital – Demand and supply – determination of factor price – Interaction of product and factor market – General equilibrium and efficiency of competitive markets.

**UNIT IV PERFORMANCE OF AN ECONOMY – MACRO ECONOMICS 8 Hours**

Macro-economic aggregates – circular flow of macroeconomic activity – National income determination – Aggregate demand and supply – Macroeconomic equilibrium – Components of aggregate demand and national income – multiplier effect – Demand side management – Fiscal policy in theory, Introduction to Public Finance.

**UNIT V AGGREGATE SUPPLY AND THE ROLE OF MONEY 8 Hours**



Short-run and Long-run supply curve – Unemployment and its impact – Okun’s law – Inflation and the impact – reasons for inflation – Demand Vs Supply factors –Inflation Vs Unemployment tradeoff – Phillips curve –short-run and long-run –Supply side Policy and management- Money market- Demand and supply of money – money-market equilibrium and national income – the role of monetary policy.

### **TEXT BOOKS**

1. Paul A. Samuelson and William D. Nordhaus, Economics, 18<sup>th</sup> edition, Tata McGraw Hill, 2005.

### **REFERENCE READINGS**

1. Dominick Salvatore and Ravikesh Shrivastva, “Managerial Economics: Principles and Worldwide Application (Adapted version)” 7<sup>th</sup> edition, Oxford University Press, New Delhi, 2012.
2. N. Gregory Mankiw, Principles of Economics, 3<sup>rd</sup> edition, Thomson learning, New Delhi, 2007.
3. Richard Lipsey and Alee Charystal, Economics, 13<sup>th</sup> edition, Oxford University Press, New Delhi, 2015.
4. Karl E. Case and Ray C. Fair, Principles of Economics, 6<sup>th</sup> edition, Pearson Education Asia, New Delhi, 2002.

**Course Title:**Accounting for Managers

**Course Code:** MBA-103

L	T	P	C.U.
30	5	5	3

**Programme& Semester:** MBA I

**Pre-requisite:** Foundation Course - Financial Accounting

**Course Description:** Accounting for managers can be used in short-term and long-term decisions involving the financial health of a company. Managerial accounting helps managers make operational decisions–intended to help increase the company's operational efficiency and cost management. The syllabus of Accounting for Managers spread over five units; unit 1 covers the conceptual framework of Management Accounting which includes cost control, cost reduction, and cost management, Accounting Standards and IFRS. Unit 2 covers Preparation of Final Accounts. Unit 3 covers Analysis of financial statements; Ratio Analysis, Common size statement and Trend Analysis. Unit-4 Covers Budget and Budgetary Control and Unit-5 covers Marginal Costing and Decision-making, Concept of responsibility accounting. Students will also be trained on computerised accounting system.

The Andragogy in this subject includes power point presentations, case studies, assignments, class test, quiz, mini project etc.

**Course Objectives:**

1. To understand the basic concepts of financial accounting, cost accounting and management accounting.
2. To develop basic computerized accounting skills.
3. To understand the use of accounting information for planning, controlling and decision-making in organizations.
4. To develops skills of interpreting financial statements.
5. To develop decision making skills using the techniques of management accounting.

**Course Outcome: On completion of the course student will be able to:**

CO1: Understand the basic concepts of financial accounting, cost accounting and management accounting.

CO2: Understand accounting process as an information system for decision-making.

CO3: Use of various tools of accounting for analyzing business situations and to take decision.

CO4: Analyze the financial position business.

CO5: Solve the problems related to managerial decisions using the techniques of management accounting.

**Course Contents**

**Unit 1 Concept**

**8 Hours**

Nature, scope, and importance of management accounting; difference between financial accounting and management accounting; difference between cost accounting and management accounting; cost control, cost reduction, and cost management.

**Accounting Standards and IFRS:** International Accounting Principles and Standards; Matching of Indian Accounting Standards with International Accounting Standards, Human Resource Accounting, Forensic Accounting.

**Unit II Preparation of Final Accounts:**

**8 Hours**

Trading Account, Profit and Loss Account, Balance Sheet: Meaning, Need.Excel Application to make Balance sheet. Accounting for non-profit organization -An overview

**Unit III Analysis of financial statements:**

**8 Hours**

Meaning and need of ratio analysis; various types of ratios; solvency ratios, profitability ratios, activity ratios, liquidity ratios, market capitalization ratios.Common size statement, Trend Analysis.

**Unit IV Budget and Budgetary Control**

**8 Hours**

Concept of budget and budgetary control; objectives, merits, and limitations of budget administration; types of budgets: fixed and flexible budgets, zero-base budget, programme and performance budget.

**UNIT V Marginal Costing and Decision-making**

**8 Hours**

Concept of marginal costing, differential costing and absorption costing, break-even analysis, use of above costs in decision-making; make or buy, change of product-mix, pricing and determination of shut-down point.

**Responsibility Accounting**

Concept of responsibility accounting, responsibility centres and their types.

**Lab.: Computerized accounting using Tally.**

**SUGGESTED READINGS :**

**Text Book:**

1. S.N. Maheshwari (Author), SuneelMaheshwari (Author), Sharad K. Maheshwari, A Textbook of Accounting for Management(Vikas) 2018

**Reference Readings:**

1. Asish K. Bhattacharyya, Essentials of Financial Accounting (PHI, 4<sup>th</sup> Ed.) 2017
2. M C Shukla, S C Gupta & T S Grewal, Advanced Accounts Volume I, (S Chand, 19th Ed.) 2016
3. Robert Anthony, David Hawkins, Kenneth A. Merchant, Accounting: Texts and Cases Accounting (McGraw Hill India, 13<sup>th</sup> Ed. ) 2017
4. Ravi M Kishore,Taxmann's Cost & Management Accounting (Taxmann, 6th Edition,Reprint September 2019) 2019
5. TusharTulsian P C Tulsian, Bharat Tulsian, Tulsian's Cost and Management Accounting (McGraw Hill India) 2020
6. PC Tulsian, Financial Accounting (Pearson) 2016
7. Charles C. Horngren, Gary L. Sundem, and William O. Stratton, Introduction to Management Accounting, 15th ed., Prentice—Hall of India/Pearson Education, Delhi, 2009

**Course Title:**Quantitative Techniques for Managers

**Course Code:** MBA-104

L	T	P	C.U.
30	5	5	3

**Programme& Semester:** MBA I

**Pre-requisite:** Business Mathematics

**Course Description:** Quantitative techniques are collection of statistical tools that are used to provide powerful means of analysis using quantitative data for effective decision making in business. The syllabus of quantitative techniques for managers includes five units; unit one is introduction which includes basic concept of quantitative techniques, applications in decision-making in Business and management, graphical representation of Data, measures of central tendency, measures of skewness and kurtosis; Unit 2 includes measures of dispersion and index number; Unit 3 includes correlation and regression analysis; in unit-4 includes time series analysis, components and methods; Unit-5 includes probability distribution & formulation of hypothesis & hypothesis testing. The Andragogy in this subject includes power point presentations, case studies, assignments, class test, quiz, mini project etc.

**Course Objectives:** The objective of this course is to familiarize students with the basic quantitative techniques tools used for managerial decision-making and to have a proper understanding of quantitative techniques applications in business and management.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO1: Describe basic concepts of quantitative techniques.

CO2: Examine various Measures of Central Tendency, Measures of Dispersion, Correlation and Regression analysis in decision making.

CO3: Interpret the trend analysis with different methods of time series analysis.

CO4: Explain basic concepts of probability and perform probability theoretical distributions. Understanding

CO5: Operate the concept of statistical analysis which includes various hypothesis tests like chi square test, ANOVA

**Course Contents:**

**Unit 1: Introduction:**

**8 Hours**

Basic Concept of Quantitative techniques, Applications in decision-making in Business and Management, Graphical representation of Data, Measures of Central Tendency: Mean; Median; Mode, Measures of Skewness and Kurtosis

**Unit-2 Measures of Dispersion and Index Number:**

**8 Hours**

Introduction to Measures of Dispersion, Range, Quartile Deviation, Quartiles, Standard Deviation, Significance of Measures of Dispersion, Coefficient of Variation. Index Numbers: Introduction, Characteristics, Uses, Simple Index Numbers, Weighted Index Numbers: Laspeyres, Paasche's, Marshall-Edgeworth's, Walsh's, Bowley's and Fisher's Index Number

**Unit 3: Correlation Analysis and Regression Analysis:**

**8 Hours**

Introduction of correlation, Importance and types of correlation, Degrees of correlation, Methods to Measure correlation: Scatter diagram, Karl Pearson's Coefficient of Correlation, Spearman's rank correlation coefficient and Concurrent deviation method.

Introduction and importance of regression analysis, Properties, Regression equations, Methods to Measure Regression: Least squares method: Direct Mean and Short- Cut Method, Using r and S.D.

**Unit 4: Time Series Analysis:**

**8 Hours**

Introduction, Importance of Time series analysis, Components of time series, Time series models: Additive and multiplicative model, Method of time series analysis/ Trend Analysis: Semi Average Method, Moving Average Method and Method of Least Squares

**Unit 5: Probability Distribution & Formulation of Hypothesis & Hypothesis Testing** **8 Hours**

- a) Probability: Concept, Mutually exclusive events, Addition and multiplication rules of probability.
- b) Probability Distribution: Concept of probability distribution, Normal probability distribution, Poisson distribution, Binomial distribution.
- c) Formulation of Hypothesis & Hypothesis Testing: Formulation of Alternate and Null hypothesis, Procedure of hypothesis testing, ANOVA, Chi-square test: Test of Independence; Test of Goodness of fit

**Text Book:**

1. Levin R.I., Rubin D.S., Rastogi S. and Siddiqui H.M. (2017). *Statistics for Management*, 8<sup>th</sup> ed., Pearson Education.

**Suggested Readings:**

- 1. Levine D.M., Berenson M.L., Krehbiel T.C., Viswanathan P.K. (2017). *Business Statistics: A First Course*, 7<sup>th</sup> Ed., Pearson Education.
- 2. Siegel A.F. (2016). *Practical Business Statistics*, 7<sup>th</sup> ed., Academic Press.
- 3. Vohra N.D. (2017). *Business Statistics*, McGraw Hill Education.
- 4. Spiegel M.R., Stephens L.J., Kumar N. (2010). *Statistics*, 4<sup>th</sup> ed., McGraw Hill Education.
- 5. Anderson, Sweeney and Williams (2015). *Statistics for Students of Economics and Business*, 7<sup>th</sup> ed., Cengage Learning.
- 6. Beri G. C. (2009). *Business Statistics*, 3<sup>rd</sup> ed., Mc Graw Hill Education.
- 7. Beri G.C. (2013). *Marketing Research*, 5<sup>th</sup> ed., Mc Graw Hill.
- 8. Vohra N.D. (2011). *Quantitative Techniques in Management*, 4<sup>th</sup> ed., McGraw-Hill, New Delhi.

**E-Book:** Kundu S., An Introduction to Business Statistics, available at: [www.ddegjust.ac.in](http://www.ddegjust.ac.in)

**Course Title:**Legal Aspects of Business

**Course Code:** MBA-105

L	T	P	C.U.
32	5	3	3

**Programme& Semester:** MBA I

**Pre-requisite:**NIL

**Course Description:** To provide a basis of understanding to the students with reference to the rules, practices and regulations that governs the formation as well as the operation of business. The course will help them to understand the different legal and illegal activities and actions in the business.

**Course Objective:** The objective of this course is to understand about different acts related to business. To understand the duties of members and their relationship to one another. To create an awareness about important legislations namely Sale of Goods Act, Consumer Protection Act, Factories Act having impact on business

**Course Outcomes:** Upon the successful completion of this course, the student will be able to:

CO1: Acquire a sound understanding of the legal aspects of the laws affecting businesses

CO2: Apply basic legal knowledge to business transactions

CO3: Communicate effectively using standard business and legal terminology

CO4: Analyse a given business context using basic understanding of the applicable Acts and develop a suitable operational framework.

CO5: Describe current law, rules, and regulations related to settling business disputes

### **Course Contents**

#### **Unit I: Law of Contract**

**8 Hours**

Concept of Contract, offer and acceptance; valid contracts and its essential elements; void agreements; classification of contracts; Quasi contract; performance of contract; discharge of contract; remedies for breach of contract. Special Contracts: Indemnity, Guarantee, Bailment, pledge. Law of Agency: Essentials, kinds of agents, rights and duties of agent and principal, creation of agency, termination of agency

#### **Unit 2: Law of Sales of Goods**

**8 Hours**

Contract of sale, Goods and their classification, Meaning of price, Conditions and Warranties, Passing of property in goods, Transfer of title by non-owners, Performance of a contract of sale, Unpaid seller and his rights, Remedies for breach of contract

**Consumer Protection Act:** Objectives, definition, consumer protection council and state consumer protection council.

**The Partnership Act:** Nature of Partnership, Formulation of Partnership firms; rights, duties, and liabilities of partners; Dissolution of Partnership Term

#### **Unit 3: The Negotiable Instruments Act, 1881**

**8 Hours**

Definition, Features and types of negotiable instruments, kinds of negotiable instruments, Methods of negotiation of instruments; holder and holderin due Course; Endorsement and delivery of a negotiable instrument; Presentation of Negotiable Instrument.

Banker and Customer: An introduction; Crossing of a cheque; Types of crossing; Bouncing of cheques, Obligations of banker and customer; Dishonour and discharge of negotiable instruments

**Unit 4: The Companies Act****8 Hours**

Definition, characteristics and kinds of companies, steps in formation of company.

Memorandum of association, articles of association and prospectus.

Directors: appointment, power, duties and liabilities, meeting and resolutions: types of meetings. Auditor: appointment, rights and liabilities. Modes of winding up of a company.

**Unit 5: The Information Technology Act, 2000****8 Hours**

Definition, Digital Signature, Electronic Governance, Attribution, Acknowledgment and Dispatch of Electronic Records, Sense Electronic Records and Sense Digital Signatures, Regulation of Certifying Authorities, Digital Signature Certificates, Duties of Subscribers, Penalties and Offences.

**Intellectual Property Laws-** Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement.

**Suggested Readings**

1. Kuchhal M.C. - Business Law (Vikas Publication)
2. Gulshan S.S. - Business Law Including Company Law (Excel Books)
3. N D Kapoor – Elements of Mercantile Law – Sultan Chand-2014
4. Dr Avatar Singh- Principles of Mercantile Law, Eastern Book Company 2014
5. NandanKamath- Law relating to Computer, Internet and E-Commerce (A Guide to cyber Laws), Universal Law Publishing Co. Ltd.New Delhi, 2012.

**Course Title:** Business Ethics

**Course Code:** MBA-106

L	T	P	C.U.
32	8	0	3

**Programme& Semester:** MBA I

**Pre-Requisite:** NIL

**Course Objectives:** The basic objective of this course is to gain insight into ethical behavior and to become familiar with inherent conflicts in being ethical. To understand the ethical dilemmas in business situations and to find out ways to resolve them. To learn to make decisions effectively based on ethical thinking and decision making processes.

**Course Outcomes (COs):** At the end of this course students will be able to:

- CO 1: Analyze the concepts of business ethics from a personal and an organizational perspective
- CO 2: Assess the ethical issues facing business leaders.
- CO 3: Evaluate and distinguish between the concepts of social responsibility, integrity, and business ethics
- CO 4: Discuss the moral and social responsibility dimensions of corporate governance;
- CO 5: understanding of Global modern Business Ethics and their residing applications in different context

**Course Contents:**

**Unit-1:**

**8 Hours**

Meaning and Nature of Ethics, Moral and Ethics: Importance of Ethics, Types of Ethics, Causes of Unethical Behavior Meaning, Nature and Importance of Business Ethics, Types of Business Ethics, Factors Influencing Business Ethics, Corporate Ethics: Ethical Behavior and Audit of Ethical Behavior.

**Unit-2:**

**8 Hours**

Individual Ethics, Professional Ethics, Gandhian Philosophy of Ethical Behavior, Social Audit, Concept of Globalization and Global Business Network, Relationship among Business, Business Ethics and BusinessDevelopment Developing Business System Ethics relating to Ethics in Global Economy, Marketing Ethics in Foreign Trade, Role of Business Ethics in Developing Civilized Society.

**Unit-3:**

**8 Hours**

Managing Business Ethics: Ethical Decision Making Processes and Guidelines; Building an Ethical Value System in the organization; Role of Laws and Enforcement; Training in Business Ethics; business and ecological/ environmental issues in the Indian context.

**Unit-4:**

**8 Hours**

Corporate Social Responsibility: Definition & Drivers of CSR; The Scope of Social Responsibility; Social Responsibility and Indian Corporations; CSR and Environmental Protection; Role of Government in Corporate Governance: Government Interference in Market Economies; Different Roles of Government in the Economy; Forms of Government Regulation; The Scope of Government's Relations with Business.



**Unit – 5:****8 Hours** Global

Business and Ethical Convergence: Role of International bodies like WTO in establishing Model Codes of Conduct; Cross-Cultural Ethical Dilemmas and their Resolution.

**Text Book:**

Fernando, A.C. (2011). Corporate Governance: Principles, Policies and Practices. Pearson Education.

**Reference Readings:**

1. Hartman Laura P. & Chatterjee Abha, “Perspectives in Business Ethics”, McGraw Hill.
2. Velasquez, Manuel G., “Business Ethics – Concepts and Cases”, PHI Publications.
3. Crane Andrew & Matten Dirk, “Business Ethics”, Oxford University Press, New Delhi.
4. Weiss Joseph W., “Business Ethics – Concepts and Cases”, Cengage Learning.
5. Badi R.V & Badi N. V., “Business Ethics”, Vrinda Publications.

**Course Title:**Personality Development and Communication Skills

**Course Code:** MBA-107

L	T	P	C.U.
30	5	5	3

**Programme& Semester:** MBA I

**Pre-requisites:** The learners are expected to have completed Graduation in any discipline.

**Course Description:** This course covers various dimensions and importance of effective personality and business communication. It helps to understand personality traits and importance of business communication in the world of business. Also, the course makes the students aware about the various dynamics of personality development. The course aims to cause a basic awareness about the significance of soft skills in professional and inter-personal communication s and facilitate an all-round development of personality.

**Course Objective:** The course objective is to develop all forms of communication skills in students to enable them to conduct well in an any business process without any communication barrier.This course covers various dimensions and importance of effective personality. It helps to understand personality traits and formation and vital contribution in the world of business. Also, the course makes the students aware about the various dynamics of personality development.

**Course Outcomes: (CO)**

After completion of this course, the student will be able to:

CO1: Understand business communication strategies and principles for effective communication in domestic and international business situations.

CO2: Develop the ability to research and write a documented paper and/or to give an oral presentation.

CO3: Develop the ability to communicate via electronic mail, Internet, and other technologies for presenting business messages.

CO4: Identify ethical, legal, cultural, and global issues affecting business communication.

CO5:Operate in team activities that lead to the development of collaborative work skills.

**Course Contents**

**Unit1: Introduction:**

**8 Hours**

NatureofCommunication,ProcessofCommunication,TypesofCommunication(verbal&NonVerbal),Importance ofCommunication,characteristics of successful communication Different forms of Communication Barriers to Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers.

**Unit 2: Business Correspondence:**

**8 Hours**

Business letters: Introduction to business letters: writing routine and persuasive letters positive and negative messages- writing memos, presentation, inviting quotations, sending quotations, placing orders, inviting tenders,Salesletters,claim&adjustmentlettersandsocialcorrespondence,Memorandum,Inter-officeMemo,Notices,Agenda,Minutes,Jobapplicationletter,preparingtheResume.

**Unit 3: Report Writing:****8 Hours**

Business reports: what is a report purpose, kinds and objectives of report writing. Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, checklists for reports. Oral Presentation: Importance, Characteristics, Presentation Plan, Power point presentation, Visual aids.

**Unit4: Personality & Group Communication****8 Hours**

Define Personality, Determinants of Personality Development, Perception: Definition, Perceptual Process. Factors of Association Relationship, Personality Traits, Developing Effective Habits, Emotional Intelligence. Interpersonal Relationship, Personality Spiritual journey beyond management of change, Good manners & Etiquettes, Effective Speech, Understanding Body language, projective positive body language

Group communication: Meetings – Planning meetings, objectives, participants, timing, venue of meetings, leading meetings. Media management: the press release press conference, media interviews Seminars, workshop, conferences.

**Unit 5: Business Communication****8 Hours**

Group Discussions. Interview skills, Impact of Technological Advancement on Business Communication. Stress Management: Introduction, Causes, stress management techniques, Time management: Importance of time management, Techniques of time management, Time management styles.

**Text Book**

Chaturvedi P. D, Chaturvedi M. (2011). Business Communication: Concepts, Cases and Applications. 13<sup>th</sup>ed; Pearson Education, New Delhi.

**Reference Reading:**

1. Pal, Rajendra and Korlahalli, J.S. (2011). *Essentials of Business Communication*. 13<sup>th</sup>ed; Sultan Chand & Sons Publication, New Delhi
2. C. Murali Krishna and S. Mishra (2011). *Communication Skills for Engineers*, 13<sup>th</sup>ed; Pearson education
3. Bovee, and Thill (2016). *Business Communication Essentials*. 7<sup>th</sup>ed; Pearson Education
4. Shirley Taylor (2011). *Communication for Business*. 4<sup>th</sup>ed; Pearson Education
5. Locker and Kaczmarek (2012). *Business Communication: Building Critical Skills*, 6<sup>th</sup>ed; McGraw Hill Education
6. Seven Habits of Highly Effective People – Stephen Covey
7. You Can Win – Shiv Khera
8. Effective Business Communication – H. Murphy.

## SYLLABUS

### MBA-1 Semester

#### Course Title: STRESS MANAGEMENT

#### Course Code: MBA-107 A

**Objectives of the Course** - The objectives of stress management are to reduce the negative effects of stress on physical and mental health, improve coping mechanisms, and promote overall well-being. It aims to enhance productivity, increase emotional resilience, and maintain a balanced lifestyle, helping individuals manage stress effectively for better personal and professional performance.

#### Unit 1: Understanding Stress and Its Impact

**Objective:** Introduce the concept of stress, its types, and the physiological and psychological impact on individuals.

- **Key Topics:**
  - **Definition of Stress:** What is stress? Eustress vs. Distress.
  - **Sources of Stress:** Academic pressures, time management, interpersonal conflicts, expectations, and career planning.
  - **Stress Responses:** The fight-or-flight response, physical, emotional, and behavioral symptoms of stress.
  - **Impact of Stress:** How chronic stress affects health, well-being, and academic performance.
  - **Stress and Performance:** The Yerkes-Dodson Law (the relationship between stress and performance).

#### Unit 2: Time Management and Prioritization

**Objective:** Equip students with practical tools to manage their time effectively and reduce stress caused by workload.

- **Key Topics:**
  - **Time Management Strategies:** The Pomodoro Technique, Time Blocking, and the Eisenhower Matrix (urgent vs. important tasks).
  - **Goal Setting:** SMART Goals (Specific, Measurable, Achievable, Relevant, Time-bound).
  - **Prioritization Techniques:** How to determine what to focus on based on urgency and importance.
  - **Dealing with Procrastination:** Understanding procrastination and strategies to overcome it.

#### Unit 3: Emotional Intelligence (EI) and Stress

**Objective:** Help students understand how emotional intelligence can help in managing stress and building interpersonal relationships.

- **Key Topics:**
  - **Components of EI:** Self-awareness, self-regulation, motivation, empathy, and social skills.
  - **How EI Impacts Stress:** Emotional triggers, coping strategies, and resilience.
  - **Managing Difficult Emotions:** Techniques like mindfulness and emotional regulation to reduce stress.

- **Empathy in Stress Management:** How understanding others' emotions can reduce conflict and stress in group work.

#### Unit 4: Mindfulness and Relaxation Techniques

**Objective:** Teach students practical techniques for reducing stress through mindfulness, breathing, and relaxation exercises.

- **Key Topics:**
  - **Introduction to Mindfulness:** What is mindfulness, and how it helps reduce stress?
  - **Breathing Techniques:** Deep breathing exercises, diaphragmatic breathing, and the 4-7-8 technique.
  - **Progressive Muscle Relaxation (PMR):** A method of systematically tensing and relaxing muscle groups to release stress.
  - **Mindful Meditation:** Guided meditation techniques for reducing stress and improving focus.
  - **The Role of Sleep:** Importance of sleep in stress management and cognitive performance.

#### Unit 5: Building Resilience and Coping Strategies

**Objective:** Focus on building resilience and effective coping strategies to handle challenges and setbacks in both academic and professional life.

- **Key Topics:**
  - **What is Resilience?:** Definition and importance of resilience in overcoming stress.
  - **Developing a Resilient Mindset:** Positive thinking, reframing challenges, and finding opportunities in adversity.
  - **Coping Strategies:** Active vs. passive coping, problem-solving techniques, and seeking support.
  - **Stress-Buffering Resources:** Social support networks, mentorship, and seeking professional help when necessary.
  - **Work-Life Balance:** How to maintain balance and avoid burnout.

#### Suggested readings-

- **Davis, M., Eshelman, E.R., & McKay, M. (2000).** *The Relaxation and Stress Reduction Workbook*. 5th ed., New Harbinger Publications.
- **Maté, G. (2003).** *When the Body Says No: The Cost of Hidden Stress*. Wiley.
- **Benson, H. (1975).** *The Relaxation Response*. William Morrow & Co.
- **Nagoski, E., & Nagoski, A. (2020).** *Burnout: The Secret to Unlocking the Stress Cycle*. Ballantine Books.
- **Posen, D. (2010).** *The Little Book of Stress Relief*. Macmillan.
- **Sivananda, Swami (2001).** *The Art of Stress-Free Living*. The Divine Life Society.

**SYLLABUS**  
**MBA-1<sup>st</sup> SEMESTER**  
**COURSE TITLE- INTRODUCTION TO PSYCHOLOGY**  
**SUBJECT CODE-MBA-107 B**

**Objectives of the Course** - The objectives of an introduction to psychology are to explore human behavior, cognition, and emotions. It aims to provide foundational knowledge of psychological theories and principles, understanding mental processes, and addressing psychological issues. The course seeks to develop critical thinking, enhance self-awareness, and apply psychological concepts in everyday life.

Unit 1: Basics of Psychology and its Importance for Business

- **What is Psychology?**
  - Definition, history, and key branches (e.g., cognitive, social, organizational psychology)
- **The Role of Psychology in Business**
  - Understanding human behavior in organizational settings
  - Psychological principles that apply to leadership, marketing, consumer behavior, and management
- **Subfields of Psychology Relevant to MBA**
  - Industrial-organizational psychology, social psychology, consumer psychology
- **The Scientific Method in Psychology**
  - Research methods: experimental, survey, observational, and case study

Unit 2: Human Behavior and Personality

*Key Topics:*

- **Understanding Human Behavior**
  - Nature vs. Nurture debate
  - The role of motivation, emotion, and cognition
- **Personality Theories**
  - Freud's Psychoanalytic Theory
  - Jung's Analytical Psychology
  - The Big Five Personality Traits
- **Personality and Business**
  - How personality influences work style, decision-making, and team interactions
  - Leadership styles based on personality

Unit 3: Perception and Decision-Making in Business

*Key Topics:*

- **Perception and its Influence**
  - The process of perception: attention, interpretation, and response
  - Factors influencing perception (e.g., stereotypes, biases)

- **Cognitive Biases and Heuristics**
  - Common biases in decision-making (e.g., confirmation bias, availability heuristic)
  - The impact of cognitive shortcuts on business decisions
- **The Psychology of Decision-Making**
  - Rational vs. bounded rationality
  - Groupthink and its effects on organizational decisions

#### Unit 4: Motivation and Leadership

##### *Key Topics:*

- **Motivation Theories**
  - Maslow's Hierarchy of Needs
  - Herzberg's Two-Factor Theory
  - Vroom's Expectancy Theory
  - McClelland's Theory of Needs
- **Motivational Strategies in Business**
  - Intrinsic vs. extrinsic motivation
  - Designing jobs and rewards systems to motivate employees
- **Leadership and Motivation**
  - Leadership styles: transformational, transactional, and servant leadership
  - How leaders motivate and inspire teams

#### Unit 5: Group Behavior and Organizational Culture

##### *Key Topics:*

- **Group Dynamics**
  - Types of groups in organizations: formal and informal
  - Group formation and development (Tuckman's stages: forming, storming, norming, performing, adjourning)
  - Group roles and behaviors
- **Organizational Culture**
  - Definition and elements of organizational culture (values, norms, rituals)
  - The role of culture in shaping behavior and decision-making
  - Aligning organizational culture with business strategy
- **Conflict and Cooperation in Teams**
  - Managing conflict in teams
  - Techniques for fostering collaboration and teamwork

##### Suggested readings-

- *The Relaxation and Stress Reduction Workbook* by Martha Davis
  - *Emotional Intelligence 2.0* by Travis Bradberry and Jean Greaves
  - Articles and case studies on stress management in academic settings
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## SYLLABUS

### MBA-1<sup>st</sup> SEMESTER

#### COURSE TITLE- ART OF HAPPINESS /YOGA & MEDITATION

#### SUBJECT CODE-MBA-107 C

**Objectives of the Course** - The objectives of the art of happiness, yoga, and meditation are to enhance mental clarity, reduce stress, and promote emotional well-being. They aim to cultivate mindfulness, balance, and inner peace, fostering self-awareness and resilience. These practices improve physical health, increase positivity, and lead to a harmonious, fulfilling life.

#### Unit 1: Introduction to Happiness and Well-being

- **The Concept of Happiness:** Definitions of happiness from different cultural, psychological, and philosophical perspectives.
- **The Science of Happiness:** How happiness impacts the brain and body. The role of positive psychology.
- **External vs Internal Happiness:** The difference between fleeting happiness (based on external circumstances) and lasting joy (cultivated through internal practices).
- **Reflection Activity:** Journaling about moments of true happiness and what made them meaningful.

#### Unit 2: Introduction to Yoga

- **What is Yoga?:** Its origin, history, and philosophy (including the 8 Limbs of Yoga).
- **Benefits of Yoga:** How physical postures (asanas) affect the body, mind, and spirit.
- **Connection between Yoga and Happiness:** How regular practice can reduce stress, increase mindfulness, and foster a sense of contentment.
- **Beginner-Friendly Poses:** Teaching basic asanas (like Downward Dog, Child's Pose, and Mountain Pose) that promote relaxation and ease.
- **Practical Session:** A guided 15-minute yoga session focusing on breathing and gentle stretching.

#### Unit 3: The Power of Breath (Pranayama)

- **What is Pranayama?:** Introduction to controlled breathing techniques in yoga and meditation.
- **The Link between Breath and Mind:** How conscious breathing impacts emotional regulation and mental health.
- **Common Breathing Techniques:**
  - **Nadi Shodhana** (Alternate nostril breathing) for calming the mind.
  - **Kapalbhati** (Breath of Fire) for energizing the body.
- **Practical Session:** Guided Pranayama session for 10 minutes.

#### Unit 4: Meditation and Mindfulness

- **What is Meditation?:** A deeper look into the practice of meditation as a tool for mindfulness, relaxation, and clarity.
- **Mindfulness Meditation:** Developing the ability to stay present and non-reactive in the moment.
- **Types of Meditation:**
  - **Guided Meditation:** Focusing on imagery or a specific theme.



- **Mantra Meditation:** Using a sound or word to center the mind.
- **Loving-Kindness Meditation (Metta):** Cultivating compassion towards self and others.
- **The Science of Meditation:** How regular practice can reduce stress, improve concentration, and enhance emotional resilience.
- **Practical Session:** A 10-minute guided meditation focusing on breath awareness.

#### **Unit 5: Integrating Yoga, Meditation, and Happiness**

- **Bringing Yoga into Daily Life:** How to practice mindfulness and yoga in everyday situations (e.g., mindful eating, walking, or even at work).
- **The Role of Gratitude:** Developing a gratitude practice and how it enhances happiness and emotional well-being.
- **Sustainable Practices:** Creating a personal routine for practicing yoga, meditation, and mindful living.
- **Reflection and Journaling:** Encouraging participants to reflect on their journey, personal growth, and plans for continuing the practices.

#### **Suggested readings-**

- Dalai Lama, T., & Cutler, H. C. (1998).** *The Art of Happiness: A Handbook for Living.* Riverhead Books.
- Kabat-Zinn, J. (1990).** *Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness.* Delta.
- Iyengar, B. K. S. (1966).** *Light on Yoga.* HarperCollins.
- Tolle, E. (1997).** *The Power of Now: A Guide to Spiritual Enlightenment.* New World Library.
- Nhat Hanh, T. (1999).** *The Miracle of Mindfulness: An Introduction to the Practice of Meditation.* Beacon Press.

**Course Title:**Information Systems

**Course Code:** MBA-108

L	T	P	C.U.
30	5	5	3

**Programme& Semester:** MBA I

**Pre-Requisite: Basic Knowledge of Computer**

**Course Description:** An examination of the use of information systems to support the management activities of an organization. Topics include: the fundamentals of hardware, software, database management, data communications, transaction processing information systems, decision support systems, information reporting systems, office automation, networks, expert systems, and systems analyses and design. Case studies and several software packages will be utilized to illustrate the principles covered.

**Course Objectives:**

This course is designed to provide students with an understanding of the theoretic and practical issues related to the application of information systems within organizations. The main objectives of the course are to:

- Demonstrate how information systems integrate information and organizational processes across functional areas into unified systems.
- Outline challenges and benefits from the most commonly used enterprise systems.
- Employ a software package to illustrate how enterprise systems work.
- Integrate conceptual and technical (software) skills of students so that a business problem is addressed within the scope of a group project.

**Course Outcome: On completion of the course student will be able to:**

CO1: Evaluate the role of information systems in today's competitive business environment.

CO2: Identify and describe important features of organizations in order to build and use information systems successfully.

CO3: Demonstrate systems analysis, design and decision making in a business setting.

CO4: Define and describe the fundamentals of hardware, software, database management, data communications and systems related to the management activities of an organization.

CO5: Assess how information systems support the activities of managers and end-users in organizations.

CO6: Identify the principal management challenges posed by the ethical and social impact of information systems and management solutions.

**Course Contents:**

**UNIT –I Information System introduction**

**8 Hours**

The meaning and use MIS, System View of Business, Process of MIS, Development of MIS within the organization, Management Process, Information Needs, System Approach in Planning Organizing and Controlling MIS.

**Unit II Conceptual Framework****6 Hours**

Hardware: (a)

Input devices - keyboard, printing devices, voice speech devices, scanner, MICR, OMR, Bar code reader, digital camera etc. (b) Output devices - Visual Display Unit, printers, plotters (c) Storage Devices – Magnetic storage devices, Optical storage devices, Flash Memory.

**Unit III: Operating System and Software****6 Hours**

Software: Types of software with examples; Introduction to languages, compiler, interpreter and Assembler, Operating System Functions, Types and Classification, Elements of GUI based operating system.

**Unit IV: Communication Technology****6 Hours**

Network and Internet: Types of computer networks (LAN, WAN and MAN), Network topologies, EDI.

Internet: Netiquettes, Architecture & Functioning of Internet, Basic services over Internet like WWW, FTP, Telnet, Gopher, IP addresses, ISPs, URL, Domain names, Web Browsers, Internet Protocols, Search engines, e-mail.

**Unit V: Office tools for Business****6 Hours**

Use of MS-Office: Word: Paragraph formatting, Page formatting, Header and footer, Bullets and numbering, Finding and replacing text, Mail merge, Macros. Cell referencing, Ranges.

Excel: Formulae, Functions, Auto sum, Copying formula, Formatting data, creating charts, creating Database, sorting data, filtering.

Power Point: Formatting text on slides, Inserting charts, adding tables, Clipping, Slide animation, Slide shows.

**Unit-VI Security and Ethical Challenges of IT****4 Hours**

Concept of Business Ethics, Technology Ethics; Security and Ethical Challenges of IT, Cyber Crime and Privacy Issues, Cyber Laws, IT Act 2000.

**Suggested Readings**

1. Shrivastava-Fundamental of Computer& Information Systems (Wiley Dreamtech)
2. Leon A and Leon M - Introduction to Computers ( Vikas, 1st Edition).
3. IITL ESL – Introduction to Information Technology (Pearson, 2nd Edition).
- 4 IITL ESL – Introduction to Computer science (Pearson, 2nd Edition).
5. Introduction to Computers, Norton P. (TATA McGraw Hill)
6. Leon - Fundamentals of Information Technology, (Vikas)

## SYLLABUS

### MBA-1<sup>st</sup> SEMESTER

### COURSE TITLE- FUNDAMENTAL OF COMPUTER

### SUBJECT CODE-MBA-108 A

**Objectives of the Course** - The objectives of Fundamentals of Computer are to provide a basic understanding of computer hardware, software, and applications. It aims to teach essential computing skills, including operating systems, data processing, and problem-solving techniques. The course seeks to build foundational knowledge for using technology effectively in personal and professional environments.

#### Unit 1: Introduction to Computers

1. **Definition and Characteristics of a Computer:**
  - What is a computer?
  - Characteristics of computers (Speed, Accuracy, Automation, Storage, Versatility, etc.)
2. **Types of Computers:**
  - Analog, Digital, Hybrid
  - Classification based on size (Supercomputers, Mainframe, Minicomputers, Microcomputers)
3. **Components of a Computer System:**
  - Hardware: Input devices (keyboard, mouse), Output devices (monitor, printer), Central Processing Unit (CPU)
  - Software: System software (Operating System), Application software
  - Memory: Primary (RAM, Cache), Secondary (Hard Disk, SSD, etc.)
4. **Generation of Computers:**
  - First generation (Vacuum tubes)
  - Second generation (Transistors)
  - Third generation (Integrated Circuits)
  - Fourth generation (Microprocessors)
  - Fifth generation (AI, Quantum Computing)
5. **Uses of Computers in Business:**
  - Information Management, Decision Making, Process Automation, Communication, Data Analysis

#### Unit 2: Hardware and Software Basics

1. **Computer Hardware Components:**
  - Input Devices (keyboard, scanner, microphone)
  - Output Devices (monitor, printer, speakers)
  - Storage Devices (HDD, SSD, USB, cloud storage)
  - Motherboard, CPU, RAM, etc.
2. **Software Overview:**
  - System Software: Operating Systems (Windows, Linux, macOS)
  - Application Software: Word processors, Spreadsheet programs (Microsoft Office, Google Docs)
  - Development Software: IDEs, programming languages (C, Python, Java)
3. **Types of Software:**
  - Proprietary vs. Open Source Software
  - Application Software vs. System Software
4. **Operating System:**
  - Functions and types of operating systems (Windows, Linux, Mac OS, Android)
  - Multitasking, Multithreading, and Memory Management

- File Systems (FAT32, NTFS, ext3/ext4)

### **Unit 3: Data Representation and Storage**

- 1. Data Representation:**
  - Binary System (Bits, Bytes, etc.)
  - Number Systems (Binary, Octal, Decimal, Hexadecimal)
  - Data encoding (ASCII, Unicode)
- 2. Storage Devices:**
  - Primary Memory: RAM (Random Access Memory), Cache Memory
  - Secondary Storage: Hard Drives, Solid State Drives, Optical Drives (CD/DVD), Cloud Storage
  - Tertiary Storage: Magnetic tapes, Backup systems
- 3. Data Compression:**
  - Lossy vs Lossless compression (JPEG, PNG, MP3, ZIP)
- 4. Storage and Retrieval of Data:**
  - File Systems and Directories
  - Database Management Systems (DBMS)

### **Unit 4: Computer Networks and Internet**

- 1. Introduction to Networking:**
  - Definition of a Network, Types of Networks (LAN, MAN, WAN)
  - Components: Routers, Switches, Hubs, and Modems
- 2. Internet:**
  - Basic Terminology: IP Address, DNS, HTTP, HTTPS
  - Web Browsers and Web Servers
  - Internet Protocols (TCP/IP)
- 3. E-commerce and Digital Marketing:**
  - Role of the Internet in Business: E-commerce models (B2B, B2C, C2C, etc.)
  - Digital Marketing: SEO, SEM, Social Media Marketing
- 4. Cybersecurity:**
  - Types of Cyber Threats (Viruses, Malware, Phishing)
  - Basic Security Measures (Firewalls, Antivirus, Encryption)

### **Unit 5: Applications of Computers in Business**

- 1. Business Information Systems (BIS):**
  - ERP (Enterprise Resource Planning), CRM (Customer Relationship Management)
  - MIS (Management Information Systems), DSS (Decision Support Systems)
- 2. Business Communication:**
  - Email, Video Conferencing, Collaborative Tools (Slack, Microsoft Teams, Google Meet)
- 3. Automation in Business:**
  - Robotics Process Automation (RPA), AI in customer service (Chatbots, Virtual Assistants)
  - Cloud Computing: SaaS, PaaS, IaaS
- 4. Data Analytics and Business Intelligence:**
  - Importance of Data Analytics in Business
  - Tools: Microsoft Power BI, Tableau, Google Analytics
  - Data-driven Decision Making
- 5. Future Trends in Computing:**
  - Artificial Intelligence and Machine Learning in business
  - Blockchain Technology
  - Internet of Things (IoT)
  - Big Data and its applications

### **Key Tips for Study:**

- **Concept Understanding:** Focus on understanding the core concepts of computers and their application in business.
- **Practical Knowledge:** Learn about popular software and tools used in business contexts (e.g., Microsoft Office, Google Workspace, CRM software).
- **Current Trends:** Keep up with emerging technologies and their impact on business (e.g., AI, blockchain, and data analytics).

### **Suggestive Readings:**

- **"Computer Fundamentals"** by P.K. Sinha – A comprehensive guide on computer basics, covering hardware, software, and applications.
- **"Understanding Computers: Today and Tomorrow"** by Deborah Morley – Provides an overview of modern computing systems and technology trends.
- **"Introduction to Computers"** by Peter Norton – A well-known resource for beginners, focusing on computer hardware, software, and operating systems.
- **"Computers: Understanding Technology"** by Alan Evans, Kendall Martin, and Mary Anne Poatsy – A textbook that explains computer concepts in a user-friendly manner.
  
- **"Fundamentals of Computers"** by V. Rajaraman – A detailed guide that introduces computer systems, networks, and programming basics.

**SYLLABUS**  
**MBA-1<sup>st</sup> SEMESTER**  
**COURSE TITLE- DATA ANALYSIS**  
**SUBJECT CODE-MBA-108 B**

**Objectives of the Course** - The objectives of data analysis are to extract meaningful insights, identify patterns, and make informed decisions. It aims to improve forecasting, optimize processes, and support evidence-based decision-making, ultimately enhancing business efficiency and problem-solving.

Unit 1: Introduction to Data Analysis

- **Overview of Data Analysis**
  - Importance and scope of data analysis in different domains (business, healthcare, science, etc.)
  - Types of data: Quantitative vs. Qualitative data, Structured vs. Unstructured data
  - Data collection techniques and sources
- **Data Types and Variables**
  - Nominal, Ordinal, Interval, and Ratio data
  - Understanding continuous and discrete data
- **Descriptive Statistics**
  - Measures of central tendency: Mean, Median, Mode
  - Measures of dispersion: Range, Variance, Standard deviation
  - Data distribution: Frequency distributions, Histograms
- **Data Cleaning and Preprocessing**
  - Handling missing data
  - Identifying and dealing with outliers
  - Data normalization and standardization

Unit 2: Statistical Foundations for Data Analysis

- **Probability and Probability Distributions**
  - Basics of probability theory
  - Common probability distributions: Normal distribution, Binomial distribution, Poisson distribution
  - Central Limit Theorem
- **Sampling Techniques**
  - Types of sampling: Random, Stratified, Systematic, Convenience
  - Sampling error and biases
- **Hypothesis Testing**
  - Null and Alternative Hypotheses
  - Type I and Type II errors
  - p-values and significance levels
  - Common tests: t-tests, Chi-square tests, ANOVA
- **Confidence Intervals**
  - Understanding and calculating confidence intervals
  - Interpreting results in the context of data analysis
- **Regression Analysis**
  - Simple linear regression: Interpretation and assumptions

Unit 3: Advanced Data Analysis Techniques

- Multiple linear regression: Variables selection, Multicollinearity
- Model fitting and evaluation: R-squared, Adjusted R-squared, Residual analysis
- **Correlation Analysis**
  - Pearson correlation, Spearman's rank correlation
  - Understanding correlation vs causation
- **Time Series Analysis**
  - Components of time series data: Trend, Seasonality, Noise
  - Moving averages and smoothing techniques
  - ARIMA models (Autoregressive Integrated Moving Average)
- **Multivariate Analysis**
  - Principal Component Analysis (PCA)
  - Cluster analysis
  - Factor analysis

#### Unit 4: Data Visualization and Interpretation

- **Introduction to Data Visualization**
  - Importance of visualization in data analysis
  - Principles of effective data visualization
- **Charts and Graphs**
  - Bar charts, Line graphs, Histograms, Box plots
  - Scatter plots and heat maps
  - Pie charts and their limitations
- **Advanced Visualizations**
  - Interactive dashboards and data storytelling
  - Visualizing correlations and regression lines
  - Geographic Information Systems (GIS) and mapping data
- **Visualization Tools**
  - Introduction to visualization tools: Excel, Tableau, Power BI, R (ggplot2), Python (Matplotlib, Seaborn)
  - Best practices in data visualization

#### Unit 5: Tools and Applications for Data Analysis

- **Introduction to Data Analysis Tools**
  - Overview of statistical software and programming languages: Excel, R, Python
  - Setting up and using Python libraries for data analysis: NumPy, Pandas, SciPy, StatsModels
  - Using R for statistical analysis
- **Data Analytics Platforms and Big Data**
  - Introduction to big data technologies: Hadoop, Spark, NoSQL databases
  - Working with databases: SQL and NoSQL
  - Data pipelines and workflows
- **Machine Learning Basics (Optional, if included in syllabus)**
  - Supervised vs. Unsupervised learning
  - Introduction to regression, classification, and clustering
  - Evaluation metrics for machine learning models
- **Real-world Data Analysis Applications**
  - Case studies from different industries (e.g., business, finance, healthcare)
  - Problem-solving using data analysis tools and techniques

#### Additional Topics (Optional)

- **Ethical Considerations in Data Analysis**
  - Data privacy, security, and consent



- Ethical use of data and algorithms

**Suggested Readings:**

- "Data Science for Business" by Foster Provost
- "The Art of Data Science" by Roger D. Peng
- "Practical Data Science with R" by Nina Zumel & John Mount.

## SYLLABUS

### MBA-1<sup>st</sup> SEMESTER

### COURSE TITLE- STATISTICS, COMPUTATION AND APPLICATIONS

### SUBJECT CODE-MBA-108 C

**Objectives of the Course** - The objectives of statistics, computation, and application are to analyze data, model relationships, and solve real-world problems. It focuses on improving decision-making, forecasting trends, and optimizing processes using statistical techniques and computational tools across various fields like business, economics, and engineering.

#### Unit 1: Introduction to Statistics and Probability

- **Overview of Statistics**
  - Role of statistics in various fields (business, science, social science, healthcare, etc.)
  - Types of statistics: Descriptive vs. Inferential statistics
  - The importance of data in decision-making
- **Basic Probability Theory**
  - Basic concepts: Sample space, events, probability, conditional probability
  - Rules of probability: Addition and multiplication rules
  - Bayes' Theorem and its applications
- **Random Variables and Probability Distributions**
  - Discrete vs. continuous random variables
  - Common probability distributions: Binomial, Poisson, Uniform, Normal, Exponential, etc.
  - Probability mass functions (PMF) and probability density functions (PDF)
- **Descriptive Statistics**
  - Measures of central tendency: Mean, Median, Mode
  - Measures of spread: Range, Variance, Standard deviation, Interquartile range
  - Graphical methods: Histograms, Bar charts, Pie charts

#### Unit 2: Statistical Inference and Hypothesis Testing

- **Estimation and Confidence Intervals**
  - Point estimation and interval estimation
  - Confidence intervals for population mean, variance, proportion
  - Margin of error and sample size determination
- **Hypothesis Testing**
  - Formulation of null and alternative hypotheses
  - Type I and Type II errors, power of a test
  - p-values, significance levels, and decision-making
  - Common tests: t-tests, Chi-square test, Z-test, F-test
- **Analysis of Variance (ANOVA)**
  - One-way ANOVA for comparing multiple groups
  - Assumptions of ANOVA and post-hoc tests
  - Interpretation of F-statistic and p-values
- **Non-parametric Tests**
  - Wilcoxon signed-rank test, Mann-Whitney U test
  - Kruskal-Wallis test
  - Use cases for non-parametric tests

### Unit 3: Regression Analysis and Multivariate Techniques

- **Simple Linear Regression**
  - Regression line, least squares estimation
  - Model assumptions and diagnostics
  - Interpretation of coefficients, R-squared, residual analysis
- **Multiple Linear Regression**
  - Multiple predictors and multicollinearity
  - Model selection techniques: Forward, backward, and stepwise regression
  - Interaction effects and interpretation of results
- **Logistic Regression**
  - Binary logistic regression model and interpretation
  - Odds ratios, Likelihood Ratio Tests
  - Model evaluation metrics: ROC curve, AUC, confusion matrix
- **Multivariate Analysis**
  - Principal Component Analysis (PCA)
  - Factor Analysis
  - Cluster Analysis (K-means, Hierarchical Clustering)
  - Canonical Correlation Analysis (CCA)

### Unit 4: Computational Methods in Statistics

- **Introduction to Computational Statistics**
  - The role of computation in modern statistics
  - Overview of software tools for statistical analysis (R, Python, SAS, SPSS)
- **Simulation Methods**
  - Monte Carlo simulations
  - Bootstrap methods and resampling techniques
  - Markov Chain Monte Carlo (MCMC) methods
- **Optimization Techniques**
  - Numerical optimization methods: Gradient descent, Newton-Raphson, and others
  - Solving systems of equations computationally
  - Maximum likelihood estimation (MLE) and its computational implementation
- **Statistical Software: R and Python**
  - Introduction to R for statistical analysis: Data structures, plotting, statistical modeling
  - Python for statistics: Using libraries like NumPy, SciPy, Pandas, StatsModels
  - Writing efficient statistical code and automating analyses

### Unit 5: Applications of Statistics in Real-World Problems

- **Statistics in Business and Economics**
  - Market research, customer satisfaction surveys, and opinion polls
  - Time series analysis for forecasting sales, demand, and stock prices
  - A/B testing for experimental design and decision-making
- **Statistics in Healthcare and Medicine**
  - Clinical trials: Randomized control trials (RCTs) and observational studies
  - Epidemiological studies: Cohort studies, Case-control studies
  - Survival analysis (Kaplan-Meier estimator, Cox regression)
- **Data Science and Machine Learning Applications**
  - Data preprocessing: Feature selection, cleaning, and transformation
  - Supervised and unsupervised learning methods in statistics
  - Evaluating machine learning models: Cross-validation, bias-variance tradeoff
  - Applications in image recognition, text analysis, and recommender systems
- **Environmental Statistics**

- Statistical models in environmental monitoring (pollution levels, climate change)
  - Spatial statistics and geographic information systems (GIS)
  - **Statistical Applications in Social Sciences**
    - Surveys and sampling techniques in political science, sociology, and psychology
    - Structural Equation Modeling (SEM) and path analysis
- 

Additional Topics (Optional):

- **Ethical Considerations in Data and Statistics**
  - Data privacy, informed consent, and ethical use of statistical methods
  - Bias and fairness in statistical modeling
- **Advanced Statistical Techniques (Optional)**
  - Bayesian statistics and inference
  - Advanced time series models (GARCH, ARIMA with exogenous variables)
  - Neural networks and deep learning for statistical modeling
- **Project/Case Studies**
  - Hands-on application of statistical methods to solve real-world problems
  - Group or individual projects using datasets from various fields like business, healthcare, or social sciences

**Suggested Readings:**

- "Statistics for Business and Economics" by Paul Newbold
- "Applied Multivariate Statistical Analysis" by Richard A. Johnson
- "Introduction to Computational Statistics" by James E. Gentle.

## MBA 2 Semester

**Course Title:**Marketing Management

**Course Code:** MBA-201

L	T	P	C.U.
35	5	0	3

**Programme& Semester:** MBA II

**Course Description:** The main objective of this course is to acquaint the students with the principles and practices of marketing. Marketing management course enables students to understand the fundamental of marketing concept and role marketing plays in business. . It will enable the student to understand the marketing mix elements and strategies and principles underlying the modern marketing practices.

**Course Objectives:** The objective of the course is to help the students to gain understanding of the functions and responsibilities of the marketing manager, provide them tools and techniques to perform the marketing function smoothly in an organization.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO1: Understand strong conceptual knowledge in the functional area of marketing management.

CO2: Develop marketing strategies based on segmentation, target marketing and positioning by examining consumer behavior.

CO3: Evaluate the relevance of marketing concepts impact on environmental change while designing marketing plans, strategies and practices.

CO4: Understand the product life cycle, product mix and branding

CO5: Explain factors influencing pricing decisions.

### **Course Contents:**

**Unit 1: a) Marketing Concept** - Marketing management; Nature and scope; Evolution of marketing; Selling vs marketing; Emerging role of marketing; Marketing mix.

**b) Marketing Environment** - Concept; Need for study; Major elements and their impact on marketing decisions.

**Unit 2: a) Consumer Behaviour** - Consumer vs. organisational/ industrial buyer; Their characteristics; Importance of understanding consumer behaviour; Determinants of consumer behaviour; Theories of consumer behaviour; Various buying roles in family; Types of buying behaviour; Consumer decision-making process in buying.

**b) Market Segmentation** - Nature and importance of segmentation; Pre-requisites for effective segmentation; Bases of segmenting consumer markets; Market selection strategies; Positioning.

### **Unit 3: Product Decisions**

Concept of product; Classification of products; Product line and Product mix; Branding, packaging, and labeling; Customer services; Development of new product; Product Life-cycle; The new product (Consumer); Adoption process.

**Unit 4: a) Price Decisions** - Pricing as a marketing variable-its role and importance; Price vs. non-price competition; Factors influencing price determination; Price setting in practice; Price policies and strategies.

**b) Distribution Channels and Physical Distribution Decisions** - Why are marketing intermediaries used? Marketing channel functions; Selecting channels of distribution; Determining the intensity of distribution; Channel management decisions-selection, motivation and evaluation of individual middlemen; Manufacturer-distribution relationship; Retailing and wholesaling; Logistics of distribution.

**Unit 5: a) Promotion Decisions** - Nature; Objectives and importance of promotion; Communication process; Promotion mix and methods; Advertising; Personal Selling; Public Relations; and Sales Promotion.

**b) Legal, Ethical, and Social Aspects of Marketing** - Consumerism; Consumer protection measures in India; Recent developments in consumer protection in India.

**Suggested Readings:**

1. Philip Kotler, • Levin Lane Keller, Abraham Koshy, and MithleshwarJha, *Marketing Management: South Asian Perspective*, 13<sup>th</sup> ed., Pearson Education, New Delhi, 2012
2. Michale J. Etzel, Bruce J. Walker, William J. Stanton, and Ajay Pandit, *Marketing: Indian Adaptation*, 14<sup>th</sup> ed., Tata McGraw-Hill, New Delhi, 2009
3. E. Jerome McCarthy and William B. Perrealet, *Basic Marketing: A Managerial Approach*, 15<sup>th</sup> ed., Tata McGraw-Hill, New Delhi, 2009
4. Philip Kotler and Gary Armstrong, *Principle of Marketing*, 14<sup>th</sup> ed., Prentice-Hall of India, New Delhi, 2014
5. *The Consumer Protection Act, 1986*

**Course Title:**Financial Management

**Course Code:** MBA-202

L	T	P	C.U.
35	5	0	3

**Programme& Semester:** MBA II

**Objectives of the Course:** This course seeks to help the students in developing their skills for financial decision-making.

**Course Outcome:** On completion of this course, the students will be able to:

- CO1 Understand the concept of time value of Money
- CO2 To evaluate the various projects by different methods.
- CO3 Understand and compare the theories of dividend policy
- CO4 To analyse and evaluate the various available financing options.
- CO5 Identify the major sources of short-term financing available to the firm

### **Course Contents**

#### **Unit 1: Introduction to Financial Management**

Nature, scope, and objectives of financial management; Time-value of money; Concept of risk and return; Valuation of securities: Bonds and Equities; Functions of Finance Management in modern age.

#### **Unit 2: Long-term Investment Decisions**

Concept and Principles of Capital Budgeting; Methods of capital Budgeting: Payback Method, Accounting Rate of Return, Net Present Value (NPV), Net Terminal Value, Internal Rate of Return (IRR), Profitability Index; Capital budgeting under risk; Certainty-Equivalent Approach and Risk-adjusted Discount Rate

#### **Unit 3 : Working Capital Management**

Concept of working capital; Planning for working capital, The risk-return trade-off; Management of cash and near-cash assets; Payables management; Management of accounts receivable; Inventory management; Sources, of short-term finance.

#### **Unit 4 : Long-term Financing Decisions and Cost of Capital**

Capitalisation; Capital structure; Factors affecting the pattern of capital structure; Basic assumptions and theory of capital structure; Estimation of components of cost of capital; Equity capital and external and internal retained earnings; Debt and preference capital; Weighted-Average Cost of Capital (WACC) and marginal cost of capital; Sources of long-term financing: Capital structure; Operating and financial leverage; Determinants of capital structure; Corporate securities.

#### **Unit 5 : Dividend Decisions**

Concept of dividend; Significance of dividend decision in business; Forms of dividend; Factors affecting dividend policy; Dividend policy theories: Walter's Model; Modigliani-Miller approach; Gordon's Model; Dividend policy in practice.

#### **Suggested Readings:**

1. James C Van home, Financial Management and Policy, 13th ed., Prentice-Hall of India, New Delhi
2. I.M. Pandey, Financial Management, Vikas Publication, 11 ed., 2015
3. M.Y. Khan and P.K. Jain, Financial Management, Tata McGraw-Hill, 7th ed., 2014
4. V. Sharan, Essentials of Financial Management, Prentice-Hall of India, New Delhi, 6<sup>th</sup> ed., 2010
5. Van Horne and Wachowicz, Jr., Fundamentals of Financial Management, 13th ed., 2015  
Prentice-Hall of India,
6. Eugene F. Brigham and Joel F. Houston, Fundamentals of Financial Management, concise 9<sup>th</sup> ed. (Indian Edition), Thomson South-western (now Cengage Learning), New Delhi, 2016

## Syllabus

**Course Title:** Human Resource Management

**Course Code:** MBA-203

L	T	P	C.U.
35	5	0	3

**Programme & Semester:** MBA II

**Course Objective:** In this course the students will learn the basic concepts and frameworks of Human Resource Management (HRM) and understand the role that HRM has to play in effective business administration. It will provide an insight as how to use Human Resource as a tool to implement strategies.

### Course Outcomes (CO)

After completion of this course, the student will be able:

CO1: To State the basic concept of Human Resource Management and role played by HR Manager.

CO2: To explain the key issues related to administering the human elements such as recruitment, selection, motivation, placement, compensation, appraisal, career planning, diversity, ethics, and training.

CO3: To schedule appropriate implementation, monitoring and assessment procedures of training.

CO4: To interpret the significance of employee compensation benefits to both employers and employees.

CO5: To value the concept of performance management and outline its role in contemporary organizations.

### Course Contents

#### Unit 1: Introduction to Human Resource Management

(a) Evolution of FIRM (b) Objectives and functions of HRM (c) Role and responsibilities of HR manager (d) Relevance of HRM (e) Systems approach to HRM.

#### Unit 2: Acquisition of Human Resource Management

(a) Human Resource Planning: Purpose and process (b) Recruitment and Selection: Sources of Recruitment, Stages in Selection Process (c) Placement, goals analysis: Job description and job specification.

#### Unit 3: Developing Human Resources

(a) Training and Development: Training needs, training methods, application of computers in training, developing effective training programs (b) Concept of HRD (c) Management development programs.

#### Unit 4: Performance Appraisal

(a) Concept and objectives of performance appraisal (b) Process of performance appraisal (c) Criteria for performance appraisal (d) Benefits of performance appraisal (d) Limitations and constraints (f) 360-degree performance appraisal (g) Promotion-degree, transfer and separation: Promotion, purpose, principles and types; Transfer: Reasons, principles and types; Separation: Lay-off, resignation, dismissal, retrenchment, voluntary, retirement scheme.

#### Unit 5: Motivating Human Resources

(a) Motivation at Work, Major Motivation Theory: An Overview (b) Participative Management (c) Compensation Management, Major Elements of Compensation Management (d) Incentives: Concepts, types of incentives; Incentives schemes in Indian industries; Fringe benefits (e) Discipline and employees' grievance redressal.

### TEXT BOOK



Rao, V. S. P. (2016). *Human Resource Management: Text and Cases*, 3<sup>rd</sup> ed., Excel Books

**Reference Reading:**

1. Dessler, Gary, and Biju Varkkey(2016)*Human Resource Management*, (15<sup>th</sup>Ed). Pearson Education, New Delhi
2. Gomez-Mejia, et al;(2016) *Managing Human Resources*,(8<sup>th</sup>Ed). Pearson Education, New Delhi
3. John M. Ivancevich (2017)*Human Resource Management*, (12<sup>th</sup>Ed).Tata McGraw-Hill, New Delhi
4. David A. DeCenzo and Stephen P. Robbins(2016)*Fundamentals of Human Resource Management*, 8<sup>th</sup>Ed., Prentice-Hall of India, New Delhi
5. BiswajeetPattanayak (2015)*Human Resource Management*, (5<sup>th</sup>Ed). Prentice-Hall of India, New Delhi
6. K. Aswathappa (2017)*Human Resource and Personnel Management*, (7<sup>th</sup>Ed). Tata McGraw-Hill, New Delhi
7. RS Dwivedi (2018) *Human Resource Management in Indian Enterprises*, (5<sup>th</sup>Ed). Vikas Publishing, New Delhi
8. Louis Bevoc (2018) *A Basic Introduction of Human Resource Management*, Kindle Edition
- 9.C B Gupta (2017) *Human Resource Management*, (5<sup>th</sup> Ed). Sultan Chand & Sons Publication, New Delhi
- 10.Wendell L. French (2006) *Human Resource Management*,6<sup>th</sup>Ed; Houghton Mifflin

**Course Title:** Production & Operations Management

**Course Code:** MBA-204

L	T	P	C.U.
35	5	0	3

**Programme & Semester:** MBA II

**Course Description:** The course description is to make the students examines the functional area of production and operations management as practiced in the manufacturing industry. The course includes decision-making, capacity planning, aggregate planning, forecasting, and inventory management, distribution planning, materials requirements planning (MRP), project management and quality control. The course will demonstrate awareness and an appreciation of the importance of the operations and supply management to the sustainability of an enterprise.

**Course Objectives:** The objective of the course is to help the students to introduce major concepts and tools used in the design and use of operations systems in organizations. It introduces the discipline and the role the function plays in a value-creating organization. Emphasis is given both to familiarization of various production processes and service systems, and to quantitative analysis of problems/ issues arising in the management of operations.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO1- Identify the role of Operations in overall Business Strategy of the industry.

CO2- Discuss the application of operations management policies and techniques to the service sector as well as manufacturing firms.

CO3- Evaluate the vital factors and their interdependence of these factors in the design of effective operations system.

CO4- Classify the trends and challenges of Operations Management in the current business scenario.

CO5- Explain the students with the tools and techniques for effective utilization of operational resources and managing the processes to produce good quality products and services at competitive prices.

**Course Contents:**

**Unit 1 : Introduction to Production and Operations Management (P&OM)**

Nature, Objectives and Scope of P&OM (b) Evolution of P&OM (c) Transformation System (d) Functions and Responsibilities of Operations Manager (e) Difference between Goods and Services (f) New product development

**Unit 2 : Facilities Management**

(a) Types of Processes (b) Process Selection (c) Importance of Facilities Location (d) Factors Affecting Facilities Location (e) Location Evaluation (f) Facility's Layout: Criteria for Good Layout, Benefits of good layout, Symptoms of Poor Layout, Types of Facility's Layout, Layout planning

**Unit 3 : Production Planning**

(a) Introduction to Production Planning (b) Production Planning Strategies (c) Introduction to Capacity Planning (d) Aggregate Planning (e) Master Production Scheduling (f) Material Requirement Planning (g) Production Scheduling

**Unit 4 : Production Control**

(a) Elements of Production Control (b) Purchase Process (c) Receiving (d) Inventory Management: Graphical, Tabular and EOQ Models of Inventory Control; Economic Production Lot Size (EPLS) (e) Just-In-Time Inventory (f) Selective Control Tools of Inventory.

**Unit 5 :**

**a) Quality Management:** Concepts of Total Quality Management (TQM)

**b) Tools for Lean and Six Sigma:** Value stream map; 7 wastes; Pure and replenishment types; Standardized work; Total Productivity Management (TPM); Just-in-time (JIT)

**Suggested Readings:**

1. Chase, Jacob, Aquilano, and Agarwal, Production and Operations Management, 13<sup>th</sup>ed. (TMH, New Delhi), 2009
2. Lee J. Krajwski, Operations Management: Strategy and Analysis, 6<sup>th</sup> ed., Pearson Education, N. Delhi
3. Jeffery K. Liver, Toyota Production Way
4. Adam Ebert, Production and Operations Management, 6<sup>th</sup> ed., Pearson Education, N. Delhi
5. S.N. Chary, Production and Operations Management, TMH, New Delhi, 5<sup>th</sup> edition
6. William J. Stevenson, Operations Management, 13<sup>th</sup> ed., 2017, McGraw-Hill, New Delhi
7. Muhlemann, Oakland, Lockyer, Sudhir, and Katyayani, Production and Operations Management, 6<sup>th</sup> ed., Pearson Education, 2007
8. Elwoods S. Buffa and Rakesh K. Sarin, Modern Production/ Operations Management, 8<sup>th</sup> ed., Wiley Student Edition, 2009
9. Joseph S. Martinich, Production and Operations Management, 10<sup>th</sup> Reprint, Tata McGraw-Hill, New Delhi/Nbida, 2005
10. Norman Gaither, Operations Management, Cengage Learning
11. Ritzman, et al., Operations Management, Pearson, 11<sup>th</sup>ed.

**Course Title:** Research Methodology

L	T	P	C.U.
30	5	5	3

**Course Code:**MBA-205

**Programme& Semester:** MBA II

**Pre-requisite:** Statistics for Management

**Course Description:** Research methodology is a systematic approach to solve the research problem. We study various steps that are generally adopted by the researcher in studying his research problem along with logic behind them. The syllabus of research methodology includes five units; unit one is concept of research which includes an overview of research and research methodology, defining a research problem and research proposal. Unit 2 includes various research design and their characteristics. Unit 3 includes various Scaling & Measurement Techniques; in unit-4 Sampling Design & Collection of Data are included and Unit-5 includes Data Analysis, Hypothesis Testing & Report Writing.

The Andragogy in this subject includes power point presentations, case studies, assignments, class test, quiz, mini project etc.

**Course Objectives:** The course is designed to develop a research orientation among the students and make the students aware with the different research methods and techniques and to develop understanding the practical application of various research techniques.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO 1: Explain the basic framework of research process involved in research.

CO 2: Construct the research proposal related to business or management problems.

CO 4: Design the questionnaire related to primary data collection method.

CO 5: Operate the concept of statistical analysis which includes various tests like t-test, F Test, Z test.

CO 6: Identify the mechanism and techniques of report writing.

**Course Contents:**

**Unit 1 Concept of Research:** Definition, Importance & Objectives of Research, Types of Research, Concept of Research Methodology, Research Problems: Problems encountered by researchers in India, Precautions to be taken while selecting the Research Problem, Research Process: Steps involved in Research Process, Research Proposal – Elements of a Research Proposal and Drafting a Research Proposal

**Unit 2 Research design:** Concept, Features of a good research design, Exploratory Research Design: Concept, Types: Literature Research, Experience Survey and Case study Method

Descriptive Research Designs: Concept & Types: Cross-sectional and Longitudinal Research

Experimental Design: Concept of Causal relationships, Important experimental designs: Informal experimental designs and Formal experimental designs.

**Unit 3 Scaling & Measurement Techniques:** Concept of Measurement: Need of Measurement; Levels of measurement: Nominal, Ordinal, Interval, Ratio. Attitude Scaling Techniques: Concept & Applications of Scales: Rating Scales viz. Likert Scales, Semantic Differential Scales, Constant Sum Scales, Graphic Rating Scales, Ranking Scales, Paired comparison.

**Unit 4 Sampling Design & Collection of Data:** Sampling Design Concepts: Defining the Universe, Concepts of Statistical Population, Sample, Procedure in sampling design, Sample Size, Factor affecting sample size, Sampling errors and Non Sampling errors

Probability Sampling: Simple Random Sampling, Systematic Sampling, Stratified Random Sampling, Area Sampling & Cluster Sampling.

Non Probability Sampling: Judgment Sampling, Convenience Sampling, Purposive Sampling, Quota Sampling & Snowballing Sampling methods.

Secondary and Primary Sources of data, Methods of Data Collection: Observation, Interview, Questionnaire and Schedule Method and Preparation of Questionnaire.

**Unit 5 Hypothesis Testing & Report Writing:** Test of Significance: Small sample tests: t (Mean, proportion) and F tests, Z test

Mechanism of Report Writing: Layout of the research report, Steps involved in research report writing, Precautions while writing research report, Citation of References.

**Text Book:**

1. Cooper D.R., Schindler P.S. (2013). *Business Research Methods*, 11th Ed., TMGH, New Delhi.

**Reference Readings:**

1. Collis J and Hussy R. (2009). *Business Research*, 3<sup>rd</sup> ed., Palgrave.

2. Emma B., Alan B. and Bill H. (2018). *Business Research Methods*, 5th ed., Oxford University Press.

3. Beri G.C. (2013). *Marketing Research*, 5th ed., Mc Graw Hill.

4. Saunders M., Lewis P., Thronhill A. (2012). *Research Methods for Business Students*, 6th ed., Pearson Education

5. Kothari C.R. (2011). *Research Methodology*, 2nd ed. (Revised), New Age International Publication.

## SYLLABUS

### MBA-2 Semester

#### Course Title: PUBLICATION ETICHS

#### COURSE CODE- 205 A

**Objectives of the Course** - The objectives of publication ethics are to ensure integrity, transparency, and accountability in the publishing process. It aims to prevent plagiarism, data manipulation, and authorship disputes. Publication ethics promotes the dissemination of reliable, accurate research while upholding fairness, confidentiality, and respect for intellectual property in academic publishing.

#### Unit 1: Introduction to Publication Ethics

- **Overview of Publication Ethics**
  - Definition of Publication Ethics.
  - Importance of ethical standards in academic publishing.
  - Role of ethical practices in maintaining credibility and integrity in research.
- **Common Ethical Issues in Publishing**
  - Plagiarism: Copying others' work without proper attribution.
  - Fabrication and falsification: Misleading data, results, or references.
  - Authorship ethics: Who should be credited and the criteria for authorship.
  - Duplicate publication: Publishing the same work in more than one journal without disclosure.
- **Ethical Responsibilities of Authors**
  - Originality of content.
  - Accurate representation of research findings.
  - Acknowledging the contributions of others.

#### Unit 2: Research Ethics and Data Integrity

- **Research Ethics in Publishing**
  - Ethical considerations in conducting research.
  - Protecting participant confidentiality and privacy in business studies.
  - Consent and transparency in research involving human subjects.
- **Data Integrity**
  - Importance of accurate data collection and reporting.
  - Ethical issues related to data manipulation or misrepresentation.
  - Importance of data sharing and open access.
  - Tools and techniques for verifying data authenticity.
- **Reporting Results Responsibly**
  - Ensuring transparency in results.
  - Ethical reporting of negative results and failures.
  - Reproducibility of research findings.

#### Unit 3: Peer Review Process and Ethical Considerations

- **Role of Peer Review in Academic Publishing**
  - The peer review process: Definition, steps, and benefits.
  - Types of peer review: Single-blind, double-blind, open review.
  - How the peer review process ensures the quality of published work.
- **Ethical Challenges in Peer Review**

- Conflicts of interest: Managing bias and objectivity.
- Reviewer misconduct: Plagiarism, inappropriate suggestions, or unethical behavior.
- Ethics of accepting or rejecting articles for review.
- **Responsibility of Editors and Reviewers**
  - Editor's role in maintaining publication integrity.
  - Ethical expectations for reviewers: Constructive feedback, confidentiality, and fairness.

#### Unit 4: Copyright, Intellectual Property, and Legal Issues

- **Understanding Copyright in Academic Publishing**
  - Definition of copyright and its role in protecting academic work.
  - How authors, editors, and publishers handle copyright issues.
  - Licensing models: Creative Commons, open access, etc.
- **Intellectual Property Rights (IPR) in Publishing**
  - Importance of intellectual property protection in research and publications.
  - Ethical implications of intellectual property theft.
  - Differences between plagiarism and legitimate use of intellectual property.
- **Legal Issues in Academic Publishing**
  - Overview of legal frameworks governing academic publishing.
  - Copyright infringement and its legal consequences.
  - How to legally cite and reference intellectual property.

#### Unit 5: Ethical Publishing Practices and Consequences of Misconduct

- **Best Practices for Ethical Publishing**
  - Writing transparent, honest, and properly cited academic papers.
  - Collaboration and authorship ethics in multi-author publications.
  - Use of ethical journals and platforms for publishing.
- **Consequences of Research Misconduct**
  - Institutional and legal consequences of academic dishonesty.
  - Impact on the reputation of authors, institutions, and publishers.
  - Case studies of well-known ethical violations in academic publishing (e.g., retracted papers, scandal cases).
- **Promoting Ethical Publishing in Business Research**
  - Role of universities and business schools in promoting ethical research.
  - Educating students and researchers on ethical publishing standards.
  - Developing a culture of ethical scholarship in business education.

#### Reference Readings:

- **"Publication Ethics: A Handbook for Journalists and Authors"** by L. J. Kaltwasser – A practical guide to understanding ethical practices in academic publishing.
- **"Publication Ethics and Social Responsibility: A Handbook for Academic Writers"** by Elizabeth Wager – Offers insights on maintaining ethical standards during the publishing process.
- **"Ethics in Publishing"** by Michael A. Berenbaum – A comprehensive text covering key ethical issues, including authorship, peer review, and conflicts of interest.

**Course Title:**Business Environment

**Course Code:** MBA-206

L	T	P	C.U.
35	5	0	3

**Programme& Semester:** MBA II

**Course Objectives:** The course is designed to enable the students to learn the concepts of economic environment of business, changes in policies and latest developments in India and abroad. The students will be able to analyse the overall business environment and evaluate its various components in business decision making. The course will be providing the concept of contemporary ethical issues and challenges existing throughout the professional business arena. Emphasis will be placed upon the manager's social and environmental responsibilities to a wide variety of stakeholders, including employees, customers and the public.

**Course Outcomes:** At the end of the course, students will be able to:

CO1: Understand the relationship between environment and business, and its components;

CO2: Understand the economic, socio-cultural and technological environment;

CO3: Explain the economic policies, legislation and economic reforms laid by the government;

CO4: Demonstrate and develop conceptual framework of business environment in international business.

### **Course Content**

#### **Unit 1: Introduction**

Concept, significance and nature of Business Environment, types of business environment, components of business environment, Interaction between internal and external environments, Nature and structure of Economy, Techniques for business environmental analysis, Approaches and Significance of Environmental Forecasting

#### **Unit 2: Economic Environment**

History of Economic Systems, Market, Planned and Mixed Economy, Planning in India: Emergence and Objective; Planning Monetary Policy, Fiscal Policy. Union Budget as instrument of growth and its Impact on Business, Industrial Policy: Meaning Objective and Recent Developments in New Economic Policy and its Impact on Business.

#### **Unit 3: Politico-Legal Environment**

Relationship between Business and Government, Economic, Planning, Regulatory, Promotional and Entrepreneurial Roles of Government, Constitutional provisions affecting Business. An overview of major laws affecting business, Consumer protection Act 2019, Social Responsibility of Business

**Unit 4:a):** Factors Influencing Technological Environment, Role and Impact of Technology on Business. Transfer of Technology - Channels, Methods and Limitations.

**b) Demographic and Socio-cultural Environment:** Population size, falling birth rate, Changing age structure and its impact on business, Business and Society, Business and Culture, Culture and Organisational Behaviour.

#### **Unit 5:**

**WTO:** Salient features and Current Developments; Globalisation: Meaning and dimensions, Features of Current Globalisation, Stages of Globalisation, Multinational Corporation (MNCs) and Transnational Corporations (TNCs), Disinvestments of PSUs, Foreign Direct Investments (FDI) and Regulation of Foreign Trade.

#### **Suggested Readings:**

1. Cherunilam, F. (2017). *Business Environment Text & Cases*, Himalaya Publishing House.
2. Fernando, A.C. (2011). *Business Environment*, ed., Pearson education, New Delhi
3. Aswathappa, K. (2017). *Essentials of Business Environment*, Himalaya Publishing House.
4. Dorrton Otter, Paul Wetherly (2018) *The Business Environment: Themes and Issues in a Globalizing World*. (2018). United Kingdom: Oxford University Press.



## SYLLABUS

### MBA-2<sup>nd</sup> SEMESTER

#### COURSE TITLE: NUTRITION AND WELL BEING

#### COURSE CODE: MBA-206-A

**Objectives of the Course** - The objectives of nutrition and well-being are to promote balanced diets, improve physical health, and enhance mental well-being. It aims to prevent nutrition-related diseases, encourage healthy lifestyle choices, and educate individuals on the importance of proper nutrition for maintaining energy, vitality, and overall quality of life.

#### **Unit 1: Introduction to Nutrition:**

10 Hours

Definition and scope of nutrition, Macronutrients and micronutrients their functions and sources. Overview of the digestive system, Digestion and absorption of nutrients, Age-specific nutritional needs (infants, children, adults, and elderly)

#### **Unit 2: Dietary Guidelines and Eating Patterns:**

10 Hours

Overview of global dietary guidelines (e.g., MyPlate, Food Pyramid, Mediterranean diet), Key principles for healthy eating, Portion control and balanced meals, Plant-based diets, intermittent fasting, ketogenic diets, and their health impacts, Strategies for planning nutritious meals, Cooking methods that preserve nutrients and reduce fat.

#### **Unit 3: Nutrition and Lifestyle Diseases:**

10 Hours

Causes and health risks of obesity, Effective weight loss strategies (caloric deficit, exercise, behavioral changes), Role of exercise and physical activity in weight management, Nutrition and heart disease prevention (impact of fats, cholesterol, sodium, and fiber), Relationship between diet and type 2 diabetes.

#### **Unit 4: Nutrition for Optimal Well-Being:**

10 Hours

Nutrients that affect mood, cognition, and mental health (e.g., Omega-3s, B vitamins), The role of diet in stress management and mental well-being, Nutrition for athletes and physical performance, The impact of food choices on the environment, Sustainable diets and their role in promoting global health.

### RECOMMENDED READINGS

- Mudambi, S.R and Rajagopal, M. V. Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed; 2012; New Age International Publishers
- Mudambi, S. R, Rao, S.M and Rajagopal, M.V. Food Science; Second Ed; 2006; New Age International Publishers
- Srilakshmi, B. Nutrition Science; 2012; New Age International (P) Ltd
- Lakra, P., Singh, M.D. Textbook of Nutrition and Health; First Ed; 2008; Academic Excellence.
- Manay, M.S, Shadaksharaswamy. Food – Facts and Principles; 2004; New Age International (P) Ltd.

**SYLLABUS**  
**MBA-2<sup>nd</sup> SEMESTER**  
**COURSE TITLE- DISASTER MANAGEMENT**  
**SUBJECT CODE-MBA-206-B**

**Objective of the Course**

1. To provide basic conceptual understanding of disasters.
2. To understand approaches of Disaster Management
3. To build skills to respond to disaster

**Unit: I -Definition and types of disaster**

Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

**Unit: II Study of Important disasters**

Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g Earthquakes, Landside). Social Economics and Environmental impact of disasters.

**Unit: III Mitigation and Management techniques of Disaster**

Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warning Systems, Building design and construction in highly seismic zones, retrofitting of buildings.

**Unit IV Training, awareness program and project on disaster management**

Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management, Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Sikkim and its surrounding areas.

**Text Books:**

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
5. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD

## SYLLABUS

MBA-2<sup>ND</sup> Semester

Course Title: Environmental Policy

Course Code: BS-206-C

**Objectives of the Course** - The objectives of environmental policy are to protect natural resources, reduce pollution, and promote sustainable development. It aims to ensure compliance with environmental regulations, conserve biodiversity, and mitigate climate change. The policy seeks to balance economic growth with environmental protection, fostering long-term ecological stability and social responsibility.

### UNIT-1: INTRODUCTION

10 Hours

Introduction to environment, Environment and society, Composition of healthy environment, Climate change, Biodiversity and climate change, Natural resource conservation and management. Over Population and its impact on environment.

### UNIT-2: WASTE MANAGEMENT

8 Hours

Introduction of waste management, Solid and Liquid waste management. Environmental policy and evolution, Environmental policy and laws in India. National environmental policy.

### UNIT-3: ENVIRONMENTAL HAZARD AND NGT

10 Hours

Environmental hazard and risk management, Ministry of environment, forest and climate change, CPCB (Central pollution control board, SPCB (State pollution control board) Roles and their functions. National Green tribunal and key environmental issues.

### UNIT-4: AN OVERVIEW OF ENVIRONMENTAL MODELING

10 Hours

**RIO earth summit 1992**, Kyoto Protocol 1997, Sustainable development and Green technology, The Environment (Protection) Act, 1986, Laws concerning wildlife in India, Biological diversity act, 2002, The Air (Prevention and Control of Pollution) Act, 1981, The Water (Prevention and Control Pollution) Act, 1974

#### Books and references

Bhatt, M S; Ashraf, S; and Illiyan, A (Eds.) (2008). *Problems and Prospects of Environment Policy: Indian Perspective*. Aakar Books: Delhi

Divan, S and Rosencranz, A (2001). *Environmental Law and Policy in India* (18<sup>th</sup> Ed.). Oxford University Press: New Delhi.

Dwivedi, O P (1997). *India's Environmental Policies, Programmes and Stewardship*. Palgrave Macmillan: London, UK.

Jaswal, P. S., and Jaswal, N. (2023). *Environmental Law* (2023 Ed.). Allahabad Law Agency.

Krishnamoorthy, B. (2017). *Environmental Management: Text and Cases* (3<sup>rd</sup> Ed.). PHI Learning: New Delhi.

Kulkarni, V and Ramachandra, T V (2006). *Environmental Management*. TERI Press: New Delhi.

**Course Title:**Corporate Image Building

**Course Code:** MBA-207

L	T	P	C.U.
35	5	0	3

**Programme& Semester:** MBA II

**Course Description:** The course objective is to make the students understand, appreciate and expose them to the concepts of Public Relations philosophies, essentiality and principles with an aim to managing, controlling and improving corporate image and related aspects for any organization. In addition to empower the students with basic knowledge and skill, to implement crisis and issue management techniques in any organization. These concepts will assist in better understanding of the Corporate World and its functioning

**Course Objectives:** The objective of the course is to help the students the importance of image building in an organization. The students will also identify the components which make an image of the corporate and to trace some of the processes involved in creating image. The objective is to evolve some strategies for projecting a positive and consistent image of an organization and its personnel.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO1: Achieve a clear understanding of corporate image.

CO2: Develop an understanding of the essence of creation of corporate image.

CO3: Understand the concept of public relations and the tools of public relations applicable in today's business scenario.

CO4: Develop the ways to build reputation with different entities using public relation tools and effective media handling.

CO5: Analyze the concept of corporate social responsibility and corporate image.

**Course Contents:**

**Unit – 1:** Corporate Image, Corporate Image Building: A Marketing exercise, an overview to marketing, ways to build corporate image and sustainable reputation, concept of corporate social responsibility and building corporate image through its relationship between identity image and reputation.

**Unit – 2:** Components of an Individual Image. Corporate Identity tools. Create corporate identity tools that include Name, Logo, Slogan, Colors, Type fonts, Mascots, and Jingles.

**Unit – 3:** Enhancing and Promoting corporate Image, Advertising and Corporate Image, Understanding Public Relations, role and scope of public relations, PR as a part of marketing communications, PR Agencies, modes of PR and media handling, PR events, crisis management in public relations.

**Unit – 4:** Protecting Corporate Image; The Grapevine and Rumors, Stereotype, Propaganda, Marriott Study, TARP Studies and Opinion Research Studies, In house journals, Ghost writing, Media writing, press releases, brochures & leaflets.

**Unit – 5:** Case Histories of Corporate Images in Private and Public Sectors

**Suggested Readings:**

1. Balmer, John M.T. "Building Societies: Change, Strategy and Corporate Identity." Journal of General Management . Winter 1991.
2. "The BBC's Corporate Identity: Myth, Paradox, and Reality." Journal of General Management . Spring 1994.
3. Ind, Nicholas. Corporate Image .Kogan Page, 1992

## MBA III

**Course Title: Strategic Management**

**Course Code: MBA-301**

L	T	P	C.U.
30	5	5	3

**Programme& Semester: MBA III**

**Course Description:** This course introduces the key concepts, tools, and principles of strategy formulation and competitive analysis. It is concerned with managerial decisions and actions that affect the performance and survival of business enterprises. The course takes a general management perspective, viewing the firm as a whole, and examining how policies in each functional area are integrated into an overall competitive strategy.

**Course Objectives:** The objective of this course is to develop a holistic perspective of an organization and to enable the students to analyse the strategic situation facing the organization, to access strategic options available to the organization and to implement the strategic choices made by it.

**Course Outcomes (COs):** At the end of this course students will be able to:

**CO1.** Formulate organizational vision, mission, goals, and values.

**CO2.** Develop strategies and action plans to achieve an organization's vision, mission, and goals.

**CO3.** Develop powers of managerial judgment, how to assess business risk, and improve ability to make sound decisions and achieve effective outcomes.

**CO4.** Evaluate and revise programs and procedures in order to achieve organizational goals

### Course Contents

**Unit 1 : Introduction to Strategic Management :** Concept of Strategic Management; Evolution of Strategic Management; Strategic management process; Business policy; Corporate strategy; Mission, vision, objectives; Basic model of strategic management; Strategic decision-making.

**Unit 2: Environmental Appraisal :** Factors considered, approaches, External environment analysis: PESTEL Analysis, EFE matrix (External Factor Evaluation); Porter's Five Forces Model methods and techniques used , Internal Appraisal – The internal environment, Organizational Capability Factors, organizational appraisal-factors affecting, approaches, methods & techniques Resource Based View (RBW) Analysis, VRIO Framework, Value Chain Analysis, IFE matrix (Internal Factor Evaluation).

**Unit-3 Strategy Formulation:** Corporate, Business, Functional strategy, Concentration Strategies, Integration Strategies: Horizontal & Vertical, Diversification: Related & Unrelated, Internationalization , Porters Model of competitive advantage of nations, Cooperative: Mergers & acquisition Strategies, Joint Venture, Strategic Alliance , Digitalization Strategies

**Unit 4 :Strategy Analysis & Implementation :** Process, Analyzing Strategic alternative, Evaluating and Choosing Among Strategic Alternative, Tools & Techniques of strategic Analysis, Strategic Choice. BCG Matrix, Ansoff Grid, GE Nine Cell Planning Grid, McKinsey's 7'S framework Implementation of Strategy Implementing Strategy through Short-Term Objectives, Functional Tactics, Reward System and Employee Empowerment, Leadership, and Culture

**Unit 5 : Strategy Evaluation & Control:** Nature, Importance, Organizational systems and Techniques of strategic evaluation & control.

### Text book:

1. AzharKazmi,(2015) Strategic Management, (4<sup>th</sup> edition, )Tata McGraw Hill

### Reference Readings:

1. John A Pearce II, Richard B Robinson. Jr., (2015) Strategic Management, 11th ed., Tata McGraw Hill
2. Lawrence R. Gaunch & William F. Glueck, Business Policy and Strategic Management, 2<sup>nd</sup> edition McGraw Hill,

**Course Title: International Business**

L	T	P	C.U.
35	5	0	3

**Course Code: MBA-302**

**Programme& Semester: MBA III**

**Course Description:** An understanding of international business is essential for students in today's interdependent global world. This course will provide students with the knowledge, skills, and abilities to understand the global economic, political, cultural and social environment within which firms operate. It will examine the strategies and structures of international business and assess the special roles of an international business's various functions.

**Course Objectives:** The course is designed to provide the student a basic knowledge of the concepts, importance, and dynamics of international business and India's involvement in global business operations. The students will be able to understand the theories of international trade and functions of various international organizations and regional economic co-operations. The course will also provide an understanding about foreign trade promotion measures and organizations in India.

**Course Outcomes:** At the end of the course, students will be able to:

- CO1: Define the nature, scope, and role of international business & globalization;
- CO2: Discuss the theoretical aspects of international business and the functions of international organizations;
- CO3: Explain the concept of economic integration and international economic environment;
- CO4: Interpret the Organizational structure for international business operations;
- CO5: Examine the business implications of international economic environment

## **Course Contents**

### **Unit 1**

- a) **Introduction:** Nature and scope of International business, concept of globalization and its importance; Impact of globalization; International business Vs domestic business, Modes of entry in International business
- b) **International business environment:** Economic, Socio-cultural and political-legal environment; Balance of Trade and Balance of Payment. Internationalization stages and orientation (EPRG framework); India's Foreign Trade Policy

### **Unit 2**

- a) **Theories of International Trade:** An overview- Theories of International trade- mercantilism, Absolute advantage, Comparative advantage, Heckscher- Ohlin, Product life cycle theory and Porter's diamond model, types of tariff and non tariff barriers.
- b) **International Organisations and Arrangements:** GATT, WTO- Its objectives, principles, organisational structure and functioning; overview of other organizations — UNCTAD, Bretton woods Conference, IMF and World Bank, Subsidiaries of World Bank.

### **Unit 3**

- a) **Regional Economic Co-operation:** Forms and stages of regional groupings and economic integration, SAARC, NAFTA, ASEAN, EU, OPEC
- b) **International Financial Environment:** International financial system and institutions; Components of International Financial environment, Foreign exchange markets and risk management; Foreign investments-types and flows; Foreign investment in Indian perspective.

### **Unit 4**

**a) Organisational structure for international business operations:** Key issues involved in making international production, finance, marketing and human resource decisions; International business negotiations.

**b) Developments and issues in International business:** Outsourcing and its potentials for India; Strategic alliances, mergers and acquisitions; Role of IT in International business; International business and ecological considerations.

## **Unit 5**

**a) Foreign Trade promotion measures and organizations in India:** Special economic zones (SEZs) and 100% export oriented units (EOUs); Measures for promoting foreign investments into and from India; Indian joint ventures and acquisitions abroad.

**b) Financing of foreign trade and payment terms:** sources of trade finance (Banks, factoring, forfaiting, Banker's Acceptance and Corporate Guarantee) and forms of payment (Cash in advance, Letter of Credit, Documentary Collection, Open Account)

### **Text Books:**

1. Cherunilam, F. (2009). *International Business: Text and Cases*, 6th ed., Prentice-Hall, India

### **Reference Readings:**

1. Ashwathappa, K. (2015). *International Business*, 6th ed., McGraw Hill Education
2. Charles W. L. Hill, John Michael Geringer, & G. Tomas M. Hult. (2017). *International Business*, 11<sup>th</sup> ed., McGraw-Hill Education
3. Varma, S. (2018). *International Business: Text and Cases*, 2<sup>nd</sup> ed., Pearson Education, India
4. Varma, S. (2019). *Fundamentals of International Business*, 1st ed., Pearson Education, India



**Course Title:** Supply Chain Management

L	T	P	C.U.
32	5	3	3

**Course Code:**MBA-303

**Programme& Semester:** MBA III

**Pre-requisite:** Production & Operations Management

### **Objective of the Course**

The objective of the course is to familiarize the students with the mechanism of supply chain planning, design, and operations in the firms. This will help to manage Facilities, inventory, transportation, and information the key drivers of supply chain management

**Course Outcomes:**At the end of the course, students will be able to:

CO1: To explain the concept of supply chain management and logistics management.

CO2: To describe performance measurement and control tools.

CO3: To interpret the E business framework related to supply chain management.

### **Course Contents:**

#### **Unit 1 : Introduction to Supply Chain Management (SCM)**

(a) Basic Concepts, Scope And Philosophy Of Supply Chain Management, (b) Importance Of Supply Chain Management, (c) Supply Chain Decision, (d) Evolution Of Supply Chain Management.

#### **Unit 2 : Designing the Supply Chain**

(a) Role Of Distribution In Supply Chain, (b) Factors Influencing Distribution Network, (c) Process Of Supply Network Design, (d) Distribution Strategy, (e) Models For Facilities Location And Capacity Allocation, (f) Impact Of Uncertainty )01n Supply Chain Design, (g) Evaluation Of Supply Chain Design, (h) Demand Chain Management, (i) Strategic Alliances.

#### **Unit 3 : Performance Measurement and Control**

(a) Concept, Dimensions Of Performance Measurement, (b)Tools For Performance Improvement: Benchmarking: Introduction, Forms Of Benchmarking, GAP Analysis, Benchmarking Study Report; (c)Achieving Strategic Integration, (d)Supply Chain Operations Reference (SCOR) Modeling, SCOR Analysis, (e)Value Chain, (f) Concept Of Configurability, (g)Evaluation Of Supply Chain Performance (Supply Chain Cost Analysis), (h)Impediments To Improved Performance.

#### **Unit 4 : Logistics Management**

(a) Concept of LOGistics, Inbound And Outbound Logistics, (b) Key Activities of Logistics, (c) Managing The Costs Of Logistics, (d)Application Of Logistics Management, (e)Trade-Offs In Logistics Management, (f)Bull-Whip Effect In Logistics, (g)Third And Fourth Party Logistics, (h)Emergence Of IT In Logistics, (i) International Issues In Logistics, (j)Warehousing, Types Of Warehouses, Site Selection, Layout And Design Of Warehouses.

#### **Unit 5 : Emerging Trends in Supply Chain Management**

(a) Role Of Information Technology (IT) In Supply Chain Management: Electronic Data Interchange (EDI), E-Customer Relationship Management, Use Of Data Mining Tools, E-Business Framework, (b) Customer Profitability Analysis (CPA), (c) International Issues In Supply Chain Management.

### **Suggested Readings:**

1. Chopra, Meindl; Supply Chain Management: Strategic Planning and Operation, 7th ed., Pearson Education, New Delhi, 2016
2. Altekhar, Supply Chain Management: Concepts and Cases, Prentice-Hall of India, New Delhi, 10<sup>th</sup> print, 2015
3. BS Sahay, Supply Chain Management, Macmillan, New Delhi, 2007
4. G. Raghuram , Logistics and Supply Chain Management, Macmillan, New Delhi, 2000
5. Balou, Supply Chain Management, Pearson Education, 5<sup>th</sup> edition, 2007

## SEMESTER IV

**Course Title:** Entrepreneurship Development

L	T	P	C.U.
32	5	3	3

**Course Code:**MBA-401

**Programme& Semester:** MBA IV

**Pre-requisite:** HRM

**Course Objectives:** The basic objective of course is to provide students with skills, knowledge, and networks needed to become entrepreneurs and innovators. This course also helps the students to involve participation in group work from diverse backgrounds. The course aims to acquaint the students with challenges of starting new ventures and enable them to investigate, understand and internalize the process of setting up a business.

**Course Outcomes:**

CO1: Explain the meaning and significance of entrepreneurship and understand the process of entrepreneurial action

CO2: To discuss the Theories of Entrepreneurship and analyze global impact of Entrepreneurship

CO3: To demonstrate & design the business plan.

CO4: To evaluate the financial schemes offered by various financial institutions, like Commercial Banks, IDBI, ICICI, SIDBI, SFCs.

CO5: To discuss and employ role of Central Government and State Government in promoting entrepreneurship with various incentives, subsidies, grants, etc.

### **Course Contents**

Unit 1 : Foundations of Entrepreneurship Development

Concept and need of entrepreneurship; Definition of entrepreneur, entrepreneurship, innovation, invention, creativity, business idea; Entrepreneurship as a career; Entrepreneurship as a style of management; The changing role of the entrepreneur; Entrepreneurial traits.

Unit 2 : Theories of Entrepreneurship

Influences on entrepreneurship development; External influences on entrepreneurship development; Socio-cultural, political, economical, personal entrepreneurial success and failure: reasons and remedies; Women entrepreneurs; Challenge to women entrepreneurs; achievements of women entrepreneurs.

Unit 3 : Business Planning Process

The business plan as an entrepreneurial tool; Elements of businessman; Objectives; Market analysis; Development of product/idea; Marketing, finance, organization and management; Ownership; Critical risk contingencies of the proposal; Scheduling and milestones

Unit 4 : Project Management

Technical, financial, marketing personnel, and management feasibility reports; Financial schemes offered by various financial institution, like Commercial Banks, IDBI, ICICI, SIDBI, SFCs.

## Unit 5 : Entrepreneurship Development and Government

Role of Central Government and State Government in promoting entrepreneurship with various incentives, subsidies, grants, etc

### Reference Readings:

1. Barringer, B.R & Ireland, R.D. (2013). Entrepreneurship Successfully Launching New Ventures. Pearson.
2. Drucker, P. F. (2006). Innovation and entrepreneurship: Practice and principles. Elsevier.
3. Fagerberg, J., Mowery, D. C., & Nelson, R. R. (Ed.). (2006). The oxford handbook of Innovation. Oxford University Press.
4. Hisrich, R., Manimala, M.J., Peters, M.P., & Shepherd, D.A. (2015). Entrepreneurship (9th ed). McGraw Hill.
5. Kaplan, J. M. (2012). Patterns of Entrepreneurship (4 ed.). John Wiley & Sons.
6. Khandwalla, P. (2003). Corporate creativity. New Delhi: Tata McGraw Hill
7. Kuratko, D.F., & Rao, T.V. (2014). Entrepreneurship: A South-Asian Perspective. Cengage
8. Learning Mullins, W. J. (2004). New business road test. Prentice Hall.

**Course Title:** Corporate Social Responsibility & Corporate Governance

L	T	P	C.U.
32	5	3	3

**Course Code:**MBA-402

**Programme& Semester:** MBA IV

**Pre-requisite:** Business Environment

**Course Objectives:** Course aims to develop student's general theoretical knowledge of corporate social responsibility in contemporary economies and to reflect upon and analysis CSR as an evolving management practice and to gain basic knowledge on Corporate Governance Principles and purpose of good corporate governance.

**Course Outcomes:** After the completion of the course students will be able:

CO1: To explain the concept of Corporate Social Responsibility and Corporate Governance.

CO2: To describe the stakeholders related to corporate sustainability.

CO3: To interpret the risk evaluation and risk management related to project.

**Course Contents:**

**Unit 1: Introduction to Corporate Social Responsibility**

Definition, Importance of Corporate Social Responsibility, Implications of CSR, Global Perspective, Trends and Generation of CSR, Social and ecological responsibility, Forces causing social and ecological responsibility, Accountability and Sustainability, Integrating Bottom Line Measures in CSR, Indian Approach to CSR.

**Unit 2: Corporate Sustainability**

Concept of corporate sustainability, Drivers for corporate sustainability, External drivers: Governments, community activists, consumers, customers, market expectations, other corporations, industry associations and non-government organizations. Internal drivers: Corporate leaders and change agents within the company.

**Unit 3: Corporate Governance**

Evolution of Corporate Governance, Scope and Role of Corporate Governance, Committees Recommendations on Corporate Governance, Effective Board of Directors and its role, Independent Directors and Audit Committee, Remuneration Committee, Nomination Committee; Corporate and Capital Structures

**Unit 4: Evaluation of effectiveness of Internal Control**

Management Accounting applications and Directors' Responsibility Statement; Going Concern status-financial and other indicators, role of management audit, evaluation of going concern uncertainties; Related party transactions and disclosures;

**Unit 5: Project management audit and corporate governance**

Relevance of Risk Evaluation and Risk management; Evaluation of key financial decisions and disclosures; Management Audit for investors' protection in the context of Corporate Governance, Corporate Governance Norms as prescribed by SEBI.

Text Books:

1. Baxi C. V. and Prasad A. (2006). Corporate Social Responsibility: Concept and Cases, Excel Books, New Delhi
2. Fernando, A.C. (2016). Business Ethics and Corporate Governance, 2nd ed., Pearson.

Reference Readings:

1. May S., George C. and Juliet R. (2007). The Debate over Corporate Social Responsibility, Oxford University Press.
2. Dunphy, D., Griffiths, A. and Benn, S. (2007). Organizational change for corporate sustainability, 2nd ed. London, U.K., New York, U.S.A.: Routledge.
3. Laura P. Hartman and Chatterjee A. (2014). Perspectives in Business Ethics, 3rd ed., Tata McGraw Hill.
4. John L. Colley et al. (2004). Corporate Governance, McGraw-Hill.
5. Bajpai G.N. (2016). The Essential Book of Corporate Governance, 1st ed., Sage Publications.

**Course Title:** E- Business

L	T	P	C.U.
30	5	5	3

**Course Code:**MBA-403

**Programme& Semester:** MBA IV

**Pre-requisite:** Nil

**Course Objectives:**

The primary objective of this course is to introduce concepts, tools and approaches to electronic business to the post-graduate students. Further the subject will help the students to develop skills to manage business in the digital world.

**Course Outcomes:** On successful completion of this module students should be able to:

CO1: Understand the E-Commerce and E- business infrastructure and trends

CO2: Analyze different types of portal technologies and deployment methodologies commonly used in the industry.

CO3: Analyze the effectiveness of network computing and cloud computing policies in a multi- location organization.

CO4: Analyze real business cases regarding their e-business strategies and transformation processes and choices.

CO5: Integrate theoretical frameworks with business strategies.

**Unit I**

**(8 Sessions)**

Introduction to E-Business: Overview of E-Business; Information Services; Interpersonal Communication; Shopping Services; Virtual Enterprises

E-Commerce: Origin and Need of E-Commerce; Factors affecting E-Commerce; Business dimension and technological dimension of E-Commerce; E-Commerce frame work; Internet as an E-Commerce enabler handling business transactions;

Handling payments: Electronic Fund Transfer System, Digital Token an notational based electronic payment system, smart card, credit card and emerging financial instruments

**Unit II**

**(8 Sessions)**

B2B E-Commerce: B2B E-Commerce models: supply oriented, buyer oriented, intermediary oriented; Just-in-time for B2B commerce

Mobile Commerce: Introduction to mobile commerce; Frame required for mobile computing; Challenges emerging in mobile commerce security considerations

**Unit III**

**(8 Sessions)**

E-Commerce and Banking: changing dynamics in banking industry; Home banking and its implementation; Management issues in on-line banking

E-Commerce and retailing: On-line retail industry dynamics; On-line mercantile models from customer perspective; Management challenges in on-line retailing

**Unit IV**

**(8 Sessions)**

E-Commerce and on-line publishing: On-line publishing approach from customer prospective; Supply chain management fundamentals; Intranets and Supply Chain Management; Managing retail supply chains, Supply chain Application Software

EDI: EDI application in business development; EDI technology; EDI as a re-engineering tool; Financial EDI

**Unit V**

**(8 Sessions)**

Indian Perspective: Benefits of E-Commerce; Drawbacks and limitations of E-Commerce; Major requirements in E-Business; Emerging trends and technologies in E-Business; From E-Commerce to E-Business, Web security: Introduction; Firewalls and transaction security.

**Suggested Readings**

1. Bhaskar- E-Commerce (Tata McGraw-Hill)
2. Krishnamurthy- E-Commerce Management: Text and Cases (Vikas)
3. Laudon and Traver- E-Commerce: Business, Technology, Society (Pearson Education)

4. Michel D et al- Business-to-Business Marketing (Palgrave, 2003)
5. Greenstein and Feinman- Internet securities
6. Kalakota and Whinston- Frontiers of electronic commerce (Pearson Education),
7. Kalakota R- Electronic Commerce: A manager's guide (Pearson Education) 2000

**MARKETING GROUP  
(Electives)  
Group A**

**Course Title:** Consumer Behaviour & Sales Management

L	T	P	C.U.
30	5	5	3

**Course Code:** MBA-3MK1

**Programme & Semester:** MBA III

**Pre-requisite:** Marketing Management

**Course Description:** Consumer behavior is all psychological, social and physical behaviors of potential consumers as they become aware of, evaluate purchase, consume and tell other about products and services. Sales management includes the task of planning, organizing and implementing the sales efforts to achieve the corporate goals. The syllabus of consumer behavior and sales management includes five units; unit one is introduction to consumer behavior, Unit 2 includes social and cultural influence of consumer behavior, Unit 3 includes consumer decision making process and models, Unit-4 includes introduction to sales management, Unit-5 includes sales forecasting, quotas and territory management.

The Andragogy in this subject includes power point presentations, case studies, assignments, class test, quiz, mini project etc.

**Course Objectives:** 1. The subject is aimed to develop students' conceptual and theoretical understanding of behavioral aspects of consumers and their strategic implications to marketers.

2. To enable the students to understand the processes, planning and strategies of sales management.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO 1: Identify the factors which influence consumer behaviour.

CO 2: Examine the major stages which consumers usually go through when making a consumption-related decision.

CO 3: Identify the major individual, social and cultural factors that affect consumer's decision making process.

CO 4: Appraise the process involved in personnel selling and its management.

CO 5: Explain the decisions involved in planning and organizing the sales efforts.

**Course Contents:**

**Unit 1 Introduction to Consumer Behavior:** Concept, Nature and Scope of Consumer Behaviour, Importance of consumer behaviour, Reasons for studying consumer behaviour, applying consumer behaviour knowledge, Factors influencing consumer behavior.

**Unit 2 Consumers in Social and Cultural Settings:** Reference Groups and Family Influences; Social class, Cultural; Sub cultural and Cross cultural Influences on Consumer Behaviour; Personal influences and Diffusion of Innovations.

**Unit-3 Consumer Decision Process & Models:** Problem Recognition; Search and Evaluating; Purchasing processes; Post-purchase Behaviour; Consumer Behaviour Models; Consumerism; Organisational Buying Behaviour, Questionnaire based Project on consumer behaviour.



**Unit 4 Introduction to Sales Management:** Definitions and Objectives of Sales Management, Sales Management Process, Role of Sales Manager, Concept of Personal Selling, Sales Management and Salesmanship, Theories and Process of Personal Selling, Types of sales organizations

**Unit 5 Sales Forecasting, Quotas and Territory Management:** Analysing market demand and sales potential, Techniques of sales forecasting, Preparation of sales budget, Designing sales territories and allocating sales effort, objectives and Quota for sales personnel, Emerging trends in sales management, Questionnaire based project on sales management.

**Text Book:**

1. Louden D.L. & Bitta A. J. (2017). *Consumer Behaviour: Concepts & Applications*, McGraw-Hill.
2. Spiro R.L., Stanton W.J. & Rich G.A. (2015). *Management of a Sales Force*, Tata McGraw-Hill.

**References:**

1. Schiffman L. & Joseph W. (2019). *Consumer Behaviour*, 12<sup>th</sup> ed., Pearson Education India.
2. Solomon (2015). *Consumer Behaviour*, 11<sup>th</sup> ed., Pearson India.
3. Wright R (2006). *Consumer Behaviour*, Cengage Learning.
4. Still R., Cundiff E.W. and Govoni N., Puri S. (2017). *Sales & Distribution Management*, Pearson.
5. Malik P. (2011). *Sales Management*, Oxford University Press.
6. Gupta SL (2009). *Sales and Distribution Management, Text & Cases An Indian Perspective*, Excel Books.

**Course Title:** Marketing of Non Profit Organisations

L	T	P	C.U.
30	5	5	3

**Course Code:**MBA-3MK2

**Programme& Semester:** MBA III

**Course Objective:** This course examines the marketing principles of mission-driven organizations, specifically nonprofits and government agencies. Marketing is one tool available to managers to improve organizational performance and encourage effective communication to stakeholders. However, public and nonprofit marketers face unique marketing challenges—from deficient resources for adequately addressing marketing needs to a general lack of understanding of the power of marketing. The course will address these and other challenges of nonprofit and public sector marketers, providing students with an introduction to marketing theory. It will also equip students with practical experience in developing a strategic marketing plan, influencing the attitudes and behaviors of diverse stakeholders, leveraging social media and other emerging technologies, and other skills relevant to nonprofit and public sector marketers.

**Course Outcome:** After completion of this course, students will be able to:

CO1. Understand the use of marketing concepts, theories and practices as applied to non-profit organizations.

CO2. Work with local nonprofit organizations to provide volunteer support and to conduct marketing plans that will aid the organizations in accomplishing their missions and obtaining their objectives.

CO3. Apply their knowledge of marketing by utilizing planning and implementation tools to improve organizational performance

**Course Contents:**

Unit1: Introduction and Overview of Non-Profit Organizations, Objectives of Non-Profit Organizations. Economic and legal framework of the nonprofit sector. Social entrepreneurship and basic concepts of social economy and third sector. Introduction to the concept of social entrepreneurship and its place in the third sector (NGOs) and social economy. Non-profits' role in the three-sector economy, Incentives and control in the nonprofit organizations. Competition for and management of the nonprofit workforce, Nonprofit organizations and market competition, Redistribution, welfare policy, and charitable organizations.

Unit 2: Factors of success for nonprofit organizations and social enterprises, The entrepreneurial team. Leadership, motivation and team management, Social Innovation, Communicative skills, Partnerships, networks and joint ventures, Examples of social enterprises of success and failure in India.

Unit 3: Social needs and business opportunities, The concept of social need. Social needs as the foundation of business opportunities, The analysis of needs and generating solutions, Social Impact. The measurement of social impact. Indicators to measure impact: quantitative and qualitative. Measuring Tools (SROI, IRIS).

Unit 4: Social Business Model: The social need as the basis for developing a sustainable business model and positive social impact. The ecosystem of nonprofits and social entrepreneurship in India and Europe. Main challenges of social entrepreneurship in India and Europe. Funding instruments and project selection criteria. Alternative financing instruments for social entrepreneurship projects, Public funding through grants, the role of banks, business angels and venture capital, and the negotiation process with investors, and the new social investment industry, such as crowdfunding, patronage and sponsorships.

**References:**

1. The Brand Idea: Managing Non-Profit Brands with Integrity, Democracy & Infinity by Nathalie Laidler- Kylander and Julia Shepard Stenzel, 2 nd Ed 2016
2. Breakthrough Non-Profit Branding: Seven Principles to Power Extraordinary Results by Jocelyne S. Daw and Carol Cone,4th Ed 2011.
3. RajendraNargundkar, Services Marketing: text & cases, Tata Mc-Graw-Hill Publishing Company, New Delhi, 2016.
4. Christopher H. Lovelock, services marketing: people, technology, strategy, Pearson Education Asia.
5. R. Srinivasan, services marketing, Prentice Hall of India Private Limited, New Delhi.
6. Zcithaml, Parasuraman& Berry, Delivering Quality Service, The Free Press, Macmillan. 2008
- 7.

**Course Title:** Integrated Marketing Communication

L	T	P	C.U.
32	5	3	3

**Course Code:**MBA-3MK3

**Programme& Semester:** MBA III

**Prerequisite:** Marketing Management

**Course Description:** Integrated marketing communication (IMC) is a cross-functional process for creating profitable relationships with customers and public by strategically controlling all messages sent to groups and encouraging dialogue. Students learn to integrate marketing communication elements (e.g., advertising, public relations, publicity, sales promotion, event marketing, direct marketing, e-communication, and selling) to advance an organization's success and brand equity. Case studies and exercises help students learn how to develop effective IMC plans.

**Course Objectives:** The objective of the course is to educate the students with essential concepts and techniques for the development and designing of an effective Integrated Marketing Communication programme. It provides the learning about various communication tools and its effectiveness, in such a way that fosters the creative ideas from the learners for development of effective marketing communication programme.

**Course Outcomes (COs):** At the end of this course students will be able to:

- CO 1: Understand a company and its marketing communications activities
- CO 2: Describe a range of media and methods available to marketers
- CO 3: Demonstrate a comprehensive understanding of Marketing Communications theories and Concepts
- CO 4: Design an advertising Campaign
- CO 5: Develop an awareness of the connection between marketing communications tools, and how each can be used effectively- individually or in an integrated mix
- CO 6: Explain emerging trends of integrated marketing communication

**Course Contents:**

**Unit-1: An Introduction to Integrated Marketing Communication (IMC):** Concept of Integrated Marketing Communication (IMC), Factors contributing to IMC, IMC Promotion Mix.

**Unit – 2: Advertising Organizations:** Advertising Management, STP Strategies for Advertising, Advertising Agencies, Type of agencies, Services offered by various agencies, Criteria for selecting the agencies and evaluation, Ethical and Social Issues in Advertising, Global Marketing and Advertising. DAGMAR approach for setting ad objectives, Advertising Budget, Factors influencing Advertising budget

**Unit-3: Developing the Integrated Marketing Communication Programme:** Media planning and selection decisions- steps involved and information needed for media planning. Measuring the effectiveness of all Promotional tools in IMC, Media Management, Campaign Planning: Message Creation, Copywriting. Role of Creativity in Copywriting.

**Unit-4:Elements of IMC:** Sales promotion, Publicity, Relationship between advertising and publicity, Corporate social Responsibility, Personal Selling, Direct marketing and direct response methods, Event Management, Digital Media, Evolution of Technology, Convergence of Digital Media and Advertising on Digital Media, Social Media, Mobile Advertising, E-PR, Introduction to digital India project.

**Unit – 5: Recent Trends in IMC:** Emerging Concepts and Issues in Marketing Communications, Role of E-Commerce in Marketing Communication.

**Text Book (s):**

1. Belch, George, Belch, Michael, Kerr, Gayle, & Powell, Irene (2014) Advertising: an integrated marketing communication perspective [3rd edition]. McGraw-Hill Education Australia, Australia

**References:**

1. Belch, Belch, (2014), *Advertising and Promotion: An Integrated Marketing Communication Perspective*, (10<sup>th</sup> ed.), McGraw-Hill
2. JaishriJethwaney&Shruti Jain, (2012). *Advertising Management*, (2<sup>nd</sup>ed.). Oxford University Press.
3. Kruti Shah & Alan D Souza, (2013). *Advertising & Promotions an Imc Perspective*, Tata McGraw Hill.
4. Batra, Myers & David A .Aker (2008). *Advertising Management*, (5<sup>th</sup>ed.). Pearson Education.

**Course Title:** International Marketing

L	T	P	C.U.
32	5	3	3

**Course Code:**MBA-4MK4

**Programme& Semester:** MBA IV

**Prerequisite:** Marketing Management

**Course Description:** This course will equip students with the tools and terminology to explore and understand marketing practices in a global environment. Putting yourself as an international marketing manager, you will learn the scope and challenge of international marketing, the dynamic environment of international trade, the culture, political, legal, and business systems of global markets, the global market opportunities and finally, the ways to develop global marketing strategies.

**Course Objectives:** The course is designed to help students to understand the concept, implications and procedures of International Marketing and be able to apply those in management of International Business. Students will also learn to develop a formal analytic framework of decision-making based on recent developments in the field of International Marketing through the group project and case studies. Also, to provide students with the latest understanding of global issues, disciplines, competitions and the necessary skills in making strategic decisions based on a global perspective.

**Course Outcome:** After completion of this course students will be able:

CO1: To provide understanding of product and pricing decisions appropriate for international market.

CO2: To gain experience in developing international marketing strategies.

CO3: To understand how companies adjust their international strategies based on the global environmental changes (e.g., globalization)

CO4: To build skills and respect toward the understanding of cultures of nations by critically analyzing the social, political, legal, and economic forces that affect the business performance of international marketing

**Course Contents:**

Unit I a) Introduction to International Marketing: Meaning, nature, and scope of international marketing; International marketing distinguished from domestic marketing, Exporting, International trade and International business; International marketing management process- an overview.

b) International Marketing Environment: Geographic, demographic, economic, political, legal, socio cultural environments- their nature and effects on international marketing operations, Tariff and non-tariff barriers; WTO, UNCTAD, Generalized system of preferences (GSP), Regional economic groupings- European Union (EU), NAFTA, ASEAN, etc., Facilities and incentives schemes for exporters.

Unit 2 a) International Product/ market Selection and Entry Modes: Selecting products, Selecting Market, Various modes of entry into international markets and their evaluation, Export licensing/ franchising, contracting, Joint Venture, setting up wholly owned subsidiary.

b) International Product Planning: Product in international context, standardization vs. adoption decision, other considerations; Packaging, Branding, after Sales Services, ISO 9001: 2000 quality system standard.

Unit 3 a) International Pricing: Factors influencing price, pricing methods, Decisions and Pricing process, Price quotations and related considerations.

b) International Distribution: Types and Functions of Foreign Distribution Channels, Selection of middlemen, Distribution logistics- transportation and warehousing decisions

#### Unit 4: International Promotion

International advertising- Standardization vs. Adaptation, Selection of Media, Selection of Agency, Measuring Advertising Effectiveness.

#### Unit 5: Import and Export Procedures

(a) ICDs, Dry Port, Wet Port (b) Domestic Procedures (c) International Procedures (d) Procedures Specific of other country.

#### **Suggested Readings:**

1. Vern Terpestra, International Marketing, Southwest publication, 2005
2. Varshney RL and B, Bhattacharya, International Marketing- Indian Perspective, Sultan chard Publication 2006
3. Fayerweather, J, International Marketing Management, Sage Publication, 2006
4. Cateroa, R, Phylip, International Marketing, Tata McGraw Hill, 2006
5. Jain Subash, International Marketing Management, Southwest Publication, 2005

**Course Title:** Rural Marketing

L	T	P	C.U.
32	5	5	3

**Course Code:**MBA-4MK5

**Programme& Semester:** MBA IV

**Prerequisite:** Marketing Management

**Course Objectives:** To enable students to understand the conceptual framework of rural marketing and strategies related to rural marketing mix.

**Course Outcomes:** After the completion of the course students will be able:

CO1: To identify the opportunities and constraints of Rural Marketing.

CO2: To demonstrate product, pricing, distribution and promotional strategies related to rural marketing.

CO3: To identify the factors which influence rural consumer behavior.

CO4: To evaluate the STP Strategy for rural market product.

### **Contents of Course**

**Unit 1: Introduction to Rural Marketing:** Concept; Importance; Nature of Market; Peculiarities, Opportunities and Constraints of Rural Marketing, (Infrastructure, Culture, Needs, Myths, Preferences and Practices: and Their Effects on Marketing) Environment Scanning of Rural Marketing; Demographic; Economic; Socio-Cultural; Government Policy; Communications.

**Unit 2: Strategy for Rural Marketing:** Product; Pricing; Advertisement; Sales Distribution; Financial Investment and Recovery Rural Consumer Behaviour: Rural Consumer Behaviour, Influencing Factors and their effect on marketing; Management of influence factors of consumer behaviour; Techniques and processes of management of consumer behaviour in rural marketing.

**Unit 3: Segmentation of Rural Markets:** Rural Market Segmentation; Targeting of Rural Market Product; Positioning of Rural Market, Product Planning and Pricing for Rural. Markets: Product Planning for Rural Products; Branding and Packaging of Rural Products; Pricing Methods and Strategies for Rural Products

### **Unit 4: Marketing Communication in Rural Markets**

(a) Role of Advertising and Sales Promotion in Rural markets (b) Challenges in Media Planning (b) Evaluation and Selection of Media Mix for Promotion (d) Sales Force Management in Rural Markets.

### **Unit 5: Distribution in Rural Markets:**

(a) Types of Rural Channels (b) Special Characteristics of Rural Channels (c) Selection and Management of Channels (d) Factors Influencing Channel Decisions (e) Managing Physical Distribution in Rural Markets - Storage, Warehousing and Transportation.

### **Text Books:**

1. Gupta S.L. (2009). *Rural Marketing Text and Cases*, Wisdom Publications.
2. Gopalswamy (2009). *Rural Marketing Environment, Problems and Strategies*, 3<sup>rd</sup> ed., Vikas Publishing House.

### **Reference Readings:**

1. Dogra B., Ghuman K. (2010). *Rural Marketing Concepts and Practices*, 4<sup>th</sup> ed., TMH, New Delhi.
2. Krishnamacharyulu CSG and Ramakrishnan L. (2010). *Rural Marketing Text and Cases*, 2<sup>nd</sup> ed., Pearson.
3. Kumar D. and Gupta P. (2015). *Rural Marketing Challenges and Opportunities*, Sage Publishing.

**FINANCE GROUP  
(Electives)  
Syllabus**

**Course Title:** Security Analysis and Portfolio Management

L	T	P	C.U.
33	5	2	3

**Course Code:**MBA-3FM1

**Programme& Semester:** MBA III

**Course Description:** This course is designed to familiarise the students with the Investments and capital market. Students will be acquainted with the fundamental and technical analysis of the diverse investment avenues .This course will not only help the student in measuring the risk of a stock but also help them in constructing and evaluating their portfolio.

**Course Objective:**

This course will emphasize an understanding of the economic forces that influence the pricing of financial assets and to provide a theoretical and practical background in the field of investments. This course will expose the students to the concepts, tools and techniques applicable in the field of security analysis and portfolio management.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO1: Analyse the environment of investment and risk return framework.

CO2: Understand the value of assets and manage investment portfolio.

CO3: Design, analyze, choose and evaluate portfolios along with a deep understanding of Capital market.

CO4: Understand and create various investment strategies on the basis of various market conditions.

CO5: Measure riskiness of a stock or a portfolio position.

**Course Contents**

Unit 1 : Introduction of Investment

(a) Meaning and Objective of/Investment (b) Investment Decision Process (c) Categories of Investment (d) Phases of Security Analysis

Unit 2 : Introduction of Capital Market

(a) Meaning and Nature of Capital Market (Primary Market and Secondary Market) (b) Functions and limitations of Capital Market (c) Trading of securities (d) SEBI guidelines

Unit 3 : Introduction to fundamental Analysis

(a) Technical Analysis and Efficient Market Hypothesis (b) Dividend Capitalization Model (c) Price-Earning Multiplier Approach

Unit 4 : Portfolio Analysis

(a) Portfolio Analysis and Selection (b) Risk and Return Analysis(c) Beta (d) Markowitz Model.(e) Capital Asset Pricing Model. (f) Arbitrage Pricing Theory

Unit 5 : Portfolio Revision and Evaluation



(a) Portfolio Revision and Portfolio Evaluation (b) Constant Rupee Value Plan (c) Constant Ratio Plan (d) Sharpe and Treynor Measures (e) Mutual Fund Industry

**References:**

1. Fischer, Donald, E. and Ronald J. Jordan (2018). Security Analysis and Portfolio Management. 7<sup>th</sup>ed. Prentice Hall India. New Delhi.
2. Chandra, Prasanna. (2017) Investment Analysis and Portfolio Management,.5<sup>th</sup> ed. Tata McGraw Hill, New Delhi.
3. Sharpe, William, F. Alexander, and Bailey, Investment, Prentice Hall Of India, 5th Edition.
4. Kevin, S. (2015)Security Analysis and Portfolio Management 2<sup>nd</sup> ed. Prentice Hall India.New Delhi.
- 5.Pandian, Punithavathy(2012). Security Analysis and Portfolio Management 2<sup>nd</sup>ed.Vikas Publishing House, New Delhi
- 6.Reilly,F., Brown, K. and Leads, S. (2018).Analysis of Investments and Management of Portfolios,11<sup>th</sup> ed. Cengage Learning, New Delhi
- 7.Bhalla, V.K. Investment Management: Security Analysis and Portfolio Management, Sultan Chand, 2010, 7th Edition, New Delhi.

**Course Title:** Financial Markets and Services

L	T	P	C.U.
35	5	0	3

**Course Code:** MBA-3FM2

**Programme & Semester:** MBA III

**Course Description:**

The course will provide an understanding of the functions, and operations of the financial markets and services operating in India. It explains the role of financial system in economic development. Various conceptual issues related to the role of regulatory bodies and the functions performed by various financial services in India are discussed elaborately.

**Course Objectives:** The course is designed to provide the student a basic knowledge of the financial markets and to familiarize them with major financial services in India. The students will be able to understand the role of financial system on economic development. The course will provide understanding about the conceptual issues related to the role of regulatory bodies in Indian securities market and the functions performed by financial services in India.

**Course Outcomes (COs):** At the end of this course students will be able to:

1. To define the roles, structure, functioning and operations of Indian financial market;
2. To explain the working of money market and capital market;
3. To discuss the management of primary market and secondary market;
4. To examine various financial services with their functions;
5. To describe the legal and regulatory aspects and implications of Indian banking

**Course Contents:**

Unit 1: Financial System: Nature and Role of Financial System; Structure/ organisation of financial system; Functions of financial sector; Indian Financial System- An overview; Globalisation of Financial Markets, Money market: functions, organisation and instruments, Role of central bank in money market; RBI- regulatory body of money market

Unit 2: Capital Markets: functions, organisation and instruments, Role of stock exchanges in Indian securities market, SEBI- regulatory body of capital market, Primary markets: New Issue Market, DIP Guidelines, Eligibility conditions, Red herring prospectus, Green Shoe Option, IPO grading, book building, French option, Dutch option, minimum subscription, pricing (band, floor), Settlement & Allotment, Escrow account, listing, Secondary Market: Stock market, trade operations & settlement.

Unit 3: Leasing & Hire Purchase: benefits of lease to lessor & lessee, difference between lease and hire purchase, Factoring & forfeiting: Concept, distinction between factoring and forfeiting, benefits of factoring, Venture capital: Meaning, venture capital process, difference between venture capital finance and conventional sources of finance.

Unit 4: Credit rating: process, evaluation of a company, CRISIL Rating symbols, Mutual Funds: Introduction, NAV of a Fund, Classification of Mutual Fund Schemes (Open end & closed end, income & growth schemes, Securitization: Concept, features, process, MBS, ABS, risk associated with securitization

Unit 5: Merchant Banking: Introduction, evolution of merchant banking, types of merchant bankers, activities undertaken by different types of merchant bankers, Depositories: Meaning, Types, trading settlement procedure, CDSL, NDSL, Insurance: types of insurance (life, non life), types of insurance policies.

**Text Book:**

1. Bhole, L.M. and Mahakud, J., (2018). Financial Institutions and Markets: Structure, Growth and Innovation, 6th ed., Tata McGraw Hills, New Delhi

**References:**

1. Das, S. C. (2015). The Financial System in India: Markets, Instruments, Institutions, Services and Regulation, 1st ed., PHI Learning Pvt. Ltd., New Delhi
2. Khan, M. Y. (2017). Indian Financial System, 9th ed., Tata McGraw Hills, New Delhi
3. Machiraju, H.R. (2018). Indian Financial System, 5th ed., Pearson Education, India
4. Mishkin, S. Frederic and Eakins, G. Stanley, (2017). Financial Markets and Institutions, 8th ed., Pearson India
5. Saunders, A. and Cornett, M.M. (2018). Financial Institutions Management, 6th ed., Tata McGraw-Hill, New Delhi
6. Suresh, P. and Paul, J. (2017). Management of Banking and Financial Services, 3rd ed. Pearson Education

**Course Title: Corporate Tax Planning****Course Code: MBA-3FM3**

L	T	P	C.U.
30	5	5	3

**Programme& Semester: MBA III****Pre-requisite:** Accounting for Managers, Financial Management

**Course Description:** Corporate Tax Planning can be used in short-term and long-term financial and operational decision making, affecting tax liability and financial health of a company. Corporate Tax Planning helps managers make operational decisions—intended to help decrease the company's tax liability. The syllabus of Corporate Tax Planning spread over five units; unit 1 covers the of Basic Concepts of Tax planning, Tax management, Tax evasion, Tax avoidance, Money laundering and an overview of taxation in India: Direct and Indirect taxes. Unit 2 covers corporate tax in India - Types of companies; Residential status of companies and tax incidence. Unit 3 covers Tax planning with reference to setting up of a new business and with reference to financial management decision etc. Unit-4 Covers Special provisions relating to non-residents and Unit-5 covers Tax planning with reference to business restructuring.

The Andragogy in this subject includes power point presentations, case studies, assignments, class test, quiz, mini project etc.

**Course Objectives:**

1. To provide basic knowledge of India's tax laws.
2. To understand the basic concepts of Tax management, Tax evasion and Tax avoidance.
3. To provide Understanding of Corporate tax in India
4. To develop skills of Corporate Tax Planning and impact of various business decisions.
5. To provide knowledge of Tax planning with reference to business restructuring.

**Course Outcome: On completion of the course student will be able to:**

CO1: Understand the basic concepts of Tax management, Tax evasion and Tax avoidance.

CO2: Understand various key decision areas for corporate tax planning.

CO3: Use various concepts of corporate tax planning.

CO4: Analyze Special provisions relating to non-residents.

CO5: Analyze corporate tax planning with reference to business restructuring.

**Course Contents****Unit 1: Basic Concepts**

Tax planning; Tax management; Tax evasion; Tax avoidance; Money laundering; An overview of taxation in India: Direct and Indirect taxes; Customs Act; Central Excise Act; Service tax; Sales tax; VAT and Goods and Service Tax (GST); Income tax; Wealth tax; Gift tax; and Central gain tax

**Unit 2 : Corporate tax in India**

Types of companies; Residential status of companies and tax incidence; Tax liability; Taxation of Not-for-Profit organisations; Tax on distributed profits.

**Unit 3 : Tax Planning**

Tax planning with reference to setting up of a new business: Location aspect, nature of business, form of organization; Tax planning with reference to financial management decision-capital structure, dividend including deemed dividend and bonus shares; Tax planning with reference to specific management decisions,- Make or buy, own or lease, repair or replace; Tax planning with reference to employ6es' remuneration; Tax planning with reference to sale of scientific research assets; Tax planning with reference to receipt of insurance compensation; Tax planning with reference to distribution of assets at the time of liquidation

#### **Unit 4 : Special provisions relating to non-residents**

Double taxation relief; Provisions regulating transfer pricing; Advance ruling Direct Tax Code 2009 and tax planning

#### **Unit 5 : Tax planning with reference to business restructuring**

Merger, Amalgamation, Acquisition, Demerger, Slump sale, Conversion of sole proprietary concern/partnership firm into company, Transfer of assets between holding and subsidiary companies

#### **Text Book:**

1. Ahuja, Girish, and Ravi Gupta, Corporate Tax Planning and Management, Bharat Law House, Delhi

#### **References:**

1. Singhanian, Vinod K., KapilSinghanian, and Monica Singhanian, Direct Taxes Planning and Management, Taxmann Publications Pvt. Ltd., New Delhi
2. Pagare, Dinkar, Direct Tax Planning and Management, Sultan Chand and Sons, New Delhi
3. SP Goyal, Direct Tax Planning, SahityaBhawan, Agra
4. Bare Acts of relevant enactments

Course Title: International Financial Management

Course Code: MBA-4FM4

L	T	P	C.U.
32	5	3	3

Programme& Semester: MBA IV

Pre-requisite: Financial Management

**Course Objectives:** The course is designed to enable the students to understand the working of International Financial Institutions, balance of payment and exchange transactions. They will be able to understand the operation model for Multinational Companies (MNCs) as well as the business environments of the host countries, including the international financial markets and the political and economic environment. The course will be providing the concept of International Financial Management, including International Financial Markets, The determination of the Exchange Rate, International Arbitrage and Interest Parity, The Relation between Inflation, Interest Rates and Exchange Rates, Forecasting the Exchange Rates, How to Measure the Fluctuation of the Exchange Rates, Managing the Transaction Exposure, Economic Exposure and Translation Exposure, etc.

**Course Outcomes:** At the end of the course, students will be able to:

CO1: Understand international capital and foreign exchange market

CO2: Understand the concept of balance of payments and how it helps to forecast exchange rates.

CO3: Identify and appraise investment opportunities in the international environment

CO4: Examine the risk relating to exchange rate fluctuations and develop strategies to deal with them

CO5: Analyze the operations of international financial markets including past and present exchange rate systems.

CO6: Explain the exposures of MNCs and non-MNCs in terms of operating, transaction and translation.

### Course Contents

#### Unit 1 : Introduction

Nature of international financial functions; Growth of international financial functions in recent decades; International flow of funds; Balance of payments — structure; Adjustments in the balance of payments.

#### Unit 2 : IMF

A brief idea of pre-IMF system of exchange rate; IMF and fixed, parity system; The present exchange rate scenario - fixed, floating, target-zone arrangement, dollarisation, currency board arrangement, crawling peg; IMF and international liquidity; Exchange rate mechanism: quotation of exchange rate; bid and ask spread, cross rate, spot and forward rates; Forward rate differential; Determination of exchange rate in spot market and the factors influencing spot exchange rate; Interest Rate Parity theory and the determination of forward market rates; Covered interest arbitrage.

#### Unit 3 : Features of foreign exchange market

Arbitrage, hedging, and speculation in foreign exchange market; Market for currency derivatives; Currency futures, hedging, and speculation in market for currency futures; Currency options — types of option market, types of options contract, gains, and losses to options buyers and sellers, hedging in option market, speculation in options market spreads, straddles, and strangles; Exchange rate risk: translation, transaction, and real operating exposure; Assessment of the size of exposure; Management of exposure.

#### Unit 4 : International capital budgeting

A brief idea of project evaluation criteria; Computation of cash flow from the view point of parent unit and the subsidiary; Adjusted present value technique; Real options and International capital budgeting; Financial evaluation of international M & As; International portfolio investment: expected return and risk, capital assets pricing model; Benefit and problems of international investment; Optimal international portfolio of assets.

#### Unit 5 : International working capital management

Management of cash in different units — assessment and optimization of cash need, investment of surplus cash; Credit policy — inter-firm and intra-firm sales; Stockpiling and international inventory management; International financial market: A brief review of changing scenario in international financial market; Euro-currency market —

financial intermediation and credit creation; international securities market — international bonds, medium term euro notes, euro notes, and euro commercial papers; Financial swaps; Concept of interest rate risk; Management of interest rate risk.

**Suggested Readings:**

1. Apte, P.G. (2014). International Financial Management, 7 th ed., Tata McGraw-Hill, New Delhi
2. Madhura, J. (2012). International Financial Management, 11 th ed., South Western, Cengage Learning
3. Levich, R.M. (2004). International Financial Markets, McGraw-Hill-Irwin
4. MadhuVij, M. (2010). International Financial Management, 3 rd ed., Excel Books

Course Title: Project Planning and Evaluation

Course Code: MBA-4FM5

Programme& Semester: MBA IV

L	T	P	C.U.
32	5	3	3

**Course Objectives:** To enable students to understand not only the theoretical aspects of project management but also its applicability in its totality and to develop skill among them to formulate and shape the corporate investment strategies. Course

**Course Outcome:** After studying this course the student will be able:

CO1: To explain the concept of Project Planning

CO2: To understand the planning and execution phases of a project.

CO3: To describe the network techniques of project management

CO4: To compare and evaluate the techniques of capital budgeting.

CO5: To understand the issues of public enterprise

### Course Contents

#### Unit 1 : Project Planning and Analysis

Introduction to concept of project management; An overview of project appraisal and capital budgeting; Resource allocation framework; Generation and screening of project ideas: Market and demand analysis, technical analysis, financial analysis.

#### Unit 2 : Project Selection and Implementation

Project cash flows; Cost of capital; Appraisal criteria; Special decision situation; Risk analysis; Social cost benefit analysis; Qualitative factors; Strategic aspects and organisational considerations; Implementations of projects; network techniques for project management; Evaluation of infrastructure projects; Public-private partnership; Types of infrastructure financing; BOT, BOOT, Annuity basis; Escrowing of/Cash profits

#### Unit 3 : Project Monitoring, Reporting Techniques and/Evaluation

Management techniques for project Management, Project monitoring; Management reporting; Management Information System (MIS); Project management self-assessment guide.

#### Unit 4 : Project Review and Administrative Aspects

Initial review; Performance evaluation; Abandonment analysis; Behavioral issues; Administrative aspects of capital budgeting; Evaluating capital budgeting system.

#### Unit 5 : Management of Public Enterprises

Organisational issues of public enterprise; Operational issues of public enterprises

### Suggested Readings:

1 Chandra, Prasanna, Projects, Planning, Planning Analysis, Selection, Implementation and Review, Tata McGraw-Hill, 4th ed., 2008

2. Goel, BB, Project Management: Principles and Techniques, Deep and Deep Publications



## HUMAN RESOURCE GROUP

(Electives)

**Course Title:** Knowledge Management

L	T	P	C.U.
32	5	3	3

**Course Code:**MBA-3HR1

**Programme& Semester:** MBA III

**Course Description:** The objective of the course is to prepare HR managers to participate in the organizational knowledge management efforts and facilitate management of knowledge. The course using case studies of many organizations shows the various aspects of KM and how the three aspects, Strategy, technology and HRM need to be aligned together to manage knowledge management.

**Course Objective:** 1. To familiarise the concepts of Knowledge Management.

2. To understand the challenges of Knowledge Based Organisations and the HR mechanisms to manage them effectively.
3. To identify the importance of the values of autonomy and accountability in Knowledge based organisations.

Course Outcomes: After studying this course the student will be able:

CO1: To explain the concept of knowledge management.

CO2: To understand the planning regarding organization structure

CO3: To describe the strategies related to knowledge management.

### Course Contents:

**Unit 1: Introduction to Knowledge Management :** Introduction to Knowledge management, the significance of KM, history and the close relationship of KM with other concepts; the three major inputs viz. strategy, people and IT for a successful KM system, the difference between data, information and knowledge, various types of knowledge viz. tacit and explicit, consequences of knowledge types on managing knowledge. Challenges for knowledge based organizations.

**Unit 2 Knowledge Management and Organization Design:** People vs. emphasis on technology in managing knowledge and its impact on organization design, impact of organization structure can affect knowledge management, how culture affects knowledge, Impact of culture on employees, Managing knowledge for organization effectiveness

**Unit 3 Knowledge Management, Strategy and HRM:** Understanding the need to align individual needs with organization, how HRM can design reward systems to facilitate KM, Using “organizational routines” for managing knowledge, Pitfalls of a global Knowledge Management and problems of cross border issues in knowledge management.

**Unit 4 Managing Knowledge for organizational Effectiveness:** Process and Methods- Concept of Intellectual Capital and Learning Orientation in the Organizations - Knowledge and Role related issues - Performance Appraisal in a KBO - Intellectual Property Rights (IPR).

**Unit 5 Knowledge Management: The Indian Experience:**

- Discussion of the case of Infosys, Tata Steel and other organizations that are experimenting with Knowledge Management
- The problems Indian organization face with respect to Knowledge Management

**References:**

8. Frances Horibe, MANAGING KNOWLEDGE WORKERS, John Wiley & Sons
9. Fernandez & Leidner, KNOWLEDGE MANAGEMENT, PHI Learning, New Delhi, 2008
10. Ganesh Natarajan and Sandhya Shekhar, KNOWLEDGE MANAGEMENT - ENABLING BUSINESS GROWTH, Tata McGrawHill, New Delhi
11. Mruthyunjaya, KNOWLEDGE MANAGEMENT, PHI Learning, New Delhi,

**Course Title:** Organizational Change and Development

L	T	P	C.U.
33	5	2	3

**Course Code:**MBA-3HR2

**Programme& Semester:** MBA III

**Course Description:** In the fast-changing world of business the organizations have to be ready for the changes and should facilitate in adopting these changes. This course aims to give a broad theoretical and practical understanding of key concepts and issues in managing organizational changes.

**Course Objectives:** The course is designed to give a broad theoretical and practical understanding of key concepts and issues in managing organizational changes and development.

**Course Outcomes (COs):** At the end of this course students will be able:

CO1: To define the models and approaches of Organizational change and development.

CO2: To discuss the assumptions and relevance of organizational development and effectiveness

CO3: To explain the roles and functions of designing organization structure.

CO4: To interpret the intervening strategies of Organizational change and development.

### **Course Contents**

**Unit 1: Organizational Change:** Meaning, definition and nature of Organizational Change, Types of organizational change, Strategies for change, stimulating factors for organizational change, Theories of Planned Change (Kurt Lewin's Three Step change model), Managing Workforce Diversity, Employee Wellness. Organizational Life Cycle, Types and Forms of Organizational Change, Roles and Responsibilities in the Change Process.

**Unit 2: Organisational Development:** Concept and meaning, Characteristics of OD, Organization Development Vs Management Development, Need and significance of OD, History of OD, Relevance of Organizational Development for Managers, Assumptions of OD, Limitations of Organization Development, Steps in Organization Development, Change Agent, OD intervention Techniques, Sensitivity Training, Role Playing.

**Unit 3: Organizations as Strategic Design:** Meaning and concept of organization, Organizational Design, Determinants and Implications of organization design, Challenges of organizational design, organizational roles, functions and divisions, Types of organizational structure, designing organizational structure, functional, divisional (geographic and market), matrix structure. Resistance to Change, OD techniques to deal with resistance to change. Technology and Change: TQM, Business Process Reengineering.

**Unit 4: Organizational Development HRD Managers viewpoint:** Organizational Strategy and Structure, Technology, Size, Age and Structure. Organizations through Cultural Lens: Implications of Corporate Culture, Culture and Mergers and Acquisitions, Managing Cultural Diversity. Organizations through Political lens: Power and Politics in Organizations, Structural Conflict in Organizations. Organization and ethics, technology and organizational effectiveness. Departmentation, Authority, Power, Responsibility and Accountability. Linkage of Organizational Elements (Structure, Culture and Capabilities) to Organizational Effectiveness.

**Unit 5: Future of OD:** Organizational Development and Globalization, Emerging Trends in OD: OD in, health care organizations, family owned organizations, educational institutions, public sector organizations. Executing change: challenges of execution, execution framework, developing cross functional linkages, aligning policies, and removing structural impediments, developing new routines for innovation and improvement, considering human element.

**Text Book:**

1. French, W.L. & Bell, C. H. (2017). *Organization Development Behavioral Science Interventions for Organizational Improvement*, 6<sup>th</sup> ed., Pearson Education, India

**References:**

1. Jones, G.R. & Mathew, M. (2018). *Organizational Theory Design and Change*, 1<sup>st</sup> ed., Pearson Education, India
2. Warner, W. B. (2017). *Organization Change: Theory and Practice*, 5<sup>th</sup> ed., SAGE Publications
3. Harigopal, K. (2016). *Management of Organizational Change: Leveraging Transformation*, 3<sup>rd</sup> ed., SAGE Publications

**Course Title:** Performance Management & Competency Mapping

L	T	P	C.U.
33	5	2	3

**Course Code:**MBA-3HR3

**Programme& Semester:** MBA III

**Course Description:**Performance Management and Competency Mapping (PMCM) is a Human Resource Management course that has been developed to choose the right candidate for a particular job and also to see that the candidate performs well in his assigned job role. This course envisions the totality of an organization's function, along with its teams and individuals, by 'organising and managing performance within an agreed framework of planned goals, standards and competency requirements'. It will equip students with the necessary skills and critical understanding of the performance review process that combines challenge and support & places a focus on personal, team & organizational learning & accountability.

**Course Objectives:**The students, through this course would develop a knowledge for measuring the performance and expectations from employees over a period of time, gain an idea of how the annual review and appraisal process takes place, to generate the kind of work environment to attract and retain talented workforce in the company. Competency Mapping segment encapsulates the key competencies of an individual or an organization and shows how to incorporate those competencies through various processes, so that the organizations gain a competitive edge over others with its workforce ability. The students would also gain the ability to identify and map various competencies required in a particular work environment, use the different techniques and tools used to design a Competency Model, use assorted Assessment Center tools and 360 Degrees' Feedback to identify the highly competent workforce for an organization.

**Course Outcomes (COs):** At the end of this course students will be able to:

**CO1:** Explain the performance management & Performance appraisal

**CO2:** Compare and contrast various organizational performance management programs and best Practices and define attributes of effective performance management

**CO3:** Design an organizations performance management process that is compliant with law and Supports organizational mission and strategy.

**CO4:** Evaluate a performance appraisal system

**CO5:** Construct competency model

**CO6:** Conduct competency mapping exercise

**CO7:** Develop Assessment centre for competency identification

**Course Contents:**

**Unit I: Concept, Principles and Contribution of Performance Management-** Historical perspective of PMS- processes of PMS Contributions of Performance Management– Background to Performance Management- Components of Manage Performance & Development Plan, setting objectives in manage Performance & Development –Annual Stock taking- Performance Feedback

**Unit II: Process of Performance Management–** Goal oriented Performance Management Cycle– Role Definition– Key to Successful Performance Management–Dimensions of PM–Performance planning & Goal setting- performance Review— Benchmarking process.

**Unit III: Performance Appraisal Model**–Meaning, Features and Objectives of Performance Appraisal– Factors affecting Performance Appraisal–Individual KRAs & KPIs- Benefits of Performance Appraisal– Problems with Performance Appraisal– Essentials of a Good Appraisal System–Performance Criteria Evaluation of a Performance Appraisal System.

**Unit IV: Appraisal Methods on the basis of approaches** – Ranking–Forced Distribution–Paired Comparison– Check List– Critical Incident–Graphic Rating Scale– BARS–MBO–Human Resource Accounting. - 360 degree Feedback– Definition & Uses of 360 degree feedback– Rationale for 360 degree feedback—Scope of application in various industries – Advantage and disadvantage of 360 degree feedback- Concept of Potential Appraisal – Requirements for an Effective Potential Appraisal system-Performance Appraisal and Potential Appraisal-Web based Performance Appraisal System-Facilitating Factors of the Performance Appraisal-Rating errors by raters- Organizational Performance Appraisal Problems-Ways to improve the accuracy of Performance ratings

**Unit V: Introduction to Competency Mapping:** Concept of Competency and Competence-History of Competency- Constituents of competence-Types of Competencies-Competency Model Pyramid-Correlation between Competency Model & HRM- Benefits of using competency Mapping Model in the organization-Issues related to Developing Competency Models-Process for writing Competencies-Assessment Centre Tools-Competency based Interviewing-Competency Modelling

**Text Books:**

1. Agunis, H. (2008), Performance Management, (2ndEdition). Pearson Education, New Delhi
2. Kohli, A.S. & Deb, T. (2009). Performance Management. Oxford University Press, New Delhi

**References:**

1. Bagchi., S.N. (2010). Performance Management, Cengage Learning, New Delhi.
2. Smither, J.W. (2009). Performance Management: Putting Research into Practice. Wiley
3. Rao, T.V. (2008). Performance Management and Appraisal Systems: HR Tools for Global Competitiveness. Response Books: A division of Sage Publications
4. Kandula, S.R.(2007). Performance Management. PHI of India, New Delhi

**Course Title:** Industrial Relations and Labour Laws

L	T	P	C.U.
33	5	2	3

**Course Code:**MBA-4HR4

**Programme & Semester:** MBA IV

**Course Objectives:** To enable students to learn the concepts of industrial relations including Trade unions, collective bargaining, discipline and various labour enactments.

**Course Outcomes (COs):** At the end of this course students will be able:

CO1: To explain the concept of industrial relations.

CO2: To interpret the international dimensions of Industrial relations.

CO3: To explain the role of Workers' Participation in Management.

CO4: To interpret the role Grievance Redressal.

## Course Contents

### Unit I: Industrial Relations

Concept of Industrial Relations; Nature of Industrial Relations; Objectives of IR; Factors affecting IR in changing Environment , Evolution of IR in India ; Role of State; Trade Union; Employers' Organisation; Human Resource Management and IR, Role of I.L.O in Industrial Relations, International Dimensions of IR

### Unit 2: Trade Union

Trade Union: Origin and growth, unions after independence, unions in the era of liberalization; Factor Affecting Growth of Trade Unions in India, Multiplicity & Recognition of Trade Unions; Provisions of Trade Union Act 1926.

### Unit 3: Collective Bargaining and Workers' Participation in Management

a) Collective Bargaining: Meaning, Nature, Types, Process and Importance of CB-prerequisites issues involved. Status of Collective Bargaining in India, Functions and role of Trade Unions in collective bargaining; b) Workers' Participation in Management: Concept- practices in India works committees, Joint management councils. Participative Management and co-ownership; Productive Bargaining and Gain Sharing

### Unit 4: Discipline and Grievance Redressal

Discipline - Causes of Indiscipline - Maintenance of discipline and misconduct, Highlights of Domestic enquiries - Principles of Natural Justice; Labour turnover; Absenteeism Grievance - Meaning of Grievance, Grievance redressal machinery in India- Grievance Handling Procedure; Salient features of Industrial Employment (Standing Orders) Act, 1946.

### Unit 5

a) **The Industrial Disputes Act, 1947:** Definitions of Industry, Workman and Industrial Dispute - Authorities under the Act —Procedure, Powers and Duties of Authorities — Strikes and Lock outs — Lay off and Retrenchment — Special Provisions relating to Layoff, Retrenchment and Closure.

b) **The Factories Act, 1948:** Provisions relating to Health, Safety, Welfare facilities, Working hours, Employment of young persons Annual Leave with wages etc.

### Suggested Readings:

1. C.S VenkataRatnam — Industrial Relations , Oxford University Press, 2nd Edition, March 2006
2. B.D Singh- Industrial Relations and Labour Laws, Excel Books, New Delhi, 2008
3. K Aswathappa- Human Resource Management, Tata McGraw-Hill, 7th Edition, 2013
4. P.L Malik - Handbook of Labour and Industrial Law (EBC) (12th Edition, 2009)
5. M.V Pylee, Workers Participation in Management, Vikas Publishing House Pvt. Ltd. 2004
6. C.S VenkataRatnam, Pravin Sinha, Trade Union Challenges at the beginning of 21st Century (Excel Books), 2000

**Course Title:** Compensation Management

L	T	P	C.U.
33	5	2	3

**Course Code:**MBA-4HR5

**Programme& Semester:** MBA IV

**Course Objective:** The objective of the course is to develop an understanding and familiarity among the student on an understanding to various components of executive and non-executive compensation; tools and techniques of job evaluation for assessing and monetizing the relative value of jobs/ job categories; and an understanding in designing a compensation policy and managing compensation system on the principles of equity, fairness and efficiency

**Course Outcomes:**

CO1: Students will be able to discuss key concepts related to compensation components, factors, theory, role of Trade Unions and government and other stake holder

CO2: To describe different Job Evaluation techniques for determining basic pay and will be able to demonstrate a sample Job Evaluation tool

CO3: To evaluate various components of a compensation package, how to structure them, and how to develop a company's compensation policy

CO4: To describe different statutory/ voluntary benefits, perks, incentives, and employee services offered by different organizations in order to motivate employees for better performance and retention

CO5: To discuss the role of collective bargaining / executive compensation negotiations in determining various employee/ executive benefits

CO6: Participants will be able to understand recent trends in executive compensation, rewards and recognition programs, and employee benefits.

**Course Contents**

Unit 1 : Introduction: Compensation meaning, Importance, Components & types of compensations, Factors Influencing Compensation, Challenges of Compensation, Theory of wages, Wages – Living wage, Fair wage and Minimum wage, Related Case Laws, Difference between Wages and salary, Wages Plans, Compensation Management: Role of Trade Unions, Government and Other Stakeholders.

Unit 2 : Internal alignment, Factors influencing internal structure, Strategic choices in defining internal structure, Job analysis: procedure and design. Job evaluation- definition, Purpose of job evaluation, Job based structures, its role in determining the compensation system, categories of job evaluation- analytical, non-analytical and market pricing; developing and maintaining job evaluation schemes.

Unit 3 : Individual and Team Pay Types of grade and pay structure, developing grade and pay structure, individual contingent pay, performance and competency related pay, contribution related pay; Team rewards- developing team pay, profit sharing, ESOPs, Recognition schemes, Role of performance appraisal in compensation decisions.

Unit 4 Legal Aspects of Wages & Salary Administration International Labour Standards & Norms for Wage determination, Salient features of Payment of Wages Act 1936, Minimum Wages Act 1948, Employees Provident & Misc. Provisions Act, Latest developments in Govt pension schemes, Equal Remuneration Act

Unit 5 : International pay systems Managing variations, The social contract, culture, National systems: Comparative compensations. Future trends in compensation management, case studies.



**Suggested Readings:**

1. Armstrong, M. (2019). *Armstrong's Handbook of Reward Management Practice: Improving Performance through Reward* (6th Ed.). London: Kogan Page.
2. Armstrong, M. & Cummins, A. (2011). *The Reward Management Toolkit: A Step-By-Step Guide to Designing and Delivering Pay and Benefits*. London: Kogan Page.
3. Armstrong, M. (2018). *Armstrong's Job Evaluation Handbook: A Guide to Achieving Fairness and Transparency in Pay and Reward*. London: Kogan Page.
4. Berger, L.A. & Berger, D. (2015). *The Compensation Handbook: A State-of-the-Art Guide to Compensation Strategy and Design* (6th Ed.). New York: McGraw Hill.
5. Ellig, B.R. (2014). *The Complete Guide to Executive Compensation* (3 rd Ed.) New Delhi: Tata McGraw Hill.
6. Fisher, J.G. (2015). *Strategic Reward and Recognition: Improving Employee Performance Through Non-Monetary Incentives*. London: Kogan Page.
7. Gerhart, B., Newman, J. & Milkovich, G. (2016). *Compensation*. New York. McGraw Hill.

## INTERNATIONAL BUSINESS GROUP

(Electives)

**Course Title:**International Business Environment

**Course Code:** MBA-3IB1

L	T	P	C.U.
35	5	0	3

**Programme& Semester:** MBA III

**Pre-requisite:** Business Environment

Course Objective: The purpose of this paper is to enable the students learn nature scope and structure of International Business, and understand the influence of various environmental factors on international business operations.

Course Outcomes: At the end of the course, students will be able:

- CO1: To explain the nature, scope, and role of international business & globalization;
- CO2: To discuss the theoretical aspects of international business and the functions of international organizations;
- CO3: To explain the concept of economic integration and international economic environment;
- CO4: To interpret the Organizational structure for international business operations

UNIT 1 Introduction to International Business: Importance nature and scope of International business; modes of entry into International Business internationalization process and managerial Implications. Environmental Context of International Business: Framework for analyzing international business environment

UNIT 2 Domestic, foreign and global environments and their impact on international business decisions-Global Trading Environment: World trade in goods and services – Major trends and developments; World trade and protectionism – Tariff and non-tariff barriers; Counter trade.

UNIT 3 International Financial Environment: Foreign investments -Pattern, Structure and effects; Movements in foreign exchange and interest rates and then impact on trade and investment flows.

UNIT 4 International Economic Institutions and Agreements: WTO, IMF, World Bank UNCTAD, Agreement on Textiles and Clothing (ATC), GSP, GSTP and other International agreements; International commodity trading and agreements. Emerging Developments and Other Issues: Growing concern for ecology; Counter trade; IT and international business.

### **Suggested Readings:**

1. Bennet, Roger, International Business, Financial Times, Pitman Publishing, London, 1999.
2. Bhattacharya, B., Going International: Respon se Strategies of the Indian Sector, Wheeler Publishing, New Delhi, 1996.
3. Czinkota, Michael R., et. al., International Business, the Dryden Press, Fortworth, 1999.
4. Danoes, John D. and Radebaugh, Lee H., International Business: Environment and Operations, 8th ed., Addison Wesley, Readings, 1998.
5. Griffin, Ricky W. and Pustay, Michael W, International Business: A Managerial Perspective, Addison Wesley, Readings, 1999.
6. Hill, Charles W. L., International Business, McGraw Hill, New York, 2000.

**Course Title:International Marketing**

**Course Code: MBA-3IB2**

L	T	P	C.U.
35	5	0	3

**Programme& Semester: MBA III**

**Pre-requisite: Marketing Management**

Course Objectives: To understand the principles & concepts in Marketing, to provide the knowledge of marketing management in the international perspective to develop marketing strategies for the dynamic international markets.

Course Outcomes: At the end of the course, students will be able:

CO1: To provide understanding of product and pricing decisions appropriate for international market.

CO2: To analyze the international marketing strategies.

CO3: To understand how companies adjust their international strategies based on the global environmental changes (e.g., globalization)

CO4: To build skills and respect toward the understanding of cultures of nations by critically analyzing the social, political, legal, and economic forces that affect the business performance of international marketing

**Course Contents**

UNIT-1 The importance and scope of marketing - Evolution of marketing: From transaction-based to relationship marketing- Marketing research and Decision support systems .Market Segmentation, Targeting and Positioning.

UNIT-2 Product Mix - Product management decisions, Product Life Cycle strategies - New Product Development - Pricing considerations and approaches, pricing strategies.

UNIT-3 Distribution channels and physical distribution. Marketing communication and Promotion mix Strategies. Nature of international marketing: meaning, Framework for International Marketing-Barriers for International Marketing.

UNIT-4 International Marketing Decisions: Product Planning, Designing and Development for international markets-Pricing Decisions: Pricing Strategies and Price setting For International Markets.

UNIT-5 Distribution: Channel Management and Physical distribution Management in International Marketing. Promotion: International Advertising Programs, Sales Management and Sales Promotion for Foreign Markets.

**Suggested Readings**

1. Philip Kotler, (2010), Marketing Management- The South Asian Perspective, Pearson
2. Warren J. keegan (2010): Global Marketing Management’ Pearson Education
3. SvendHollensen (2010): Global Marketing: A Decision-Oriented Approach- 3rd Edition, Pearson Education.
- 2) Ramasamy, Namakumari (2010) Marketing Management, McMillan Publishers
- 3) Saxena: Marketing Management (Tata McGraw-Hill)

**Course Title:Financing of International Trade**

**Course Code: MBA-3IB3**

L	T	P	C.U.
35	5	0	3

**Programme& Semester: MBA III**

**Pre-requisite:** International Business

Course Objectives: To familiarize the students with the basic documents required and financing techniques of foreign trade.

**Course Outcome:**At the end of the course, students will be able to:

CO1.Explain the concepts of international trade and finance and apply for the management decisions

CO2.To analyze impact of WTO on current global trade in detail.

CO3. To apply the different methods to mitigate the foreign trade and exchange rate risks in their respective organizations.

**UNIT-1**

Methods of payment- Cash, Open account, Cash against Documents, Documents on acceptance, Advance payment, Bills of exchange and Letter of Credit (LoC), International commercial terms- Contract terms for carriage by sea transport – FAS–FOB–CFR–CIF–DES–DEQ–contract terms for carriage by any mode of transport – EXW-FCA-CPT-CIP-DAF-DDP-DDU. Procedure for drawing various LoC and their operations - Types of Letter of Credit – **Discrepancies, Letter of credit - UCP- 600**

**UNIT – II**

Pre-shipment Credit: Meaning, Procedure, rates and documents needed, Post Shipment Credit: Definition and features– Various applications of post shipment finance and their procedure, Negotiation of export bills, Bills purchased discounted under limits granted to customers. Advances against claims for export incentives, deferred payment export credits.

**UNIT – III**

Export credit insurance: Role of ECGC – Standard policies – Risks covered: Commercial Banks, Political Risks – Risks not covered, how to obtain a policy and file claim - Maximum liability and credit, Guarantees for covering export finance. Insurance policies and bank Guarantees and Special Schemes. FEMA: Exchange control, regulations and procedure in India

**Unit – IV**

Export, import trade control procedure, Processing of an export order: Customs and Port clearance. Procedure and documents relating to quality control, Export contracts, Basic Principles of Insurance: Marine insurance – types of policies, perils covered, EXIM Banks – Objectives, Organizations Functions of EXIM Bank – Export financing programmes.

**UNIT-5:** Relevant Case studies

**Suggested Readings** 1) Nabhis, ‘Export’s manual and documentation’ Nabhi Publications

2) G.S. Lal, ‘Finance of foreign trade and foreign exchange’ H.P.J Kapoor Publications

3) S.C. Jain, ‘Export Procedure and documents’ Nabhi Publications

4) Current Export and import policies

5) Paras Ram, ‘Export What, Where, and How’ Anupama Publishers

**Course Title:Export Management And Documentation**

**Course Code: MBA-4IB4**

L	T	P	C.U.
35	5	0	3

**Programme& Semester: MBA IV**

**Objectives:** It gives an understanding on the India’s trade Position in the World and the various trade procedures involved in an international business. It gives an insight to the various documents required for trading.

**Course Outcomes:** At the end of the course, students will be able to:

- CO1. Understand various import process and procedures
- CO2. Analyze the principle of international business and strategies adopted by firms for the expansion.
- CO3.Explain the concepts in trade documentation in international business with respect to foreign trade

**Course Contents**

**UNIT-1**

International Trade: Need and importance of International Trade – Recent Trends in World Trade – Leading players – India’s Foreign Trade – Commodity composition and Destination – India’s position in World merchandise trade and services – India’s Foreign Trade Policy.

**UNIT-2**

Export Procedure: Starting an export firm – Selection of an export product – Market selection –Buyer selection - Registration procedure with Sales Tax, Central Exercise and various Boards and councils – Exim code number – Elements of export contract- Incoterms – Terms of payment and Letter of Credit.

**UNIT-3**

Export Documentation: Types of documents – Transport, Negotiation and Insurance documents.

**UNIT-4**

Export Finance: Sources of Finance - Role of commercial bank, EXIM Bank, ECGC and others – Export promotion Schemes – Insurance for Export – Types – export credit insurance – Risk Management – Types of risks – mitigation methods.

**UNIT-5**

Import Procedure and Documentation: Global sourcing – Types of global procurement – Tender – Negotiation – Contract and others – Customs regulations and import clearance formalities – Types of import licensesExport Promotion Capital Goods Scheme (EPCG) license- Duty exemption scheme – Duty Entitlement Pass Book Scheme (DEPBS)- Import formalities for 100% EOUs and SEZs - Import Risk Management.

**Suggested Readings:**

1. Aseem Kumar “Export and Import Management”, Excel Books, 2007
2. David Stewart ,”International Supply chain Management”, Cengage publications,2008
3. Jeevanandam C “Foreign Exchange : Practices Concepts and control” Sultan chand Publications, 2002.
4. Foreign Trade Policy: Hand book of Export Procedure and Annual of the Ministry of Commerce, Government of India.
5. Export and Import Manual, Nabhi Publications, New Delhi.
6. World Development Indicator, World Bank Publication

**Course Title:**International Logistics Management

**Course Code:** MBA-4IB5

**Programme& Semester:** MBA IV

L	T	P	C.U.
35	5	0	3

**Objective:** The course provides the analytical framework for understanding the logistic models and supply chain techniques in an international perspective.

**Course Outcomes:**At the end of the course, students will be able to:

CO1: Analyze Business Models, Business Strategies and Competitive Advantage.

CO2: Formulate and implement Warehouse Strategies

CO3: Recognize the requirements for Transportation and International Logistics

### **Course Contents**

#### **UNIT-1**

Logistics Management: Concepts – Importance – Elements of the logistic System – Marketing and logistic mix – Logistics and marketing interface – Value-chain and production efficiency.

#### **UNIT-2**

Shipping Industry: Types of ships – Shipping systems: linear, Tramp, conference, chartering, Baltic freight exchange – Shipping intermediaries: agent , forwarder, brokers and others – containerization – types of containers – ICDs – CFS – CONCOR.

#### **UNIT-3**

Air Transport: Air transport – Air freight – IATA – Cargo handling – Designing the International Information system – system modules – Distribution and Transportation.

#### **UNIT-4**

**Supply chain:** Definition – scope and importance of supply chain – supply chain drivers and metrics - efficient and responsive supply chain - Designing supply chain network: Distribution network – Factor influencing distribution - Transportation decision in supply chain management.

#### **UNIT-5**

Forecasting and planning in supply chain management – Pricing in supply chain management- Role of IT in supply chain management - co-ordination in supply chain management.

#### **Suggested Readings:**

1. David P, “International Logistics” Biztantra, New Delhi , 2006.
2. Donald J Bowersox Davi J Class” Logistics Management, Tata Mc.GrawHill,New Delhi.
3. David Stewart,”International Supply chain Management”, Cengage publications,2008.
4. Rejilsmail,“Logistics Management” Excel Books, 2008.

**OPERATIONS MANAGEMENT  
(Electives)**

**Course Title:** Facilities Management

**Course Code:** MBA-3OM1

**Programme & Semester:** MBA III

L	T	P	C.U.
33	5	2	3

**Objective of the Course**

The main objective of this course is to enable the students to be trained with planning/production and plant layouts, studying about strategies of material handling and equipments, and selection of site locations and layouts. The course will enable the students to understand the processes and methodology of operational management of facilities.

**Course Outcomes (CO)**

After completion of this course, the student will be able:

CO1: To understand the product selection, design and production layouts through basic strategies with computer applications.

CO2: To Understand different types of production processes and facility layout suitable for manufacturing different categories of products.

CO3: To identify and analyse the problems in the existing layout or material handling system and to optimize the layout or material handling system.

CO4: To develop layout design procedure and layouts for typical applications in the industries and suggesting appropriate material handling strategies in the industries.

**Contents Course**

**Unit 1: Product Selection and Design**

(a) Product selection process, (b) development of products (Goods and Services), (c) sources of product innovations, (d) design for customer (quality function on deployment), (e) value analysis / value engineering, (f) measuring product development performance.

**Unit 2: Production Process Management**

(a) Introduction, factors affecting process selection, (b) classification of processes: based on materials management and customer order type, (c) process flow design, (d) process analysis, (e) product-process strategy.

**Unit 3: Operations Technology**

(a) Definition of technology, (b) types of technology, (c) factors affecting technology selection decision, (d) misalignments in technology implementation, (e) level of automation, (f) technology development process, (g) Technologies for processes: Computer Integrated Manufacturing (CIM), CNC/ DNC machines, Computer Aided Manufacturing (CAM), Computer Aided Engineering (CAE), Office Automation, Electronic Data Interchange (EDI), and Internet, evaluation of technology investments.

**Unit 4 : Facilities Location**

Importance, factors affecting facilities location, (b) methods for evaluating, (c) facilities location: factor rating system, multiplant location method, locating facility within a network, dimensional analysis, methods for locating service outlet, (d) cost-volume analysis of facilities location.

**Unit 5 : Facilities Layout**

Importance of facility layout, (b) criteria for good layout, (c) symptoms of poor layout, (d) types of facility layout: product layout, process layout, cellular layout, mixed layout, fixed position layout, retail service layout, office layout, (e) flow and activity analysis, (f) layout design procedure: assembly line balancing, designing based on closeness rating, (g) computerized layout planning, (h) evaluating, and implementation of layout design.

**Suggested Readings**

1. Chase, Aquilano, Jacob, Production and Operations Management, 8th Ed. (TMH, N Delhi).
2. Lee J Krajwski, Operations Management: Strategy & Analysis, 6th Ed. (Pearson Education) Delhi).
3. S.N Chary, Production and Operations Management, (TMH, N Delhi).
4. Adam Ebert, Production and Operations Management, 6th Ed. (Pearson Education, N. Delhi).

**Course Title: Production Planning and Control****Course Code:**MBA-3OM2

L	T	P	C.U.
33	5	2	3

**Programme& Semester:** MBA III**Objective of the Course**

Production Planning and Control are the two important components of the management process. The subject will enable the consideration of all input variables to achieve defined output goals and control will help in corrective action taken to meet the planned output. The objective of the course is to enable the students to study basic strategies of production planning and its controlling methods

**Course Outcomes (CO)**

After completion of this course, the student will be able:

CO1: To understand the concept of capacity planning, aggregate planning and process of aggregate planning.

CO2: To understand the concept of Master Production Schedule and Material Requirement Planning and identify their elements.

CO3: To design an appropriate strategy for resource planning through appropriate MRP tool.

CO4: To explain demand forecasting, production planning tools & production control tools.

CO5: To demonstrate the Production Planning and Control and its functions for effective and efficient operations management.

**Course Contents****Unit 1 :Strategic Capacity Planning**

Concept, importance and objectives of capacity planning, (b)Type of capacity, Issues related to capacity planning, (e)Process of capacity planning: demand identification (qualitative and quantitative methods), assessment of capacity, alternative ways of altering capacity (make or buy decision), evaluation of alternatives.

**Unit 2: Aggregate Planning**

(a) Concept of Aggregation, Aggregate Planning Environment, (b) Aggregation Techniques, Planning Product Mix (Simple Application of Linear Programming), Process Of Aggregate Planning, (c)Mixed Strategy, (d)Mathematical Planning Models, (e)Performance Measures.

**Unit 3: Master Production Schedule and Material Requirement Planning (MRP)**

(a) Concept Of Master Production Schedule (MPS), (b)Importance Of MPS, (c)Process Of Preparing MPS, (d)Rough-Cut Planning, (e)Importance Of Material Requirement Planning (MRP), (f)Process Of Material Requirement Planning (MI(P), Elements Of Material Requirement Planning (MRP), Bill of Materials.

**Unit 4: Job Scheduling and Sequencing**

Introduction To Types Of Jobs In Organization, (b)Methods Of Job Scheduling: One Machine- N Jobs, Two Machines- N Jobs, N Machines- N Jobs, M Machines- N Jobs, Project Scheduling , Network Diagrams (PERT And CPM), (c) Job Sequencing, Job Sequencing In Service Organization (Application Of Simulation).

**Unit 5: Production Control System**

Concept, Function, and importance of production control, (b)centralization and decentralization, (c)documents and procedures us,AI in production control: work order, material requisition, control sheet, internal delivery note, progress note, machine load chart.

**Suggested Reading:**

1. J L Riggs, Production System Planning, Analysis, and Control, John Willy & Sons, New York 2. Lee J Krajwski, Operations Management: Stratekry& Analysis, 6th Ed. (Pearson Education, N. Delhi).
3. Buffa , Sarin, Production and Operations Management, Willey- Publication, New Delhi.
4. Adam Ebert, Production and Operations Management, 6th Ed. (Pearson Education, New Delhi).



**Course Title: Project Management**

**Course Code: MBA-3OM3**

**Programme & Semester: MBA III**

L	T	P	C.U.
33	5	2	3

**Objective of the Course**

This subject will help the students to understand importance of job design and productivity and its role in organizations. The subject will also enable students to learn about various processes of the organization to improve organisation's productivity.

**Course Outcomes (CO)**

After completion of this course, the student will be able:

CO1: To understand the basic project management skills with a strong emphasis on issues and problems associated with delivering successful projects.

CO1: To explain the importance, scope and functions of project management in successful project with productivity.

CO2: To evaluate, prioritize and select projects from a list of potential projects.

CO3: To illustrate the estimation of guidelines for time, costs and resources required for project management by applying different methods.

CO4: To evaluate and monitor the performance of the project with different approaches.

**Course Contents**

**Unit 1 : Productivity**

(a) Concept of productivity, (b) Measures of productivity, (c) Methods for productivity enhancement, (d) Productivity in manufacturing and service organization, (e) Principles of motion economy.

**Unit 2 : Job Design**

(a) Concept of job simplification and job standardization, (b) Specialization and automation, (c) Approaches to job design, (d) Behavioral considerations of job design, (e) Work analysis and work measurement, (f) Time-study methods: work sampling, stop-watch method, man-machine charts, calculation of allowances, normal time, and standard time; (g) Compensation, legal and ethical consideration.

**Unit 3 : Project Management**

(a) Project planning, objective of project management, (b) Classification of projects, (c) Project planning tools, GANTT charts, Milestone Charts, Network Analysis: PERT and CPM, finding critical path, earliest and latest activity time, (d) Time-Cost trade offs, (e) multilevel scheduling system.

**Unit 4 : Maintenance and Safety Management**

(a) Concept, objectives and importance of maintenance, (b) maintenance strategies, (c) maintenance economy, (d) Total productivity maintenance (TPM), (e) Measurements of maintenance performance; (f) Plant Safety: plant and equipments conditions, accidents' costs, approaches for accidents prevention, risk management.

**Suggested Readings:**

1. Lee J Krajwski, Operations Management: Strategy & Analysis, 6th Ed. (Pearson Education, N. Delhi).
2. S.N Chary, Production and Operations Management, 11th Ed., (TMI-I, N Delhi)
3. Adam Ebert, Production and Operations Management, 6th Ed. (Pearson Education, N. Delhi)

**Course Title: Materials Management****Course Code:**MBA-4OM4**Programme& Semester:** MBA IV

L	T	P	C.U.
33	5	2	3

**Objective of the Course**

In this course Students having experience in the field of production can learn the techniques of materials and logistics management and implement them in daily operations.

**Course Outcomes (CO)**

After completion of this course, the student will be able:

**CO1:** To develop an ability to perform the role of materials manager in an organization.

**CO2:** To analyze the inventory situation of a company and suggest improvements.

**CO3:** To understand the ethical issues in purchasing and negotiations.

**CO4:** To manage the activities of material manager like purchasing, inventory analysis, storage etc; in a scientific manner.

**Contents of Course****Unit 1 : Purchase Management:**

(a) Concept, objectives, and role of purchase function, (b)Inputs to procurement process, (c)Restrains and functions affecting purchase decision, (d)Procurement decisions: supplier selection, timing of purchase, price, quality and quantity of material, (e)Evaluation of procurement process, (f)Purchasing in government departments.

**Unit 2 : Inventory Management:**

(a) Introduction To Inventory System: Concept, Costs Associated With Inventory, Functions Of Inventory, Types Of Inventory, (b)Splective Control Of Inventory: ABC, VED, FNSD, GOLF, HML, (c)Models Of Inventory Control, Determination Of Economic Order Quantity (EOQ): Graphical , Tabular, And Mathematical Models (For Deterministic And Probabilistic Demand), Safety Stock, Reorder Level, (d)Concept Of Just In Time (JIT) System.

**Unit 3 : Stores Management:**

(a) Introduction, (b)Functions Of Stores, (c)Organization. Of Store, (d)Types Of Stores, (e)Stores System And Procedures, (f)Decentralization V/S Centralization, (g)Control Of Spare Parts, (h)Codification And Classification Of Materials, (i)Stores Audit System, (j)Store's Location And Layouts.

**Unit 4 : Waste Management:**

(a) Concept Of Waste Management, Importance Of Waste Management, (b)Concept Of Productivity And Wastivity, Gross And Net Wastivity, Wastivity As. Performance Measurement, (c)Wastivity V/S Productivity, (d)Classification of Waste Management, (e) Waste Reduction Methods, (f)Treatment of Waste In Cost Accounting.

**Suggested Readings:**

1. JR Tony Arnold, et al, Introduction to Material Management, 5th Ed., Pearson,
2. N K Nayar, Resource Management, Vikas Publication, New Delhi
3. AK Citall et al, Materials Management : Text and Cases, .TMH, N Delhi
4. AK Datta, Materials Management: Procedure, Text and Cases, PHI, 2nd , N Delhi.

**Course Title: Total Quality Management and Quality Standards**

**Course Code:**MBA-4OM5

L	T	P	C.U.
33	5	2	3

**Programme& Semester:** MBA IV

**Course Objective:**

The objective of this course isto enrich students the fundamentals of Total Quality Management to foster the emerging trends in production whereby students practically would know how the six sigma technique could be used to minimize defects.

**Course Outcomes (CO)**

After completion of this course, the student will be able:

CO1: To learn the basic concepts of quality and quality from organizational point of view.

CO2: To learn the concept of total quality management from western and Japanese approach.

CO3:To learn the internal politics, quality culture, education and training of the organization.

CO4:To be aware of international/national Quality awards

**Contents of the Course**

**Unit 1 : Total Quality Management (TQM) Concept and Fundamentals**

(a) Definition, Basic Approach, (b) TQM Framework, (c) Principles of TQM, (d) Philosophies Of Quality Gurus: Deming's 14 Points, Crosby's Four Absolutes, Juran's Trilogy, Feigenbaum's Total Quality Control, The Total Quality Triad, (e) Evolution of TQM.

**Unit 2 : Human Aspect of Total Quality Management (TQM)**

(a) The human factor: The fundamental prerequisite for success, (b) TQM's human elements, (c) Motivating people for total quality, (9.) Resistance to change, (e)Characteristics of quality leaders, (f) Role of quality readers, (g)Teams for TQM, (h)On-the-job satisfaction and quality, (i) Participative management, (j) Compensation system, (k) Ergonomics.

**Unit 3 Strategic Quality Planning**

(a.) Strategic quality management, (b) Quality statement, culture, product quality cycle, (c) TQM planning environment, (d) Role of quality control department, (e) Planning for productivity, (f) Quality and re-engineering, (g)The cost of quality (Direct & Indirect cost), (h)Evaluating the cost of TQM, (i) Quality index, (j) The total quality cost curve, (k)Standardization.

**Unit 4: Total Quality Management (TQM) Practices**

(a) TQM technologies, (b) TQM practices: policy deployment, benchmarking, backtracking, cross-functional teams, QFD, Taguchi Method, failure-mode and effect analysis, the Poka-Yoke concept, concurrent engineering, (c) Malcolm Baldrige award, European Quality award, (d)TQM Implementation Process.

**Unit 5 : Quality Management Standards**

(a) Concept and need of quality standards, (b) National quality standard organizations: Bureau of Indian Standards (BIS), Agmark Grading of agriculture and allied commodities, Quality council of India; (c) International Organisation for standardization (ISO), ISO standards: ISO 9000 and 14000 series, integration of ISO 14000 with ISO 9000, (d) Process of ISO certification, (e) Implementing the system, (f) Post certification.

**Suggested Readings:**

1. Dale, Carol, Glen, Mary, Total Quality Management, 3rd ed., Pearson Education, New Delhi
2. Ross, Total Quality Management: Text, Cases, and Readings, 2nd ed. St. Lucie Press.
3. H Lal, Total Quality Management: A practical approach, New Age International, New Delhi.
4. Hand Book for-ISO certification.

**AGRI - BUSINESS MANAGEMENT**  
**Electives**

**Course Title: Agribusiness and Rural Marketing**

**Course Code: MBA-3AG1**

L	T	P	C.U.
30	5	5	3

**Programme & Semester: MBA III**

**Course Objective:** The course is designed for the student who plans to seek employment on, manage, or own a farm; or seek employment in an agribusiness field. Students will be involved in learning activities that generally prepare him/her to apply the economic and business principles involved in the organization, operation, and management of the farm, ranch, or agribusiness.

**Course Outcomes (CO)**

After completion of this course, the student will be able:

CO1: To enable students to gain knowledge on agricultural marketing, challenges and prospects for improving agricultural marketing system.

CO2: To gain skills to analyze marketing functions, marketing information and intelligence.

CO3: To impart knowledge of the marketing efficiency and agricultural prices.

CO5: Provide the platform to the students of Marketing of Agricultural Inputs

**Course Contents**

**Unit-1:** Concept of Agricultural Marketing, Study of organization and function of agricultural marketing in India.

**Unit-2:** Methods of Grading farm products, Magnitude and dimensions of marketing & marketable surplus in agricultural communities.

**Unit-3:** Efficiency of marketing storage, Transportation and Financial Management in Agriculture.

**Unit-4:** Marketing: Perishability, seasonality and processing of agricultural products.

**Unit-5:** Various models and theories of agricultural marketing with their critical evaluation.

**Suggested Readings:**

1. John, N. David and Ray, Concept of Agribusiness Management
2. Kenneth D. Dull, Principles of Management in Agri-Business, Western Publication
3. Agriculture Marketing Management
4. Acharya, S.S, Dr. N.L. Agarwal, Agricultural Marketing In India, 6/E Oxford & Ibh, 2017
5. Kohls, Marketing of Agriculture Products 9e Pearson Education India; Ninth edition (2015)

**Course Title: Agri Input Management**

L	T	P	C.U.
30	5	5	3

**Course Code:**MBA-3AG2**Programme& Semester:** MBA III

**Course Description:** The syllabus of agri input management includes five units; unit one includes concept of agri input management and type of agri inputs. Unit 2 includes Business Environment in relation to agricultural input management. Unit 3 includes marketing of agricultural inputs; unit-4 overview of financial management and financial instruments are included and Unit-5 includes promotional measures and supply chain management. The Andragogy in this subject includes PPTs, case studies, assignments, class test, quiz, mini project.

**Course Objectives:** The objective of the course is to develop the skills & knowledge to the students regarding marketing of agricultural inputs. The course builds an overview and in-depth awareness of the input market environment.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO 1: Explain the basic concept of agri input management.

CO 2: Interpret the importance of business environment related to agricultural input management.

CO 3: Analyze the marketing strategies of agricultural input management.

CO 4: Analyze the financial strategies of agricultural input management.

**Course Contents:**

**Unit1:** Agricultural Inputs and their types – farm and non-farm, Seed- Importance of seed input; Types of seeds- hybrid, high yielding and quality seeds, Chemical fertilizers- production, export-import, supply of chemical fertilizers, demand/consumption.

**Unit 2:** Business Environment in relation to agricultural input management; legal aspects of agricultural input business, sustainable management in terms of environmental, social and economic aspects, managing technological innovation in terms of agricultural inputs management.

**Unit 3:** Marketing of agricultural inputs, product strategies and development, pricing methods and strategies, marketing channels and promotion.

**Unit 4:** Overview of Financial management in agricultural inputs management, Challenges in agricultural financing, Financial instruments in agricultural sector, cost-volume-profit analysis.

**Unit 5:** Relevant promotional agencies and cooperatives, Supply chain management for agricultural inputs, problems and prospects of the agricultural inputs management.

**Text Book:**

1. Acharya, S. S & Agarwal, N. L. (2019). *Agricultural Marketing in India*, 6<sup>th</sup> Ed, Oxford & IBH, New Delhi

**References:** 1. Broadway, A. C. & Broadway, A. A. (2016). *A Text Book of Agri-Business Management*, Kalyani Publishers

2. Singh, A. K. and Pandey, S. (2005). *Rural Marketing*, New Age.

3. Krishnamacharyulu, CSG & Ramakrishnan, L. (2010). *Rural Marketing: Text & Cases*, Pearson

4. Singh, S. (2004). *Rural Marketing- Focus on Agricultural Inputs*, Vikas Publication House.

**Course Title: Farm Business Management**

L	T	P	C.U.
32	5	3	3

**Course Code:**MBA-3AG3

**Programme& Semester:** MBA III

**Course Objective:** The objective of this course is to provide students opportunity to develop skills which will make you more employable in the field of farm business management. This course introduces basic farm business management concepts. Students will study the farm management planning cycle and develop an understanding of its relationship to: family and farm business goal setting.

### **Course Outcomes (CO)**

After completion of this course, the student will be able:

CO1: To acquaint students with the ever-changing role of a farm manager in today's economy.

CO2: To gain a working knowledge of the economic and business principals necessary to survive and thrive in today's agricultural environment.

CO3: To understand the financial management of a farming operation. This includes construction and use of financial statements, a general understanding of the financial industry, organizational business structures and taxation.

CO4: To understand the importance of personal financial management and its direct impact on a business.

### **Course Contents**

**Unit 1:** Introduction, Definitions, Objectives of farm Management, Scope of Farm Management, Economic theory and farm management science, what makes a successful farm manager? Relationship of farm management with other sciences, Farm management problems under Indian conditions

**Unit2:** Economic Principles applied to Farm management: Principle of Variable proportion, Cost principle, principle of factor substitution, law of equi-marginal returns, Opportunity cost principle, principle of combining enterprises, Principle of comparative advantage, Time Comparison principle, Limitations of principles of farm management.

**Unit 3:** Farm Planning, Budgeting and Programming: Farm planning, Farm budgeting, Steps of Complete budgeting, Programming Techniques.

**Unit 4:** Systems of Farm Organization: Different systems of farming, Peasant farming, Corporate farming, State farming, Co-operative farming, Collective farming, Criteria for choice in India, Suitability of alternative systems.

**Unit 5:** Farm Size and Practices: Measurement of size of farm, Pattern of farm holdings in India, Factors determining economic holdings, Farm size practices – Large scale and small scale farming, Specialized and diversified farming, Mixed farming, Extensive and intensive farming.

### **Suggested Readings:**

1. Dhondyal, S.P. (2007) Farm Management: An Economic Analysis
2. Broadway and Broadway (2009), Agri-Business Management.
3. Johl and Kapur (2005) Farm Business Management

**Course Title: Management of Cooperatives**

L	T	P	C.U.
32	5	3	3

**Course Code:**MBA-4AG4

**Programme& Semester:** MBA IV

Objectives: The objective of this course is to provide the conceptual framework related to management of cooperatives.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO 1: Explain the basic concept of management of cooperatives.

CO 2: Interpret the role of government in the development of cooperatives.

CO 3: Analyze the strategies of Financing of cooperatives, staffing in cooperatives and training methods in cooperatives.

CO 4: Analyze theManagement practices of successful cooperatives in India.

### **Course Contents**

#### **Unit-1:**

Nature of cooperative principles, Management principles and their applications to cooperative organizations, structure and functions of various types of cooperatives.

#### **Unit-2:**

Managerial problems of cooperatives, consumer stores, role of consumer stores, role of Government in the development of cooperatives.

#### **Unit- 3:**

Financing of cooperatives, staffing in cooperatives and training methods in cooperatives and efficiency criteria.

#### **Unit 4:**

marketing Public accountability, price, output and profit and policies of cooperatives; Special problem of cooperatives in agricultural and industrial sectors.

#### **Unit-5:**

Management practices of successful cooperatives in India: selected case studies.

### **Suggested Readings:**

1. Ramkishen Y, Management of Co-operatives, JAICO Publishing House.
2. K. M. Rai. Cooperative Societies And Rural Development', Mittal Publication, New Del

**Course Title: Plantation Management**

**Course Code: MBA-4AG5**

L	T	P	C.U.
30	5	5	3

**Programme& Semester:** MBA IV

**Course Objectives:** The enable students to understand current scenario of plantation industries in India and to analyze the manufacturing, marketing and financial aspects of plantation crops.

**Course Outcomes:** After the completion of the course students will be able:

CO1: To explain the current scenario of plantation industries in India.

CO2: To demonstrate product, pricing, distribution and promotional strategies related to plantation crops.

CO3: To interpret the financial management in plantations management.

CO4: To evaluate the social, economic and technological aspects related to plantation management.

**Course Contents:**

**Unit1:** Current scenario of major plantation industries in India, plantation field operations in estates of Tea, Coffee, Rubber, Spices, etc (cultivation, harvest management, post harvest management).

**Unit 2:** Manufacturing/processing operations in estates, quality control aspects, estate management and labour relations, legal aspects of plantation business, sustainable management in terms of environmental, social and economic aspects, managing technological innovation in terms of cultivation and processing in Tea, Coffee, Rubber, Spices and other relevant plantation crops.

**Unit 3:** Marketing of plantation crops marketing channels, product development, branding, pricing and promotion.

**Unit 4:** Export environment for plantation crops, logistics management-purchase, stores and transport, Financial management in plantations, cost-volume-profit analysis.

**Unit 5:** Relevant promotional agencies and cooperatives, problems and prospects of the major plantation sector

**Text Book:**

1. David, A. Avant, *Plantation Management*. Lavant Publications.

**Reference Readings:**

1. Kumar Pankaj (2007). *Practical Manual of Plantation*, Scientific Publishers Journals Dept.
2. P. Sudarshan, *Plantation Management*.



## Electives

### Pharma Business Management

**Course Title: Pharmaceutical Marketing**

**Course Code: MBA-3PH1**

**Programme & Semester: MBA III**

L	T	P	C.U.
30	5	5	3

**Course Objectives:** The course will give an overview of the pharmaceutical industry and how marketing has become essential even for one of the most R&D-heavy industries. Many people – also within the pharmaceutical companies themselves - find marketing circumspect and believe pharmaceuticals should be sold on scientific merits only. However, R&D productivity has fallen and companies need to maximize return on each and every innovation just to survive. Therefore, the pharmaceutical industry is a good place to learn about recurrent as well as future challenges for marketers.

**Course Outcomes (COs):** At the end of this course students will be able to:

CO1- Understand the marketing concepts and techniques; and applications of the same in the pharmaceutical industry.

CO2- Describe the concept of product management and product life cycle.

CO3- Discuss the various components of promotion of pharmaceutical products.

CO4- Explain the different pharmaceutical marketing channels

CO5- Evaluate the role of mass media in product advertising.

#### Course Contents

**Units 1:** Fundamentals of Pharmaceutical Marketing: the 4 'Ps' in a regulated Pharma market, the Strategic Triangle; Market Segmentation in the pharmaceutical context, conceptual difference with consumer products market segmentation

**Unit 2:** PLC Management, reinforcing and revitalizing pharmaceutical brands, line-extensions. Product-mix Optimization

**Unit 3:** Promotional-mix Optimization: Portfolio Analysis by factoring key determinants, BCG Matrix, brand building decisions; leveraging the Promotional-mix for Brand Building. Designing Marketing Programs for New Product launch

**Unit 4:** The Pharmaceutical Industry: India and Global Scenario: Essential differences between domestic Marketing in India and International Marketing; generic products dominated market vis-à-vis patented products dominated markets

**Unit 5:** Role of pharmacies in dispensing products, role of mass media in product advertisements and social campaigns for market expansion; Structure and role of field management and product management, India Vs. Global

#### Suggested Readings:

1. Kotler, Philip, Marketing Management: Analysis, Planning, Implementation, and Control Latest Edition, Prentice Hall
2. Best, Roger J., Market-Based Management – Strategies for Growing Customer Value and Profitability (3rd Edition), Prentice Hall
3. Lehmann, Donald R. and Russell S. Winer, Product Management (2005 4th Edition). McGraw-Hill/Irwin.
4. Philip Kotler(2003). Marketing Management: Eleventh Edition, New Delhi: Pearson Education.

**Course Title:Regulatory Framework of Pharmaceutical Business**

**Course Code: MBA-3PH2**

L	T	P	C.U.
30	5	5	3

**Programme& Semester: MBA III**

Course Objectives: The course will give an overview of legal environment to the student. This paper is designed to expose the students to the Indian legal system and its affect on business activities.

Course Outcomes (COs): At the end of this course students will be able to:

CO1- Understand the law of contract, Capacity of contract and legal requirements of entering into a contract.

CO2- Demonstrate an understanding of the legal environment of business.

CO3- Apply basic legal knowledge to business transactions.

CO4- Integrate the concept of business law with foreign trade.

**Course Contents**

**Unit 1:** Law of Contract - Agreement - Offer - Acceptance - Consideration - Capacity of Contract Contingent Contract - Quasi Contract - Performance - Discharge - Remedies to breach of Contract

**Unit 2:** Partnership - Sale of Goods - Law of Insurance - Negotiable Instruments - Notes, Bills, Cheques - Crossing - Endorsement - Holder in due course - Holder in value - Contract of Agency.

**Unit-3:** Company - Formation - Memorandum - Articles - Prospectus - Shares - Debentures -Directors - Appointment - Powers and Duties - Meetings - Proceedings – Management - Accounts - Audit - Oppression and Mismanagement - Winding up.

**Unit-4:** Intellectual Property Rights & Regulations: Overview of Intellectual Properties, their types and importance of intellectual property protection. Patents: Requirement of patenting, patent specifications and claims, Indian Patent act 1970 and amendments. Patent search, analysis, drafting and stages of filing patent at national level.

**Unit-5:** International Treaties & IPR Organizations: Paris Conventions, Patent Cooperation Treaty (PCT) – introduction, application and general rules. Introduction to concept behind WIPO / WTO / TRIPS / GATT / GATS system & Uruguay Round.

**Suggested Readings:**

1. Pathak, LEGAL ASPECTS OF BUSINESS, Tata McGraw- Hill Publishing Company Limited, New Delhi
2. M.M. Sulphey&Az-har Basheer, LAWS FOR BUSINESS, PHI Learning Pvt. Ltd. New Delhi
- 3.Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and IsaderKaufer, Marcel Dekker series, Vol.143, Pharmaceutical Regulatory Process, Edited by Ira R. Berry Marcel Dekker Series,Vol.144
4. New Drug Approval Process: Accelerating Global Registrations By Richard AGuarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.19

**Course Title: Sales Promotion and Brand Management in Pharmaceutical Business**

**Course Code: MBA-3PH3**

L	T	P	C.U.
30	5	5	3

**Programme & Semester: MBA III**

**Course Objectives:** The objective of this course is to develop a basic understanding about the sales promotion and brand management. The course will also facilitate the understanding of the conceptual framework sales promotion, brand management and their determinants.

**Course Outcomes (COs): At the end of this course students will be able to:**

CO1- Explaining the meaning of sales promotion, nature and growing importance of sales promotion.

CO2- Describe the post testing, implementing and evaluating the sales promotion programs.

CO3- Explain the making necessary modifications for effective sales promotion programs.

CO4- Elaborate the relevance of brand and value awareness in an effective marketing system.

**Course Contents**

**Unit 1:** Strategic decision making using IMS-Health and C-MARC data for sales and market trend analysis; Using Medical Databases, PubMed and Standard Treatment Algorithms to build brand communication strategies; IFPMA Code of Ethics – Guidelines for Pharmaceutical Promotion

**Unit 2:** Developing content and designing of Scientific Promotional Literatures, Visual Aids and Journal Advertisements; Preparing the Promotional Budget as a part of the Marketing Budget; Monitoring & Controlling long-term projects, field-force activities and promotional-expense budget; Training Skills

**Unit 3:** Brand Name, Brand Image, Brand Value and Brand Awareness, Concept of Brand Equity, difference with brand valuation, Five dimensions of Brand Equity, key influencers of each dimension, prescription loyalty, prescriber coverage frequency, brand exposure through field-force promotion

**Unit 4:** Quality indicators, Promotional-mix, Benefits of building Brand Equity. Brand Management as a strategic marketing function: role of a Pharmaceutical Brand Manager, the 'Little CEO' concept, 'Science meets Commerce' concept

**Unit 5:** Essential differences between managing Pharmaceutical Brands and Consumer Brands, types of Pharmaceutical Brand Management organization structures, challenges of a Brand Manager; relation of Product Management Teams vis-à-vis Sales Force in Pharmaceutical companies

**Suggested Readings:**

1. Harsh Verma . Brand Mmanagement, Second Edition, Excel Publication.
2. Aaker,D.; Managing Brand Equity. RamanujMajumdar (1999) Product Management in India. New Delhi: Prentice Hall.
3. PranK.Chaudhary (2001), Successful Branding, Hyderabad: University Press Hil

**Course Title:Pharmaceutical Retail Management**

**Course Code: MBA-3PH4**

L	T	P	C.U.
30	5	5	3

**Programme& Semester: MBA IV**

**Course Objectives:** The course will give an overview of retail management. The course will also familiarize the students with organized retail and, the value it creates. The course will also make students to develop decisions making skills related to retailing

**Course Outcomes (COs): At the end of this course students will be able to:**

CO1- Evaluate current retailing trends based on consumer, legal and competitive environments.

CO2- Identify various retail opportunities and evaluate the strategies associated with each type of opportunity.

CO3- Distinguish and characterize the factors and management tools that retailers consider and use when developing their merchandising skills.

CO4- Assess current Indian retail practices in their ability to respond to environmental trends.

**Course Contents**

**Unit 1: Retailing**

An Overview, Understanding, Scope and Benefits of pharmaceutical retailing, Overview of Pharmaceutical retailing

**Unit2: Retail Strategies**

Classification of Retailers, Understanding the Retail Customer Population, demographic and geographic analysis, Retail Market Strategy, Strategic Planning Process, Pharmacies as retail outlets for switched drugs, Building Sustainable Competitive Advantage, Marketing Strategies, Product mix and assortment planning process Merchandising and store management Branding strategies.

**Unit3: Retail of OTC drugs**

Historical development of the OTC market, Major players within the OTC market, Rx-to-OTC switching: The changing role of the consumer, Consumer buying behavior for OTC drugs, Growth potential within the OTC market, Merchandise assortment planning, Organizing the buying process by categories, Merchandise purchasing process.

**Unit4: Store Management**

Store layout, design and visual merchandise, Store interior, exterior and security, Visual Merchandising for OTC drug retailing, Future Drivers of OTC Pharmaceuticals, The impact of technology on the drugs market, OTC pharmaceuticals: growth or maturity : in India and global Market Development in Pharmaceutical Marketing

**Suggested Readings:**

1. Barry Berman and Joel R. Evans, Retail Management: A Strategic Approach, Pearson,
2. Michael Levy and Barton AWeitz, Retailing Management, Tata McGraw-Hill,
3. Pradhan, Swapna, Retailing Management-Text & Cases, Tata McGraw-Hill)
4. Bajaj, Chetan, Srivastava Nidhi V, Tuli Rajesh, Retail Management, Oxford,

**Course Title:Supply Chain Management in Pharmaceutical Industry**

**Course Code: MBA-3PH5**

L	T	P	C.U.
30	5	5	3

**Programme& Semester: MBA IV**

**Objectives of the Course** - The objectives of supply chain management in the pharmaceutical industry are to ensure the timely delivery of quality medications, minimize costs, and optimize inventory management. It aims to maintain compliance with regulatory standards, enhance traceability, reduce risks, and improve collaboration among stakeholders to ensure the safety and availability of pharmaceutical products.

**Course Outcomes:**At the end of the course, students will be able to:

CO1: To explain the concept of supply chain management and logistics management.

CO2: To describe performance measurement and control tools.

CO3: To interpret the E business framework related to supply chain management.

### **Unit 1 Introduction to supply chain management**

(a) Basic Concepts, Scope And Philosophy Of Supply Chain Management, (b)Importance Of Supply Chain Management, (c)Supply Chain Decision, (d)Evolution Of Supply Chain Management.

### **Unit 2 Designing the Supply Chain**

(a)Role Of Distribution In Supply Chain, (b)Factors Influencing Distribution Network, (c)Process Of Supply Network Design, (d)Distribution Strategy, (e)Models For Facilities Location And Capacity Allocation, (f)Impact Of Uncertainty On Supply Chain Design, (g)Evaluation Of Supply Chain Design, (h)Demand Chain Management, (i)Strategic Alliances.

### **Unit 3 Performance Measurement and Control**

(a)Concept, Dimensions Of Performance Measurement, (b)Tools For Performance Improvement: Benchmarking: Introduction, Forms Of Benchmarking, GAP Analysis, Benchmarking Study Report; (c)Achieving Strategic Integration, (d)Supply Chain Operations Reference (SCOR) Modeling, SCOR Analysis, (e)Value Chain, (f)Concept Of Configurability, (g)Evaluation Of Supply Chain Performance (Supply Chain Cost Analysis), (h)Impediments To Improved Performance.

### **Unit 4 Logistics Management**

(a)Concept of Logistics, Inbound And Outbound Logistics, (b)Key Activities of Logistics, (c)Managing The Costs Of Logistics, (d)Application Of Logistics Management, (e)Trade-Offs In Logistics Management, (f)Bull-Whip Effect In Logistics, (g)Third And Fourth Party Logistics, (h)Emergence Of IT In Logistics, (i)International Issues In Logistics, (j)Warehousing, Types Of Warehouses, Site Selection, Layout And Design Of Warehouses.

### **Unit 5 Emerging Trends in Supply Chain Management**

(a)Role Of Information Technology (IT) In Supply Chain Management: Electronic Data Interchange (EDI), Use Of Data Mining Tools, E-Business Framework, (b)Customer Profitability Analysis (CPA), (c)International Issues In Supply Chain Management.

### **Suggested Readings:**

1. Chopra, Meindl; *Supply Chain Management: Strategic Planning and Operation*, 2nd ed., Pearson Education, New Delhi.
2. Altekar, *Supply Chain Management: Concepts and Cases*, Prentice-Hall of India, New Delhi
3. BS Sahay, *Supply Chain Management*, Macmillan, New Delhi.
4. G. Raghuram, *Logistics and Supply Chain Management*, Macmillan, New Delhi
5. Balou, *Supply Chain Management*, Pearson Education.

**Course Title: Innovation Management and Startup Ecosystem**

**Course Code:** MBA-4OP4

L	T	P	C.U.
30	5	5	3

**Programme& Semester:** MBA IV

**COURSE DESCRIPTION**

The course aims to provide students with basic concepts and awareness in technological innovation and an understanding of the challenges and opportunities that small and large firms face in relation to this. The course has an integrated approach to tackling the complex concepts in and knowledge about technological innovation in relation to technological development. The course covers areas such as the importance of innovation, leadership in research and development, management of innovation and technology, partnerships, networks and alliances, product and process development, commercialization of research as well as entrepreneurship and business creation.

**COURSE OBJECTIVES:** The students will be able to:

1. Understand the role of innovation and technical change in enterprise and national level economic performance
2. Understand the technological, human, economic, organisational, social and other dimensions of innovation
3. Explore and better manage the effects of new technology on people and worksystems
4. Demonstrate that the effective management of technological innovation requires the integration of people, processes and technology
5. Recognize startup ecosystem and government initiatives to promote startups, opportunities for the commercialization.

**COURSE OUTCOMES:** On completion of the course, the student should be able to:

CO1: Account for the importance of technological development and innovation for economic growth and increased competitiveness on a firm level,

CO2: Critically discuss a firms need to have a strategic and integrated approach to be able to successfully manage innovation and technical development,

CO3: Analyses complex innovation processes in firms both internally and externally. This incorporates for instance basic knowledge about partnerships, alliances, research and development, commercialisation and industrial marketing.

CO4: Understand the concept of startup ecosystem and government initiatives to promote startups.

**COURSE CONTENTS**

**UNIT – 1**

Innovation, need and importance of innovation; technological, human, economic, organisational, social and other dimensions of innovation.

**UNIT - 2**

Innovation as a core business process; Building the innovative organization, Developing an innovation strategy, Sources of innovation; Innovation Networks; Creating new products and services.

**UNIT – 3**

Partnerships, alliances, research and development, commercialization of innovative products and services, entrepreneurship and new ventures.

**UNIT – 4**

Startup ecosystem, stakeholders in Startup ecosystem, Evolution of the Indian Startup Ecosystem, Startup – financing,

**UNIT – 5**

Government initiatives and institutional framework to promote startups in India.

**Suggested Readings**

1. Mark Dodgson , David M. Gann , et al., The Oxford Handbook of Innovation Management (Oxford Handbooks), Oxford University Press; Reprint edition (2015)
2. Clayton M. Christensen, The Innovator&#39;s Dilemma: When New Technologies Cause Great Firms to Fail (Management of Innovation and Change) Harvard Business Review Press; Illustrated edition (2016)





## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Business Studies & Entrepreneurship**

#### **Ordinances, Regulations & Syllabus**

**For**

#### **Bachelor of Business Administration (BBA) Three Year Programme Semester Pattern (w.e.f. session 2013-14)**

**Revised and Approved in the year 2021 (17<sup>th</sup> meeting, Board of  
Studies)**



## **Programme Educational Objectives (PEOs)**

**PEO 1** Graduates will demonstrate a comprehensive understanding of core business concepts, including finance, marketing, management, and operations, enabling them to analyze and solve business problems effectively.

**PEO 2** Graduates will apply critical thinking and analytical skills to make informed decisions in complex business environments, considering ethical and social implications.

**PEO 3** Graduates will effectively communicate ideas and information in both written and verbal formats, demonstrating strong interpersonal skills necessary for teamwork and leadership roles.

**PEO 4** Graduates will understand the impact of globalization on business practices and appreciate diverse perspectives, fostering inclusivity in the workplace.

**PEO 5** Graduates will utilize current technologies and data analytics tools to enhance business operations and decision-making processes.

**PEO 6** Graduates will cultivate an entrepreneurial mindset, demonstrating creativity and innovation in developing new business ideas and strategies.

**PEO 7** Graduates will recognize the importance of ethical behavior and social responsibility in business, making decisions that contribute positively to society.

**PEO 8** Graduates will embrace continuous learning and adaptability, equipping them to navigate the evolving business landscape throughout their careers.

## **Programme Specific Objectives (PSO's)**

**PSO 1** Equip students with a foundational understanding of various business functions, including marketing, finance, operations, and human resources.

**PSO 2** Foster the ability to analyze complex business problems and make data-driven decisions using quantitative and qualitative methods.

**PSO 3** Instill a sense of ethical responsibility and integrity in business practices, preparing students to be ethical leaders in their future careers.

**PSO** Improve both written and verbal communication skills, enabling students to effectively present ideas and collaborate in diverse teams.

**PSO5** Inspire innovative thinking and the ability to recognize and capitalize on business opportunities in various environments.

**PSO6** Provide an understanding of global business practices and cultural diversity, preparing students for careers in an interconnected world.

## **Programme Outcome Objectives (POO's)**

**POO 1** Demonstrate a comprehensive understanding of core business concepts, theories, and practices across various disciplines, including finance, marketing, management, and operations.

**POO 2** Apply critical thinking and analytical skills to solve complex business problems and make informed decisions based on quantitative and qualitative data.

**POO 3** Exhibit effective verbal and written communication skills, enabling clear presentation of ideas and persuasive arguments in diverse business contexts.

**POO 4** Work effectively in teams, demonstrating leadership, interpersonal skills, and the ability to manage group dynamics to achieve common goals.

**POO 5** Understand and apply ethical principles and social responsibility in business decision-making, recognizing the impact of business actions on society and the environment.

**POO 6** Analyze and appreciate the impact of globalization on business practices and strategies, and demonstrate cultural awareness in diverse business environments.

**POO 7** Utilize modern technology and information systems to enhance business operations, including data analysis tools and management software.

**POO 8** Foster an entrepreneurial mindset by identifying opportunities, assessing risks, and developing innovative solutions to create value in the marketplace.

**POO 9** Commit to ongoing personal and professional development, recognizing the importance of staying current with industry trends and advancements.

**POO 10** Develop and implement effective business strategies that align with organizational goals and respond to market dynamics.

## ***Course Structure***

## ***Ordinance and Regulations***

BBA:FirstYearCourseStructure First Semester

SL.No.	Subject Code	Subject Name	Credit
1	BBN-101	Business Economics	4
2	BBN-102	Basic Accounting	4
3	BBN-103	Business Statistics	4
4	BBN-104	Principles of Management	4
5	BBN-105	Business Ethics & Governance	4
6	BBN-106/BBN-106A/BBN-106B/ BBN-106C	Computer Applications/Python/Fundamentals of Computer/Computer System Security	4
		<b>Total</b>	24

Programme/Class:Degree	Year:First	Semester:First
Course/paper-1(A)		
CourseCode:BBN-101	CourseTitle:BusinessEconomics	
<b>Courseoutcomes:</b>		
The aim of the course is to build knowledge and understanding business economics among the student. The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about business economics. The outcome of the course will be as follows –		
To provide knowledge about business economics. To provide knowledge about Demand Analysis. To Determine Production and cost analysis. To Make aware with pricing and profit management.		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	IntroductiontoBusinessEconomics:NatureandScopeofBusinessEconomics,its relationshipwithothersubjects.FundamentalEconomicTools-Opportunitycost concept, Incremental concept, Principle of time perspective, discounting principle and Equi-marginal principle.	6
<b>II</b>	Demand Analysis: Concept of Demand & its determinants. Price, Income & Substitution effects, Elasticity of demand: meaning, types, measurement and significance in managerial decisions, Revenue concepts, Conceptofdemandforecastingandmethodsofdemandforecasting.	8
<b>III</b>	Production and Cost Analysis: Meaning, Production function, Law ofvariable proportion and laws of return to scale, Various cost concepts and classification, Cost outputrelationshipinshortrun&longrun,Costcurves,Economicsanddiseconomies ofscale.	7
<b>IV</b>	Pricing: Nature of market, Types of markets and their characteristics, Pricing under different market structures–Perfect, Monopoly, Oligopoly and Monopolistic competition, Price discrimination under monopoly competition. Profit Management & Inflation: Profit, Functions of profit, Profit maximization, Break even analysis. Elementary idea of Inflation	9
<b>SuggestedReadings:</b>		
1. Varsney&Maheshwari,ManagerialEconomics 2. MotePaul&Gupta,ManagerialEconomics:Concepts&cases 3. D.N.Dwivedi,ManagerialEconomics 4. D.C.Huge,ManagerialEconomics 5. 5.Peterson&Lewis,ManagerialEconomics		
SuggestedContinuousEvaluationMethods: InadditiontothetheoreticalinputsthecoursewillbedeliveredthroughAssignments,Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
Suggestedequivalentonlinecourses:.....		
FurtherSuggestions:.....		

Programme/Class:Degree	Year:First	Semester:First
Course/paper-1(B)		
CourseCode:BBN-102	CourseTitle:BasicAccounting	
<b>Courseoutcomes:</b>		
The aimof the course isto build knowledge and understandingprinciples of accountingamong the students. The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about Accounting. The outcome of the course will be as follows –		
ToIntroduceaboutAccountingPrinciplesandotheraspects ofaccounting.To provide knowledge about rectification of errors.		
To make able about valuation of stocks. To make aware with share and Debenture.		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	Introduction: Meaning and process of accounting, Basic terminology of accounting, Difference between accounting & book keeping. Importance & limitations of accounting, Varioususersofaccountinginformation,AccountingPrinciples: Conventions&Concepts.	6
<b>II</b>	Accounting equation, Dual aspect of accounting, Types of accounts, Rulesof debit& credit, Preparation of Journal and Cash book including banking transactions, Ledger andTrial balance, Subsidiary books of accounts. Rectification of errors, Preparation of bank reconciliation statement, Bills of exchange and promissory notes.	10
<b>III</b>	Valuationofstocks,Accountingtreatmentofdepreciation,Reservesandprovisions, Preparationoffinalaccountsalongwithadjustment entries.	8
<b>IV</b>	Issueofsharesanddebentures,Issueofbonussharesandrightissue,Redemptionof preferencesharesanddebentures.	6
<b>SuggestedReadings:</b>		
1. AgarwalB.D.,AdvancedAccounting		
2. Chawla&Jain,FinancialAccounting		
3. ChakrawartiK.S.,AdvancedAccounts.		
4. GuptaR.L.&Radhaswamy,FundamentalsofAccounting		
5. Jain&Narang,AdvancedAccounts		
<b>SuggestedContinuousEvaluationMethods:</b>		
InadditiontothetheoreticalinputthecoursewillbedeliveredthroughAssignments,Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
Suggestedequivalentonlinecourses:.....		
FurtherSuggestions:.....		

Programme/Class:Degree		Year:First	Semester:First
Course/paper-2(A)			
CourseCode:BBN-103		CourseTitle:Business Statistics	
<b>Courseoutcomes:</b>			
The aim of the course is to build knowledge and understanding of Business Statistics among the student. The course seekstogivedetailedknowledgeaboutthesubjectmatterbyinstillingthembasicideasaboutBusiness Statistics. The outcome of the course will be as follows –			
To provide knowledge about basic concepts of Statistics. To provide knowledge measurement of central tendency.To give an overview of correlation and regression analysis. To make Able to know the sampling and probability.			
Credits:3		Compulsory	
Max.Marks:25+75		Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0			
<b>Unit</b>	<b>Topics</b>		<b>No. of Lectures Total=30</b>
<b>I</b>	Introduction:Concept,features,significance&limitationsofstatistics,Typesofdata, Classification&Tabulation,Frequencydistribution&graphicalrepresentation.		6
<b>II</b>	Measures of Central Tendency (Mean, Median, Mode), Measures of Variation (Range, Quartile Deviation, Mean Deviation and Standard Deviation), Significance & properties of a good measure of variation, Measures of Skewness & Kurtosis.		8
<b>III</b>	Correlation and Regression: Meaning and types of correlation, Simple correlation, Scatter diagram method, Karl Pearson's Coefficient of correlation, Significance of correlation, Regression concept, Regression lines, Regression equations and Regression coefficient.		8
<b>IV</b>	Probability: Concept, Events, Addition Law, Conditional Probability, Multiplication Law & Baye's theorem [Simple numerical]. Probability Distribution: Binomial, Poisson and Normal. Sampling: Method of sampling, Sampling and non-sampling errors, Test of hypothesis, Type-I and Type-II Errors, Large sample tests.		8
<b>Suggested Readings:</b>			
1 Gupta, S.P. & Gupta, M.P., Business Statistics 2. Levin, R.I., Statistics for Management 3. Feud, J.E., Modern Elementary Statistics 4. Elhance, D.N., Fundamentals of Statistics 5. Gupta, C.B., Introduction of Statistical Methods			
<b>Suggested Continuous Evaluation Methods:</b>			
In addition to the theoretical input the course will be delivered through Assignments, Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.			
<b>Suggested equivalent online courses:</b> .....			
<b>Further Suggestions:</b> .....			

Programme/Class:Degree	Year:First	Semester:First
Course/paper-2(B)		
CourseCode:BBN-104	CourseTitle:PrinciplesofManagement	
<b>Courseoutcomes:</b>		
The aim of the course is to build knowledge and understanding about principles of management among the student. The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about management. The outcome of the course will be as follows – To provide knowledge about management and its principles. To provide knowledge about Managerial functions. To make aware with management thinkers and their contributions.		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No.ofLectures Total=30</b>
<b>I</b>	Introduction: Concepts, objectives, nature, scope and significance of management, Contribution of Taylor, Weber and Fayol in management, Management Vs. administration..	6
<b>II</b>	Planning: Concept, objectives, nature, importance and limitations of planning, planning process Concept of Decision Making and its Importance, forms, techniques and process.	8
<b>III</b>	Organizing: Concept, objectives, nature of organizing, Types of Organization, Delegation of authority, Authority and responsibility, Centralization and Decentralization, Span of Control.	6
<b>IV</b>	Directing: Concept, principles & aspects of directing, Concept and types of Coordination, Concept of leadership, Supervision, Motivation and Communication. Controlling: Concept, Principles, Process and Techniques of Controlling, Relationship between planning and controlling	10
<b>Suggested Readings:</b>		
1. Pagare Dinkar, Principles of Management 2. Prasad L.M., Principles and Practice of Management 3. Satya Narayan and Raw VSP, Principles and Practice of Management 4. Srivastava and Chuna walla, Management Principles and Practice		
<b>Suggested Continuous Evaluation Methods:</b>		
In addition to the theoretical input the course will be delivered through Assignments, Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
<b>Suggested equivalent online courses:</b>		
.....		
<b>Further Suggestions:</b>		
.....		

Programme/Class:Degree	Year:First	Semester:First
Course/paper-3(A)		
CourseCode:BBN-105	CourseTitle:BusinessEthicsand Governance	
<b>Courseoutcomes:</b> TheaimofthecourseistobuildknowledgeandunderstandingBusinessEthicsamongthestudent.The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about Business Ethics. The outcome of the course will be as follows – Todevelopunderstandingofbusinessethicsandvalues. Toproviderelationshipbetweenethicsandcorporateexcellence. TogiveanoverviewaboutGandhianphilosophyandsocialresponsibility.		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No.ofLectures Total=30</b>
<b>I</b>	Introduction: Concept and nature of ethics; ethics, values and behaviour; development of ethics, relevance of ethics and values in business, Arguments against business ethics.	6
<b>II</b>	WorklifeinIndianPhilosophy:Indianethosforworklife,Indianvalues for the work place, Work-life balance, Ethos of Vedantain management,Hierarchismasanorganizationalvalue.	8
<b>III</b>	RelationshipbetweenEthics&CorporateExcellence,CorporateMission Statement, Code of Ethics, Organizational Culture, TQM. Gandhian Philosophy of Wealth Management, Philosophy of Trusteeship, Gandhiji's Seven Greatest Social Sins, Concept of knowledgemanagementandwisdommanagement.	8
<b>IV</b>	CorporateSocialResponsibility-SocialResponsibilityofbusiness withrespecttodifferentstakeholders,ArgumentsforandagainstSocial responsibility of business, Social Audit.	8
<b>SuggestedReadings:</b> 1. KaurTripat, Values&EthicsinManagement, GalgotiaPublishers. 2. ChakrabortyS.K., HumanvaluesforManagers 3. McCarthy,F.J., BasicMarketing 4. ChakrabortyS.K., EthicsinManagement:AVedanticPerspective, OxfordUniversityPress.		
SuggestedContinuousEvaluationMethods: InadditiontothetheoreticalinputthecoursewillbedeliveredthroughAssignments, Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
Suggestedequivalentonlinecourses: .....		
FurtherSuggestions: .....		



Programme/Class: Degree	Year:First	Semester:First
Course/paper-3(B)		
CourseCode:BBN-106	CourseTitle:ComputerApplications	
<b>Courseoutcomes:</b> Theaimofthecourseistobuildknowledge,understandingComputerApplicationsamongthestudent.The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about Computer Applications. The outcome of the course will be as follows – To provide knowledgeaboutcomputeranditsapplication. To provide knowledgeaboutcomponentsandworkingoncomputer. To give an overviewaboutsoftwaresystemandDatabase management.		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	Computer: An Introduction, Computers in Business. Elements of Computer system, Indian computing Environment, Management of data processing systems in Business organizations, Programmes development cycle, flow charting, Input Output analysis Programming Concept, Software Development process.	8
<b>II</b>	Components of a computer system, Generation of computer and computer languages, personal computers in Business, PC-software Packages, AnIntroduction to Disk. Operating system and windows, GUI,Othersystemsoftwares.	7
<b>III</b>	Text Processing, software, Introduction to spreadsheet software, creation of spreadsheet application, Range, formulas, function data base functions in spreadsheet,Graphicsonspreadsheet,modesofdataprocessing,Reportgeneration, Presentationgraphics,Creating a presentation.	7
<b>IV</b>	Computer software system, software development process, files design & Report design, Data files types, Master & Transaction file. Data Hierarchy& data file structure, Use of files in Programming. Relevance of Data base management system, data base manager, data communication,networking,LAN&WAN,RealTimeSharing,On line&off lineprocessing.	8
<b>SuggestedReadings:</b> 1. P.K.Sinha&P.Sinha,ComputerFundamentals,BPBPublication 2. V.Rajaraman,ComputerFundamentals,PHI 3. Tannenbaum,ComputerApplicationsandNetworks 4. 'O'Brien,ManagementInformationSystems		
<b>SuggestedContinuousEvaluationMethods:</b> InadditiontothetheoreticalinputthecoursewillbedeliveredthroughAssignments,Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
<b>Suggestedequivalentonlinecourses:</b> .....		
<b>FurtherSuggestions:</b> .....		

## **BBA I SEM Syllabus PYTHON (BBN-106A)**

### **CO: COURSE OBJECTIVES**

**CO-1** Develop a foundational understanding of Python programming concepts, including syntax, data types, and control structures.

**CO-2** Apply logical and computational thinking to solve real-world business problems through Python programming.

**CO-3** Understand and apply basic principles of object-oriented programming (OOP) in Python to develop modular and reusable code.

**CO-4** Explore how Python can be integrated with business tools and platforms, such as databases and APIs, to enhance data-driven decision-making.

### **Course Contents**

**Unit I: Introduction to Python:** Overview of Python: History, features, and applications in business.

Setting Up the Environment: Installation of Python and IDEs (e.g., Anaconda, Jupyter Notebook).

Basic Syntax and Data Types: Variables, data types (integers, floats, strings), and type conversion.

Control Structures: Conditional statements (if, else, elif) and loops (for, while).

**Unit II: Data Structures and Functions Lists and Tuples:** Creation, manipulation, and common methods.

Dictionaries and Sets: Key-value pairs, set operations, and their applications. Functions: Defining functions, parameters, return values, and scope. Modules and Packages: Importing modules and using built-in libraries.

**Unit III: Data Manipulation and Analysis:** Introduction to Libraries: Overview of NumPy and Pandas.

DataFrames and Series: Creating, manipulating, and analyzing data using Pandas. Data Cleaning and Preparation: Handling missing values, data types, and filtering data. Basic Statistical Analysis: Descriptive statistics and data summarization techniques.

**Unit IV Data Visualization:** Introduction to Data Visualization: Importance and principles of effective visualization.

Matplotlib and Seaborn: Creating plots (line, bar, histogram, scatter) using Matplotlib; advanced visualizations with Seaborn.

Visualizing Business Data: Practical examples of visualizing sales, performance metrics, and other business-related data.

**Unit V: Practical Applications and Projects:** Automation with Python: Writing scripts for data entry, report generation, and other business tasks.

Introduction to APIs: Fetching and using data from web APIs relevant to business. Capstone Project: Working on a project that incorporates data analysis and visualization to solve a real-world business problem.

Collaboration and Version Control: Introduction to Git for project management and collaboration.

**Suggested Readings:**

1. *"Python Programming: A Modular Approach"* by Reema Thareja
2. *"Introduction to Computing and Problem Solving with Python"* by D. S. Malik
3. *"Data Science Using Python and R"* by Chaurasia, S.
4. *"Python for Data Analysis"* by Wes McKinney (Indian Edition)

### **COURSE OUTCOMES-**

**COs-1** Demonstrate proficiency in Python programming fundamentals, including syntax, data types, and control structures.

**COs-2** Utilize Python libraries such as Pandas and NumPy to manipulate, analyze, and visualize data relevant to business scenarios.

**COs-3** Develop scripts to automate repetitive business tasks, enhancing operational efficiency and productivity..

**COs-4** Understand and apply the principles of object-oriented programming (OOP) to design and implement modular and reusable code.

# BBA I sem Syllabus

## FUNDAMENTALS OF COMPUTER (BBN-106 B)

### CO: COURSE OBJECTIVES

**CO-1** Acquire a foundational knowledge of computer hardware, software, and the principles of operation.

**CO-2** Gain familiarity with various operating systems (e.g., Windows, macOS, Linux) and their functionalities, including file management and system navigation.

**CO-3** Develop proficiency in using common business application software, such as word processors, spreadsheets, and presentation tools

**CO-4** Recognize the importance of cybersecurity, data protection, and safe online practices to mitigate risks in a digital environment.

### *Course Contents*

**Unit I: Introduction to Computers:** Overview of Computers: Definition, types (desktop, laptop, tablet), and components (hardware and software). Computer Architecture: Basic components (CPU, memory, storage) and their functions. Operating Systems: Introduction to operating systems (Windows, macOS, Linux), their functions, and user interfaces. Basic Terminology: Understanding key terms (software, hardware, networks, data).

#### **Unit II: Application Software:**

Word Processing: Introduction to MS Word or Google Docs; formatting, editing, and document management.

Spreadsheets: Overview of MS Excel or Google Sheets; basic formulas, functions, data analysis, and visualization

Presentation Software: Creating presentations using MS PowerPoint or Google Slides; design principles and effective communication

Database Basics: Introduction to database concepts; using basic features of MS Access or Google Sheets for data management.

**Unit III: Internet and Networking:** Understanding the Internet: What is the internet? Components and functioning (ISP, web browsers). Web Technologies: Basics of web applications, websites, and cloud computing.

Networking Concepts: Introduction to local area networks (LAN), wide area networks (WAN), and network protocols. Online

Communication Tools: Overview of email, instant messaging, and collaboration tools (e.g., Slack, Zoom).

**Unit IV: Cybersecurity and Ethics:** Cybersecurity Fundamentals: Importance of cybersecurity; common threats (viruses, phishing, malware). Data Protection: Best practices for securing data, including passwords and encryption. Ethics in

Computing: Understanding digital ethics, privacy issues, and the implications of technology in society. Legal Aspects:

Overview of laws related to data protection and intellectual property

**Unit V: Introduction to Programming Concepts:** Basic Programming Logic: Understanding algorithms, flowcharts, and

pseudocode. Introduction to Programming Languages: Overview of programming languages (Python, Java) and their

applications in business. Hands-On Programming: Simple coding exercises to reinforce concepts (if applicable). Problem-

Solving with Computers: Applying programming concepts to solve basic business problems.

#### **Suggested Readings:**

1. *"Fundamentals of Computers"* by V. Rajaraman

2. *"Computer Science with Python"* by S. D. Sharma

3. *"Fundamentals of Information Technology"* by R. S. Salaria Rani

4. *"Information Technology: Principles and Practices"* by K. K. Jain

#### **COURSE OUTCOMES-**

**COs-1** Demonstrate a foundational understanding of computer hardware, software, and basic architecture.

**COs-2** Utilize common business application software (e.g., word processors, spreadsheets, and presentation tools) effectively for various tasks.

**COs-3** Discuss ethical issues related to technology use, including privacy, intellectual property, and responsible digital citizenship.

**COs-4** Apply computational thinking to analyze business scenarios and develop technology-driven solutions.

## BBA I sem Syllabus

### COMPUTER SYSTEM SECURITY (BBN-106 C)

#### CO: COURSE OBJECTIVES

**CO-1** Acquire a foundational knowledge of computer security concepts, including types of threats, vulnerabilities, and attack vectors..

**CO-2** Develop the ability to design and implement basic security controls and policies to protect information assets.

**CO-3** Understand network security protocols and tools, including firewalls, intrusion detection systems, and secure communication methods.

**CO-4** Gain skills in developing and executing incident response plans to effectively handle security breaches and incidents.

#### Course Contents

**Unit I: Introduction to Computer Security:** Overview of Computer Security: Definition, importance, and key concepts.

Types of Threats: Malware, phishing, social engineering, insider threats, and physical threats.

Security Vulnerabilities: Common vulnerabilities in hardware, software, and networks. Basic Security Principles:

Confidentiality, integrity, availability, and authentication.

**Unit II: Risk Management and Security Policies:** Word Processing: Introduction to MS Word or Google Docs; formatting,

editing, and document management. Spreadsheets: Overview of MS Excel or Google Sheets; basic formulas, functions, data

analysis, and visualization Presentation Software: Creating presentations using MS PowerPoint or Google Slides; design

principles and effective communication .Database Basics: Introduction to database concepts; using basic features of MS

Access or Google Sheets for data management.

**Unit III: Network Security:** Network Security Fundamentals: Understanding network architecture and common security

threats .Firewalls and Intrusion Detection Systems: Types, configurations, and best practices.

Secure Communication Protocols: HTTPS, SSL/TLS, VPNs, and secure email practices. Wireless Security: Security

measures for Wi-Fi networks and mobile devices.

**Unit IV: Data Protection and Cryptography:** Data Protection Strategies: Encryption methods, secure data storage, and

backup solutions. Cryptographic Techniques: Symmetric and asymmetric encryption, hashing, and digital signatures .Data

Loss Prevention: Strategies for preventing data breaches and loss.

Incident Response Planning: Developing incident response plans and handling breaches.

**Unit V Emerging Threats and Security Trends:** Current Cyber Threat Landscape: Overview of recent attacks and trends in

cybersecurity. Social Media and Cybersecurity: Risks associated with social media use in business.

Cloud Security: Security considerations for cloud computing and storage. Future Trends: Emerging technologies (AI, IoT)

and their impact on security.

#### Suggested Readings:

1. "*Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*" by Nina Godbole and Sunit Belapure

2. "*Computer Security: Principles and Practice*" by William Stallings and Lawrie Brown

3. "*Ethical Hacking and Penetration Testing Guide*" by G. R. S. Rao

4. "*Information Security: A Practical Guide to Data Security*" by S. K. Singh

#### COURSE OUTCOMES-

**COs-1** Demonstrate a clear understanding of key concepts in computer security, including threats, vulnerabilities, and security policies.

**COs-2** Effectively identify, analyze, and prioritize risks to information systems and propose appropriate mitigation strategies.

**COs-3** Develop and implement basic security measures and policies to safeguard organizational information assets.

Recognize the legal and ethical considerations surrounding cybersecurity, including compliance with relevant regulations and standards.

**COs-4** Apply computational thinking to analyze business scenarios and develop technology-driven solutions.

## Year-1/Semester-II

SL.No.	Subject Code	Subject Name	Credit
1	BBN-201	Organization Behaviour	4
2	BBN-202	Business Finance	4
3	BBN-203	Human Resource Development	4
4	BBN-204	Marketing Theories & Practices	4
5	BBN-205	Business Mathematics	4
6	BBN-206/BBN-206A/BBN-206B/BBN-206C/BBN-206D	Advertising Management/ Fundamentals of Communication/Spreadsheet Essentials/Critical Thinking & Story Telling/ Critical Thinking for Decisions at Workplace	4
		<b>Total</b>	24

Programme/Class:Degree	Year:First	Semester:Second
Course/paper-4(A)		
CourseCode:BBN-201	CourseTitle:Organisational Behavior	
<b>Courseoutcomes:</b>		
<p>The aim of the course is to build knowledge and understanding of Organisational Behavior among the student. The course seeks to give detailed knowledge about the subject matter by instilling them basicideasabout Organisational Behavior. The outcome of the course will be as follows – To provide knowledge about Organisational Behavior.</p> <p>To provideknowledgeaboutindividualandgroupbehaviour.To givean overview about change in organization and QWL.</p>		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	No. of Lectures Total=30
<b>I</b>	Introduction:NatureandscopeofOB,Challengesandopportunities forOB,OrganizationGoals,ModelsofOB,ImpactofGlobalandCulturaldiversityonOB.	7
<b>II</b>	IndividualBehavior:concept,Personality,Perceptionanditsroleinindividualdecision making, Learning,Motivation,Hierarchyofneedstheory,TheoryXandY,Motivation-Hyginetheory, Vroom'sexpectancytheory.	8
<b>III</b>	BehaviorDynamics: Interpersonal behavior, Communication, TransactionAnalysis, The Johari Window, Leadership, Its Theories and prevailing leadership styles in Indian Organisations. Group Behavior: Definition and classification of Groups, Types of Group Structures, Group decision making, Teams Vs Groups, Contemporary issues in managing teams, Inter-group problems in organizational group dynamics, Management of conflict.	8
<b>IV</b>	Management of Change: Change and Organisational development, Resistance to change, Approaches to managing organizational change, Organisational effectiveness, Organisational culture, Power and Politics inOrganisation, Quality of work life, Recent advances in OB.	7
<b>SuggestedReadings:</b>		
<ol style="list-style-type: none"> <li>1 Bennis, W. G., Organisation Development</li> <li>2. Breech Islwar, Oragnaistion-The Framework of Management</li> <li>3. Dayal, Keith, Organisational Development</li> <li>4. Sharma, R. A., Organisational Theory and Behavior</li> <li>5. Prasad, L. M., Organisational Behavior</li> </ol>		
<b>SuggestedContinuousEvaluationMethods:</b>		
In addition to the theoretical input the course will be delivered through Assignments, Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
Suggested equivalent online courses: .....		
Further Suggestions:		
.....		

Programme/Class:Degree	Year:Second	Semester:Second
Course/paper-4(B)		
CourseCode:BBN-202	CourseTitle: BusinessFinance	
<b>Courseoutcomes:</b> TheaimofthecourseistobuildknowledgeandunderstandingofBusinessFinanceamongthestudent.Thecourse seeks to give detailed knowledge about the subject matter by instilling them basic ideas about Business Finance. The outcome of the course will be as follows – To provide knowledge aboutbusiness finance and investment decisions. Toprovide knowledge about financing and dividend decision. Togiveanoverviewaboutworkingcapital.		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No.ofLectures Total=30</b>
<b>I</b>	Introduction to Business Finance: Concept of Business Finance and Financial management, Finance functions, objectives of financial management- Profitability vs. Shareholder wealth maximization. Time Value of Money - Compounding & Discounting. InvestmentDecisions:CapitalBudgeting-Payback,NPV,IRRandARR methods and their practical applications.	10
<b>II</b>	Financing Decision: Capitalization Concept, Basis ofCapitalization, consequences and remedies of over and under capitalization, Cost of Capital,WACC,DeterminantsofCapitalstructure,Capitalstructure theories.	7
<b>III</b>	DividendDecision:Concept&relevanceofdividenddecision, Dividend Models-Walter's, Gordon's and MM Hypothesis, Dividend policy-determinants of dividend policy..	7
<b>IV</b>	ManagementofWorkingCapital:Conceptsofworkingcapital, Approachestothe financingofcurrent Assets,Managementofdifferent components of working capital.	6
<b>SuggestedReadings:</b> 1. MaheshwariS.N.,FinancialManagement 2. KhanandJain,Financial Management 3. SinghH.K.,BusinessFinance		
SuggestedContinuousEvaluationMethods: InadditiontothetheoreticalinputsthecoursewillbedeliveredthroughAssignments,Presentation, GroupDiscussions.Thiswillinstillinstudentasenseofdecisionmakingandpractical learning.		
Suggestedequivalentonlinecourses: .....		

Programme/Class:Degree	Year:Year:First	Semester:Second
Course/paper-5(A)		
CourseCode:BBN-203	CourseTitle: HumanResource Development	
<p><b>Courseoutcomes:</b>  TheaimofthecourseistobuildknowledgeandunderstandingofHumanResourceDevelopmentamongthe student.  The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about Human Resource Development. The outcome of the course will be as follows –  To provide knowledge about HRD concepts and other aspects. To provide knowledge about potential appraisal.  To give an overview about Job Enrichment and Quality circles. To make aware with human resource accounting.</p>		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No.ofLectures Total=30</b>
<b>I</b>	HRD:Concept,importance,benefitsanditsdistinctionfromHRM,focus of HRD System, Structure of HRD System, Role of HRD manpower.ManagementDevelopment:Concept,need,management developmentmethods.	7
<b>II</b>	Potential Appraisal: Concept, need, objectives, methods and Obstacles. Training: Meaning, role, assessing needs for training, organizing training programmes, training methods, evaluation of Training.	7
<b>III</b>	Job Enrichment: Concept, Principles, steps for job enrichment, hurdles in job enrichment, making job enrichment effective, job and work redesign. Quality Circles: Concept, structure, training in quality circle, problem solving techniques, role of management, trade union and workers,qualitycirclesin India.	10
<b>IV</b>	HRA: Introduction, scope, limitations, methods. Management of careers. Stress Management: Definition, potential, sources of stress, consequences of stress, managing stress.	6
<p><b>SuggestedReadings:</b>  1. DipakKumarBhattacharya,HumanResourceManagement  2. ArunMonappa,ManagingHumanResource  3. P.SubbaRao,EssentialofHRMandIndustrialRelations  4. C.B.Memoria,PersonnelManagement</p>		
<p><b>SuggestedContinuousEvaluationMethods:</b>  InadditiontothetheoreticalinputsthecoursewillbedeliveredthroughAssignments,Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.</p>		



Programme/Class:Degree	Year:Year:First	Semester:Second
Course/paper-5(B)		
CourseCode:BBN-204	CourseTitle: MarketingTheoryandPractices	
<p><b>Courseoutcomes:</b>  The aim of the course is to build knowledge and understanding of Marketing management among the student. The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about Marketing Theory and Practices. The outcome of the course will be as follows–  To provide knowledge about Marketing Theory and Practices.  To provide knowledge about market segmentation and marketing mix. To give an overview about marketing research.</p>		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No.ofLectures Total=30</b>
<b>I</b>	Introduction to Marketing: Definition, nature, scope & importance of Marketing Management, Core concepts of marketing: selling concept, production concept, modern marketing concept, societal marketing.	7
<b>II</b>	Market segmentation: Concept, basis of segmentation, its importance in marketing; Targeting: Concept, Types, Importance; Positioning: Concept, Importance, Brand positioning, Repositioning.	7
<b>III</b>	Marketing Mix: Product – Product Mix, New Product development, types of product, Product life cycle, Branding and packaging. Distribution – Concept, importance, different types of distribution Channels. Marketing Mix: Price – Meaning, objective, factors influencing pricing, methods of pricing Promotion – Promotional mix, tools, objectives, media selection & management	9
<b>IV</b>	Marketing Research: Importance, Process & Scope. Marketing Information System: Meaning, Importance and Scope. Consumer Behaviour: Concept, Importance and factors influencing consumer Behaviour.	7
<p><b>Suggested Readings:</b>  1. Philip Kotlar, Marketing Mgt. (PHI)  2. Etzet, Walker, Stanton, Marketing  3. Rajan Saxena, Marketing Management</p>		
<p>Suggested Continuous Evaluation Methods:  In addition to the theoretical input the course will be delivered through Assignments, Presentation, Group Discussions. This will instill in students a sense of decision making and practical learning.</p>		
<p>Suggested equivalent online courses:  .....</p>		
<p>Further Suggestions:  .....</p>		

Programme/Class:Degree	Year:Year:First	Semester:Second
Course/paper-6(A)		
CourseCode:BBN-205	CourseTitle: BusinessMathematics	
<b>Courseoutcomes:</b>		
The aim of the course is to build knowledge and understanding of Business Mathematics among the student. The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about Business Mathematics. The outcome of the course will be as follows – To provide knowledge about Mathematics and its use in business. To make able about mathematical calculations. To learn about the use of set theory and calculus in business.		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No.ofLectures Total=30</b>
<b>I</b>	Matrix: Introduction, Square Matrix, Row Matrix, Column Matrix, Diagonal Matrix, Identity Matrix, Addition, Subtraction & Multiplication of Matrix, Use of Matrix in Business, Mathematical Induction. Inverse of Matrix, Rank of Matrix, Solution to a system of equation by the ad-joint matrix methods & Guassian Elimination Method.	9
<b>II</b>	Percentage, Ratio and Proportion, Average, Mathematical Series- Arithmetic, Geometric & Harmonic, Simple Interest & Compound Interest	8
<b>III</b>	Set theory: Notation of Sets, Singleton Set, Finite Set, Infinite Set, Equal Set Null Set, Subset, Proper Subset, Universal Set, Union of Sets, Intersection of Sets, Use of set theory in business, Permutation & Combination.	7
<b>IV</b>	Concept of Differentiation and Integration, Maxima and Minima in Differentiation, Application of Differentiation & Integration in Business (No proof of theorems, etc.)	6
<b>Suggested Readings:</b>		
1. Mehta & Madnani, Mathematics for Economics 2. Mongia, Mathematics for Economics 3. Zamiruddin, Business Mathematics 4. Raghavachari, Mathematics for Management		
<b>Suggested Continuous Evaluation Methods:</b>		
In addition to the theoretical input the course will be delivered through Assignments, Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
<b>Suggested equivalent online courses:</b> .....		
<b>Further Suggestions:</b> .....		

Programme/Class:Degree	Year:Year:First	Semester:Second
Course/paper-6(B)		
CourseCode:BBN-206	CourseTitle: AdvertisingManagement	
<b>Courseoutcomes:</b> The aim of the course is to build knowledge and understanding of advertisement among the student. The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about advertisingManagement. The outcome of the course will be as follows – To provide knowledge about advertisement and its use in business. To make able about advertisement concept and its management. To learn about the use of advertisement in business.		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No.ofLectures Total=30</b>
<b>I</b>	Advertising: Introduction, Scope, importance in business : Role of advertising in social and economic development of India: Ethics and truths in Indian Advertising.	9
<b>II</b>	Integrated Communication Mix (IMC)-meaning, importance; Communication meaning, importance, process, communication mix - components, role in marketing, Branding-meaning, importance in advertising.	8
<b>III</b>	Promotional objectives – importance determination of promotional objectives, setting objective DAGMAR; Advertising Budget importance, establishing the budget- approaches allocation of budget.	7
<b>IV</b>	Advertising Copy-meaning components types of advertising copy, importance of creativity in advertising; Media planning-importance, strategies, media mix. Advertising research – importance, testing advertising effectiveness market testing for ads; International Advertising-importance, international Vs local advertising.	6
<b>Suggested Readings:</b> <ul style="list-style-type: none"> <li>• Advertising and Promotion George E. Beich &amp; Michael A. Belch. T.M.H.</li> <li>• Advertising Management, Concept and Cases Manendra Mohan, TMH</li> <li>• Advertising Management Rajeev Batra, PHI</li> </ul>		
<b>Suggested Continuous Evaluation Methods:</b> In addition to the theoretical input the course will be delivered through Assignments, Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
<b>Suggested equivalent online courses:</b> .....		
<b>Further Suggestions:</b> .....		

## BBA II sem Syllabus

### Fundamentals of Communication (BBN-206 A)

#### CO: COURSE OBJECTIVES

**CO-1**Analyze key communication theories and their relevance to business practices.

**CO-2** Enhance verbal communication skills through effective speaking and active listening practices.

**CO-3**Create and deliver engaging presentations using appropriate tools and techniques.

**CO-4**Gain proficiency in digital communication tools and platforms.

#### Course Contents

**Unit I: Introduction to Communication:** Definition and importance of communication in business

Communication models and processes Barriers to effective communication

**Unit II: Verbal and Non-Verbal Communication:** Elements of verbal communication: tone, clarity, and style

Importance of active listening Non-verbal communication: body language, facial expressions, and gestures.

**Unit III: Written Communication**Principles of professional writing: clarity, conciseness, and coherence

Formats for business communication: emails, reports, memos, and proposals Tailoring messages for different audiences

**Unit IV: Presentation and Public Speaking Skills:** Preparing and organizing presentations

Using visual aids and technology effectively overcoming public speaking anxiety and engaging the audience

**Unit V: Interpersonal and Team Communication:**Effective communication in teams: roles and responsibilities Conflict

resolution and negotiation strategies Cultural awareness and communication in diverse teams.

#### Suggested Readings:

1 "*Business Communication*" by P.D. Chaturvedi and Mukesh Chaturvedi

2 "*Business Communication: A Guide to Writing and Speaking*" by V. R. S. Seshadri

3 "*Corporate Communication*" by T. S. Raghunath

4 "*Business Communication: A Hands-on Approach*" by Neeraja M. Raghavan

#### COURSE OUTCOMES-

**COs-1**Students will demonstrate effective verbal and non-verbal communication skills in various business contexts, enhancing their ability to convey information clearly and persuasively.

**COs-2**Students will produce well-structured and professionally written documents, including emails, reports, and proposals, tailored to specific audiences and purposes.

**COs-3**Students will recognize and adapt communication styles to accommodate cultural differences, enhancing their effectiveness in diverse business environments..

**COs-4**Students will effectively utilize various digital communication tools and platforms, understanding their impact on business communication practices..

## BBA II sem Syllabus

### SPREADSHEET ESSENTIALS (BBN-206 B)

#### CO: COURSE OBJECTIVES

**CO-1** Familiarize students with the basic structure, features, and functionalities of spreadsheet software (e.g., Microsoft Excel, Google Sheets).

**CO-2** Equip students with skills to analyze data using sorting, filtering, and pivot tables, allowing them to draw meaningful insights from datasets.

**CO-3** Familiarize students with scenario analysis tools such as data tables and goal seek to make informed business decisions based on variable changes.

**CO-4** Encourage students to apply critical thinking skills to solve business problems using spreadsheets, enhancing their analytical capabilities.

#### Course Contents

**Unit I: Introduction to Spreadsheets:** Overview of Spreadsheet Software:

Introduction to Microsoft Excel and Google Sheets Differences and similarities between platforms Understanding ribbons, toolbars, and menus Navigation basics: rows, columns, and cells.

**Unit II: Formulas and Functions:** Understanding formula structure and operator precedence

Using relative vs. absolute references Debugging formulas and handling errors Utilizing SUM, AVERAGE, COUNT, COUNTA, MAX, and MIN Exploring date and time functions (TODAY, NOW, DATE, DATEDIF).

**Unit III: Data Analysis and Management:** Data Organization Techniques Sorting data in ascending and descending order Filtering data using basic and advanced filters Introduction to Pivot Tables Creating and modifying pivot tables

Understanding row/column labels, values, and filters Pivot charts for data visualization Data Validation and Error Checking Setting up data validation rules for input control .Using drop-down lists and error messages .Techniques for error checking and correcting data Conditional Formatting Applying conditional formatting rules. Using color scales, data bars, and icon sets for visual insights.

**Unit IV: Data Visualization** Chart Types and Their Applications Overview of different chart types: bar, line, pie, scatter, and more .Understanding when to use specific chart types for data representation Creating and Customizing Charts Step-by-step guide to creating charts from data Customizing chart elements: titles, legends, labels, and colors Dashboard . Creation Principles of effective dashboard design .Integrating multiple charts and data visualizations in one view .Best Practices for Presenting Data Guidelines for visual clarity and impact. Techniques for storytelling with data in presentations.

**Unit V: Advanced Features and Applications:** Utilizing Goal Seek for target value analysis, Creating data tables for scenario comparison, Basics of macros: recording and editing .Practical applications of macros for repetitive tasks.

**Suggested Readings:**

1 "Excel 2019 for Dummies" by Greg Harvey

2 "Advanced Excel for Productivity" by Dinesh Kumar

3 "Practical Excel for Financial Analysts" by Rajesh K. K.

4 "Data Analysis Using Excel" by R. K. Gupta

#### COURSE OUTCOMES-

**COs-1** Students will demonstrate competence in using spreadsheet applications (e.g., Microsoft Excel, Google Sheets), navigating the user interface, and performing basic functions.

**COs-2** Students will accurately enter and format data, applying appropriate styles and techniques to enhance clarity and presentation.

**COs-3** Students will analyze datasets using sorting, filtering, and pivot tables, enabling them to derive meaningful insights for decision-making.

**COs-4** Students will demonstrate knowledge of advanced spreadsheet features, including What-If analysis, data validation, and basic macros, enhancing their analytical capabilities.

**BBAII SEM Syllabus**  
**CRITICAL THINKING AND STORY TELLING(BBN-206 C)**

**CO: COURSE OBJECTIVES**

**CO-1**Develop students' ability to analyze, evaluate, and synthesize information to make informed decisions in business contexts.

**CO-2**Teach students how to articulate ideas clearly and persuasively, both in writing and verbally, to influence stakeholders..

**CO-3**Enable students to use storytelling to enhance presentations, marketing strategies, and brand narratives to connect with customers and stakeholders.

**CO-4**Analyze case studies to identify critical thinking strategies and storytelling methods used by successful businesses.

**CourseContents**

**UnitI:Introduction to Critical Thinking:**Definition and significance of critical thinking.

Components of critical thinking: analysis, evaluation, and inference. Barriers to critical thinking..

**UnitII:Analytical Reasoning and Decision-Making:**Logical reasoning and argumentation. Decision-making models: rational, intuitive, and creative approaches. Evaluating evidence and sources. Activities: Case studies analysis. Decision-making simulation exercises.

**UnitIII:The Art of Storytelling:** Narrative structure: beginning, middle, and end. Emotional resonance and audience engagement. Types of stories: personal, corporate, and customer stories. Activities: Storytelling workshops: crafting and sharing personal narratives. Analyzing effective business stories (e.g., brand narratives).

**UnitIV:Integrating Critical Thinking and Storytelling:** Frameworks for integrating analysis into storytelling.Persuasive techniques: ethos, pathos, and logos in storytelling. Visual storytelling and its impact.

*UnitV:Ethical Considerations and Real-World Applications:Ethical dilemmas in business communication.Case studies of ethical storytelling.Final project preparation: integrating course concepts.*

**Suggested Readings:**

1. *"The Road to Success: The Story of India's Most Successful Businessmen" by Shashi Tharoor*
2. *"The Art of Thinking Clearly" by Rolf Dobelli "*
3. *"Business Sutra: A Very Indian Approach to Management" by Devdutt Pattanaik*
4. *"My Life is My Message" by Mohandas Karamchand Gandhi*

**COURSE OUTCOMES-**

**COs-1**Students will demonstrate the ability to analyze and evaluate complex business scenarios, identifying key issues and proposing logical solutions.

**COs-2**Students will apply decision-making frameworks to real-world business problems, making informed choices based on evidence and sound reasoning.

**COs-3**Students will successfully integrate critical thinking into their storytelling, crafting narratives that not only inform but also persuade and motivate.

**COs-4** Students will engage in self-reflection to assess their growth as critical thinkers and storytellers, identifying strategies for continuous improvement.

## BBA II sem Syllabus

### CRITICAL THINKING FOR DECISIONS AT WORKPLACE (BBN-206 D)

#### CO: COURSE OBJECTIVES

**CO-1** Define critical thinking and its importance in the workplace, focusing on how it enhances decision-making processes.

**CO-2** Develop skills to evaluate information sources, identify biases, and assess the validity of arguments and claims.

**CO-3** Develop skills to create actionable plans for implementing decisions, including setting objectives and measuring outcomes.

**CO-4** Encourage self-reflection on personal biases and assumptions that may influence decision-making and critical thinking.

#### Course Contents

**Unit I: Introduction to Critical Thinking:** Definition and importance in business decision-making.

Key concepts: clarity, accuracy, precision, relevance, depth, breadth, and logic. The Role of Critical Thinking in Professional Settings: Enhancing decision quality and problem-solving capabilities. Critical thinking as a skill for effective leadership and teamwork. Barriers to Critical Thinking: Identifying cognitive biases, emotional influences, and logical fallacies.

**Unit II: Problem Solving and Decision-Making Models:** Types of workplace problems: routine, complex, and crisis situations. Techniques for defining and analyzing problems. Decision-Making Models: Rational decision-making model: stages and applications. Intuitive decision-making: when to trust gut feelings. Collaborative decision-making: techniques for team-based approaches.

**Unit III: Analyzing Information and Arguments:** Distinguishing between credible and non-credible sources.

Techniques for effective research and fact-checking. Analyzing Arguments: Identifying premises and conclusions in arguments. Evaluating the validity and soundness of arguments. Logical Reasoning: Understanding deductive and inductive reasoning. Common logical fallacies and how to avoid them.

**Unit IV: Ethical Considerations in Decision-Making:** The importance of ethics in decision-making processes.

Frameworks for ethical decision-making: utilitarianism, deontological ethics, and virtue ethics.

Assessing Ethical Implications: Analyzing case studies to evaluate ethical dilemmas. Strategies for integrating ethics into critical thinking and decision-making. Developing a Personal Ethical Framework: Reflecting on personal values and their impact on decision-making.

**Unit V: Applying Critical Thinking in Real-World Scenarios:** Analyzing real-world business scenarios and decision-making challenges. Group discussions on critical thinking applications in various industries.

Role-Playing and Simulations: Engaging in role-playing exercises to practice decision-making in simulated environments.

Reflective Practices: Developing self-assessment techniques to enhance critical thinking skills over time. Creating personal action plans for continuous improvement in decision-making.

#### Suggested Readings:

1 *"Business Decision Making: A Critical Thinking Approach"* by K. R. Ramesh

2 *"Critical Thinking for Managers: A Practical Guide"* by A. K. Gupta

3 *"Rethinking Management: Critical Perspectives on the Changing Nature of Work"* by Neelam Singh

4 *"Ethics and Critical Thinking in Business"* by Varsha K.

#### COURSE OUTCOMES-

**COs-1** Students will demonstrate improved critical thinking abilities, enabling them to analyze information and arguments effectively in various business contexts.

**COs-2** Students will apply systematic problem-solving techniques to identify, analyze, and develop solutions for workplace challenges.

**COs-3** Students will recognize and apply principles of logical reasoning, avoiding common logical fallacies in their arguments and analyses.

**COs-4** Students will articulate their thoughts, rationale, and recommendations clearly and persuasively in both written and verbal formats.

BBA:SecondYearCourseStructure Third Semester

SL.No.	Subject Code	Subject Name	Credit
1	BBN-301	Management & Cost Accounting	4
2	BBN-302/ BBN-302 B/ BBN-302C	Business Law/Tax Law/ Intellectual Property Law	4
3	BBN-303	Production Management	4
4	BBN-304	Business Policy	4
5	BBN-305	Business Communication/	4
5.1	BBN-305-A	Etiquate & Convesational Skills	
5.2	BBN-305-B	Personality Development	
5.3	BBN-305-C	Corporate Communication	
5.3	BBN-305-D	Professional Communication	
6	BBN-306	Business Environment	4
6.1	BBN-306-A	Disaster Management	
6.2	BBN-306-B/BBN-306C	Food & Nutrition/Environmental Studies	
		<b>Total</b>	24



Programme/Class:BBA	Year:Second	Semester:Third
Course/paper-7(A)		
CourseCode:BBN-301	CourseTitle:Management&CostAccounting	
Courseoutcomes:Theobjective of this paperistogivethebasicknowledgeabouttheManagementand Cost accounting		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-3-0		
Unit	Topics	No. of Lectures Total=30
I	Introduction:Meaning,NatureandScopeofManagementAccounting,Functions Relationshipof ManagementAccounting, FinancialAccounting andCost Accounting	8
II	CostAccounting:NatureandScopeofCostAccounting,Costconceptsand classifications,MethodsandTechniques,InstallationofaCostingSystem; AccountingforMaterial,LabourandOverheads	7
III	ProductCosting:Singleunitcosting-preparationofcostsheet,Processcosting, Contractcosting(Elementarynumericalproblems)	8
IV	MarginalCostingandAbsorptionCosting,Break-evenanalysis,	7
SuggestedReadings:		
1. MaheshwariS.N.,AdvancedProblemandSolutionsinCostAccounting		
2. Khan&Jain,Management Accounting		
3. Gupta,S.P.,ManagementAccounting		
SuggestedContinuousEvaluationMethods:		
.....		
Suggestedequivalentonlinecourses:		
.....		
FurtherSuggestions:		
.....		

Programme/Class:BBA	Year:Second	Semester:Third
Course/paper-7(B)		
CourseCode:BBN-302	CourseTitle:BusinessLaw	
Courseoutcomes:Theobjectiveofthispaperistogivethebasicknowledgeabouttherules and Regulation of execution of Business		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-2-1		
Unit	Topics	No. of Lectures Total=30
I	TheIndianContractAct1872:ScopeoftheAct,EssentialofA Valid Contract, Agreement, Performance of Contracts, Breachof Contract & Remedies, Quasi-Contracts	8
II	TheSaleofGoodAct,1930: FormationofContract,Conditions& Warranties,RightsOfanUnpaidSeller,PerformanceoftheContractofSale	7
III	TheNegotiableInstrumentsAct,1881:NatureandTypesofnegotiable instruments,NegotiationandAssignment,Holder-in-DueCourse,Dishonour and Discharge of Negotiable Instrument; Arbitration	8
IV	TheCompaniesAct,1956:NatureandTypeofCompanies,Formationof Companies,MemorandumandArticlesofAssociation,Prospectus,Share capital, Membership, Meetings and Winding-Up	7
SuggestedReadings: 1. AvatarSingh,Company Law 2. Khergamwalla,JS,TheNegotiableInstrumentAct 3. RamayaA,AGuidetoCompaniesAct 4. TutejaSK,BusinessLawforManagers		
SuggestedContinuousEvaluationMethods: .....		
Suggestedequivalentonlinecourses: .....		
FurtherSuggestions: .....		

## **BBAIII SEM Syllabus**

### **TAX LAW (BBN-302 B )**

#### **CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the foundational principles of tax law, with a focus on the different types of taxes, their legal basis, and their impact on individuals, businesses, and the economy.

#### **CourseContents**

**UnitI: Income Tax Law and Tax Planning-** Basic Concepts, Residential Status and Tax Incidence, Exempted Incomes, Computation of Taxable Income under Various heads Computation of Taxable Income of Individuals and firms Deduction of Tax, filling of returns, different types of assessments, default and penalties

**UnitII: Financial & Management Accounting-** Basic Accounting concepts, Capital and Revenue, Financial statements Partnership Accounts: admission, Retirement, Death, Dissolution and Cash Distribution Advanced Company Accounts: Issue, forfeiture, Purchase of Business, Liquidation, Valuation of shares, Amalgamation, Absorption and Reconstruction, Holding Company Accounts

**UnitIII: Business Statistics & Data Processing-** Data types, Data collection and analysis, sampling, need, errors and methods of Sampling, Normal distribution, Hypothesis testing, Analysis and Interpretation of Data Correlation and Regression, Sample tests- i-test, F-test and chi-square test Data processing – Elements, Data entry, Data processing and Computer Applications Computer Application to Functional Areas – Accounting, Inventory control Marketing

**UnitIV: Financial Management-** Capital Structure, Financial and Operating leverage Cost of capital; Capital budgeting Working capital management Dividend Policy

**UnitV: Accounting and Finance-** Accounting standards in India, Inflation Accounting, Human Resource Accounting, Responsibility, Social Accounting Money and Capital market, working of stock exchanges in India, NSE, OTCEI, NASDAQ, Derivatives and Options Regulatory Authorities: SEBI, Rating Agencies; New Instruments: GDRs, ADRs Venture Capital Funds, Mergers and Acquisitions, Mutual Funds, Lease Financing, Factoring, Measurements of risk and returns securities and portfolios Computer Application in accounting and Finance

#### **SUGGESTED READINGS-**

**"Principles of Taxation for Business and Investment Planning"** by Sally M. Jones and Shelley C. Rhoades-Catanach

**"Taxation of Individuals and Business Entities"** by Jeffrey A. Maine, Brian C. Spilker, William H. Hoffman, and David M. Maloney

**"Income Tax Law and Practice"** by H.C. Mehta

#### **COURSE OUTCOMES-**

**COs-1**Students will demonstrate the ability to analyze and evaluate complex business scenarios, identifying key issues and proposing logical solutions.

**COs-2**Students will apply decision-making frameworks to real-world business problems, making informed choices based on evidence and sound reasoning.

**COs-3**Students will successfully integrate critical thinking into their storytelling, crafting narratives that not only inform but also persuade and motivate.

**COs-4**Students will engage in self-reflection to assess their growth as critical thinkers and storytellers, identifying strategies for continuous improvement.

**BBIII SEM Syllabus**  
**INTELLECTUAL PROPERTY LAW (BBN-302 C )**

**CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of intellectual property (IP) law, focusing on the various types of intellectual property rights, including patents, copyrights, trademarks, and trade secrets. .

**CourseContents**

**UnitI: Introduction Origin and Development of IPR** – Historical and theoretical basis for protection of IPR – Analysing and understanding the Interpretation of IP laws – Need for Protecting IP

**UnitII: Concept of Property-** Theories on concept of property – Nature – Public Vs. Private – Tangible Vs. Intangible – Industrial Vs. Intellectual

**UnitIII:International IP Regime** -World Intellectual Property Organisation (WIPO) – Functions of WIPO – Membership – GATT Agreement – Major Conventions on IP – Berne Convention – Paris Convention – TRIPS agreement.

**UnitIV: Indian IP Regime-** Overview of IP laws in India – Major IP Laws in India – International treaties signed by India. IPR and Constitution of India.

**UnitV: Forms of IPR Forms of IPR** – Copyright – Trademark – Patents – Industrial Designs – Trade Secrets – Geographical Indications - Application of different forms of IPR.

**Reference Books**

1. International Encyclopaedia of Laws: Intellectual Property (Kluwer Law International, 1997) (looseleaf). I,MON K 1401
2. V.K.Ahuja, Law relating to Intellectual Property rights, 2
3. Barrett, Margreth, Intellectual Property, (2009) 3rd, New York
4. Nard , Craig Allen, Law of Intellectual Property, (2008) 2 nd, New York Aspen publishers

Programme/Class:BBA	Year:Second	Semester:Third
Course/paper-8(A)		
CourseCode:BBN-303	CourseTitle: Production Management	
Courseoutcomes:TheobjectiveofthispaperistogivethebasicknowledgeabouttheProduction Management in industry		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-2-1		
Unit	Topics	No. of Lectures Total=30
I	Introduction to Production Management: History of Production Management; Definitions of Production Management; Production Process; Production:TheHeartofanOrganization;ObjectivesofProduction Management;ScopeofProductionManagement;ImportanceofTechnology in Production	8
II	ConceptofForecasting;PurposeofSalesForecasting,BasicElementsof Forecasting, Importance of Forecasting, Objectives of Forecasting, Classification of Forecasting ; Qualitativeand Quantitative Techniquesof Forecasting	7
III	Product Selection; Definitions of Product Design and Development: Need for ProductDesignandDevelopment,OriginoftheProductIdeaandSelection from Various Alternatives, Choosing among Alternative Products, Modifying the Existing Products, Sources of Product	8
IV	NatureofProductionPlanningandControl(PPC):TypesofPlans,Elements ofProductionPlanning,StrategyofProductionPlanning,Aggregate Planning; Main Functions of Production Planning and Control (PPC)	7
SuggestedReadings: 1.ProductionManagementbyTelsangMartandSChandPublication		
SuggestedContinuousEvaluationMethods: .....		
Suggestedequivalentonlinecourses: .....		
FurtherSuggestions: .....		

Programme/Class:BBA	Year:Second	Semester:Third
Course/paper-8(B)		
CourseCode:BBN-304	CourseTitle:Business Policy	
Courseoutcomes: Theobjectiveof thispaperistogivethebasicknowledgeabout thebusinessPolicyin Business and industry		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-2-1		
Unit	Topics	No. of Lectures Total=30
I	Introduction:Nature&importanceofBusinessPolicy,Development& Classification of Business Policy; Mechanism of policy making	8
II	Responsibilities & Tasks of Top Management: Objectives of Business, Characteristics, Classification, Types of objectives and their overall Hierarchy,Settingofobjectives,Keyareasinvolved;CorporatePlanning; Concept of long term planning, Strategic Planning, Nature, Process &Importance	7
III	CorporateStrategyConcept,Components,Importance,andStrategy Formulation: Concept, Process & Affecting Factors. Strategy Evaluation: Process, Criteria, Environmental Analysis, Resource Analysis	8
IV	ConceptofSynergy:Types,EvaluationofSynergy,CapabilityProfiles, Synergy as a Component of Strategy & its relevance	7
SuggestedReadings: 1. Gluek&Jaunch,CorporateStrategy 2. Hatton&Hatton,StrategicManagement 3. Christian,Anderson,BowerBusinessPolicy 4. McCarthy,IninChiello,CurranBusinessPolicy&Strategy 5. AzharKazmi,BusinessPolicy		
SuggestedContinuousEvaluationMethods: .....		
Suggestedequivalentonlinecourses: .....		
FurtherSuggestions: .....		

Programme/Class:BBA	Year:Second	Semester:Third
Course/paper-9(A)		
CourseCode:BBN-305	CourseTitle:Business Communication	
Courseoutcomes:TheobjectiveofthispaperistogivethebasicknowledgeabouttheBusiness Communication		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-3-0		
Unit	Topics	No. of Lectures Total=30
I	Introduction:MeaningandobjectiveofBusinesscommunication,Forms of Communication,Communicationmodelandprocess,PrinciplesofEffective Communication	8
II	CorporateCommunication:FormalandInformalCommunication,Networks, Grapevine,BarriersinCommunication,Groupsdiscussion,MockInterviews, Seminars, Individual and Group Presentations	7
III	Essential of effective Business letters, Writing Important Business letters includingcorrespondencewithBankandInsurancecompanies;Oral&Non-verbal communication: Principles of Oral Presentation, Factors affecting Presentation,effectivePresentationskills,conductingSurveys;Body Language, Para Language, Effective Listening, Interviewing skill, Writing Resume, Letter and Application;	8
IV	Modernformsofcommunication,Internationalcommunication,Cultural sensitivenessand culturalcontext,Writingandpresenting in international situations	7
SuggestedReadings:		
1. Bapat&Davar,ATextbookofBusinessCorrespondence		
2. BhendeD.S.,BusinessCommunication		
3. DavidBerio,TheProcessofCommunication		
4. Gowd&Dixit,AdvanceCommercialCorrespondence		
5. GurkyJ.M.,AReaderinHumanCommunication		
SuggestedContinuousEvaluationMethods:		
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Suggestedequivalentonlinecourses:		
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FurtherSuggestions:		
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## **BBAIII SEM Syllabus**

### **Etiquate & conversation skills (BBN-305 A )**

#### **CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of etiquette and conversational skills, emphasizing their importance in both personal and professional settings. The course aims to equip students with the knowledge and practical skills needed to navigate various social and business interactions with confidence, courtesy, and respect.

#### **UnitI: Communication:**

- Importance and Purpose of Communication
- Process of Communication
- Types of Communication
- Definition, Nature and Scope of Communication

#### **UnitII: Non-Verbal Communication**

- Personal Appearance Gesture
  - Postures
  - Facial Expression
  - Eye Contacts
  - Body Language(Kinesics)
  - Time language
  - Silence
  - Tips for Improving Non-Verbal Communication.

**UnitIII: Meeting Etiquette-** Managing a Meeting, Meeting agenda, Minute taking,; Duties of the chairperson and secretary; Effective Meeting Strategies - Preparing for the meeting, Conducting the meeting, Evaluating the meeting Presentation Etiquettes: Importance of Preparation and Practice; Effective Delivery Techniques, Audience Analysis, Handling Stage Frigh

**UnitIV: Communication Skills-** Understanding Human Communication, Constitutive Processes of Communication, Language as a tool of communication, Barriers to Effective communication, Strategies to Overcome the Barriers.

**UnitV: Teamwork and Leadership Skills-** Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills. Personality: Meaning & Definition, Determinants of Personality, Personality Traits, Personality and Organisational Behaviour Motivation: Nature & Importance, Herzberg's Two Factor theory, Maslow's Need Hierarchy theory.

#### **SUGGESTED READINGS-**

1. **"The Etiquette Advantage in Business: Personal Skills for Professional Success"** by Peggy Post and Peter Post
2. **"The Art of Conversation: A Guided Tour of a Neglected Pleasure"** by Catherine Blyth
3. **"Business Etiquette: 101 Ways to Conduct Business with Charm and Savvy"** by Peter Post



**BBAIII SEM Syllabus**  
**Personality Development (BBN-305 B )**

**CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of etiquette and personality development, focusing on how personal behavior, communication skills, and social interactions shape an individual's success in both personal and professional environments. The course aims to equip students with the tools to enhance their social grace, emotional intelligence, and self-confidence.

**CourseContents**

**UnitI: Introduction to Personality Development** -The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis.

**UnitII: Attitude & Motivation** - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages – Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self- motivation- Factors leading to de-motivation

**UnitIII: Self-esteem** -Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low selfesteem - Symptoms - Personality having low self esteem - Positive and negative self esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.

**UnitIV:Other Aspects of Personality Development-** Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management - Work ethics –Good manners and etiquette.

**UnitV: Employability Quotient-** Resume building- The art of participating in Group Discussion – Facing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

*SUGGESTED READINGS-*

1. **"How to Win Friends and Influence People"** by Dale Carnegie
2. **"The Power of Now: A Guide to Spiritual Enlightenment"** by Eckhart Tolle
3. **"Emotional Intelligence: Why It Can Matter More Than IQ"** by Daniel Goleman

**BBA III SEM Syllabus**  
**CORPORATE COMMUNICATION (BBN-305 C )**

**CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of etiquette and corporate communication, focusing on how professional behavior and effective communication contribute to success in the workplace. The course aims to provide students with the knowledge and skills to navigate corporate environments with confidence and professionalism.

**CourseContents**

Unit 1: Introduction to Corporate Communication

**1.1 Concept of Corporate Communication**

Definition and Scope

Importance in modern business

Objectives of corporate communication

**1.2 Corporate Communication in Organizations**

Roles and functions of corporate communication

Internal vs External communication

Stakeholder communication

**1.3 Corporate Communication Process**

The communication process model

Types of corporate communication (Written, Oral, Visual, and Digital)

Barriers to communication and overcoming them

Unit 2: Corporate Communication Tools and Channels

**2.1 Communication Channels**

Traditional (Letters, Memos, Reports)

Digital Communication (Emails, Social Media, Blogs, Websites)

Face-to-face communication (Meetings, Presentations, Conferences)

**2.2 Written Communication in Corporate World**

Business writing style

Drafting corporate documents (Reports, Proposals, Press Releases)

Email etiquette and professional communication

**2.3 Public Relations (PR)**

Definition and function of PR in corporate communication

PR tools and techniques

Media relations, press conferences, and handling media inquiries

Unit 3: Organizational Communication

**3.1 Internal Communication**

Importance of internal communication

Types of internal communication (Downward, Upward, Lateral)

Tools for internal communication (Intranet, Internal Newsletters, Meetings)

**3.2 Communication Flow and Structure**

Formal vs Informal communication flow

Organizational hierarchy and communication patterns

Cross-functional and cross-cultural communication

**3.3 Leadership Communication**

Role of leadership in organizational communication

Communication strategies for managers and leaders

Decision-making and effective communication

Unit 4: Crisis Communication

#### **4.1 Understanding Crisis Communication**

Definition and types of business crises

The importance of crisis communication in protecting corporate reputation

Crisis communication plan

#### **4.2 Communication During Crisis**

Steps in handling crises: Preparation, Response, and Recovery

Case studies of successful and failed crisis communications

Key strategies: Transparency, Empathy, and Accountability

#### **4.3 Media and Crisis Management**

Role of media in crisis communication

Engaging with the media during a crisis

Crisis communication through press releases and public statements

Unit 5: Corporate Communication Strategies and Case Studies

#### **5.1 Corporate Communication Strategies**

Developing effective communication strategies for businesses

Aligning communication strategies with corporate goals

Measuring the effectiveness of corporate communication

#### **5.2 Branding and Communication**

The role of corporate communication in brand management

Consistency in brand messaging

Corporate identity, brand image, and positioning

#### **5.3 Corporate Communication and International Business**

Cross-cultural communication and global strategies

Adapting corporate communication for international markets

The impact of globalization on communication

#### **Recommended Reading:**

**Corporate Communication: A Guide to Theory and Practice** by Joep Cornelissen

**Effective Business Communication** by Herta A. Murphy and Herbert W. Hildebrandt

**The New Rules of Marketing and PR** by David Meerman Scott

**Corporate Communication: A Strategic Approach** by James E. Grunig

## **BBAIII SEM Syllabus PROFESSIONAL COMMUNICATION (BBN-305 D )**

### **CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of etiquette and professional communication, focusing on how proper conduct and effective communication enhance success in the workplace.

### Unit 1: Introduction to Professional Communication

#### *1.1 Definition and Importance of Professional Communication*

- Understanding the role of communication in professional settings
- Differences between personal and professional communication
- The significance of effective communication in business success

#### *1.2 Types of Communication*

- **Verbal Communication:** Oral and written communication
  - Face-to-face interactions
  - Telephonic and video conferencing
- **Non-verbal Communication:** Body language, gestures, posture, facial expressions
- **Written Communication:** Emails, reports, memos, business letters
- **Visual Communication:** Charts, graphs, presentations

#### *1.3 Principles of Effective Communication*

- Clarity, conciseness, coherence
- Active listening, feedback, and paraphrasing
- Empathy and politeness in communication

### Unit 2: Communication Models and Theories

#### *2.1 Communication Process*

- Components: Sender, message, medium, receiver, feedback
- The communication flow: Top-down, bottom-up, and horizontal

#### *2.2 Models of Communication*

- **Linear Model** (e.g., Shannon-Weaver Model)
- **Transactional Model:** Two-way communication
- **Interactive Model:** Involves feedback loop

#### *2.3 Barriers to Effective Communication*

- **Physical barriers:** Noise, distance, technological issues
- **Psychological barriers:** Stress, emotional state, preconceptions
- **Cultural barriers:** Language differences, misinterpretation of non-verbal cues
- **Semantic barriers:** Misunderstanding due to unclear wording or jargon

## Unit 3: Business Writing and Report Writing

### 3.1 Fundamentals of Business Writing

- Writing for clarity, purpose, and audience
- Choosing the right tone and style for different business documents
- Avoiding jargon and overly complex sentences

### 3.2 Types of Business Documents

- **Emails:** Professional email etiquette and formats
- **Business Letters:** Formal letter structure, cover letters, thank-you letters
- **Memos:** Internal communication, structure, and usage
- **Reports:** Structure of a business report, research reports, analytical reports

### 3.3 Report Writing

- **Research reports:** Gathering, analyzing, and presenting data
- **Formal vs. Informal Reports**
- **Executive Summary:** Key elements and writing tips

## Unit 4: Presentation Skills

### 4.1 The Art of Presentation

- Importance of visual aids (PowerPoint slides, charts, diagrams)
- Structuring a presentation (Introduction, Body, Conclusion)
- Engaging the audience with storytelling, examples, and humor

### 4.2 Delivery Skills

- Speaking clearly, confidently, and audibly
- Body language: Eye contact, gestures, posture
- Managing nervousness and anxiety

### 4.3 Handling Questions and Feedback

- Techniques for handling difficult questions
- Giving and receiving constructive feedback
- Engaging with the audience through interactive discussions

## Unit 5: Interpersonal and Group Communication

### 5.1 Interpersonal Communication in Business

- Building rapport and trust
- Conflict resolution and negotiation skills
- Understanding personality types in communication (e.g., assertive, passive, aggressive)

### 5.2 Group Communication

- **Group dynamics:** Roles, norms, and leadership
- Effective group meetings: Setting agendas, keeping discussions on track, managing time
- Decision-making in groups: Brainstorming, consensus building

### *5.3 Cross-Cultural Communication*

- Understanding cultural differences in communication styles
- Adapting communication to diverse audiences
- Importance of cultural awareness in global business environments

#### Recommended Reading:

1. **Corporate Communication: A Guide to Theory and Practice** by Joep Cornelissen
2. **Effective Business Communication** by Herta A. Murphy and Herbert W. Hildebrandt
3. **The New Rules of Marketing and PR** by David Meerman Scott
4. **Corporate Communication: A Strategic Approach** by James E. Grunig

Programme/Class:BBA	Year:Second	Semester:Third
Course/paper-9(B)		
CourseCode: BBN-306	CourseTitle:Business Environment	
Courseoutcomes:Theobjectiveofthispaperistogivethebasicknowledgeaboutthebusiness environmentinindustry		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-2-1		
Unit	Topics	No. of Lectures Total=30
I	Introduction: Concept, Significance and Components of Business environment, Factor affecting Business Environment, Micro and Macro environment.	8
II	Economic Systems: Capitalism, Socialism, Communism, Mixed Economy - Public Sector & Private Sector	7
III	IndustrialPolicy-Briefhistoricalperspective;New industrialpolicyofIndia, Socio-economicimplicationsofLiberalization,Privatizationand Globalization	8
IV	RoleofGovernmentinRegulationandDevelopmentof Business;Monetary andFiscalPolicy;EXIMPolicy,FEMA;OverviewofInternationalBusiness Environment,TrendsWorldTrade:WTO-Objectivesandrolein internationaltrade.	7
SuggestedReadings:		
1. FrancisCherunilum,BusinessEnvironment		
2. K.Asathapa,BusinessEnvironment		
SuggestedContinuousEvaluationMethods:		
.....		
Suggestedequivalentonlinecourses:		
.....		
FurtherSuggestions:		
.....		

## **BBAIII SEM Syllabus DISASTER MANAGEMENT (BBN-306 A )**

### **CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of etiquette and disaster management, focusing on how proper conduct and effective response strategies are essential in both everyday and crisis situations.

### **CourseContents**

#### Unit 1: Introduction to Disaster Management

- **Definition of Disaster:** What constitutes a disaster, types of disasters (natural and man-made).
- **Types of Disasters:** Natural (earthquakes, floods, hurricanes, etc.) and man-made (chemical spills, nuclear accidents, terrorism).
- **Disaster Management:** Understanding the importance and goals (mitigation, preparedness, response, recovery).
- **Phases of Disaster Management:**
  - **Mitigation:** Measures to reduce disaster impact (e.g., infrastructure planning, environmental protection).
  - **Preparedness:** Preparing individuals, communities, and organizations (e.g., training, creating disaster management plans).
  - **Response:** Immediate actions taken post-disaster (e.g., rescue operations, medical aid).
  - **Recovery:** Long-term actions to rebuild and restore affected areas (e.g., rebuilding homes, supporting mental health).

#### **Key Learning Outcomes:**

- Define disasters and disaster management.
- Identify types and causes of disasters.
- Understand the core phases of disaster management.

#### Unit 2: Disaster Risk Management

- **Risk Reduction:** Principles of reducing the risk of disasters (e.g., building regulations, land-use planning).
- **Risk Assessment:** Identifying hazards, vulnerabilities, and capacities.
- **Vulnerability Analysis:** Assessing the physical, social, and economic vulnerabilities of communities.
- **Disaster Risk Financing:** Understanding how resources are allocated for risk mitigation (insurance, government funding, community funds).
- **Early Warning Systems:** Use of technology in predicting and mitigating disaster impacts.

#### **Key Learning Outcomes:**

- Understand risk management concepts and principles.
- Conduct risk assessments and vulnerability analysis.
- Identify and use early warning systems.

#### Unit 3: Role of Government and Organizations in Disaster Management

- **National and International Bodies:** Understanding the role of agencies like NDRF (National Disaster Response Force), UNDP, WHO, and other NGOs in disaster management.
- **Disaster Management Policies:** Overview of India's National Policy on Disaster Management.
- **Government Structure:** Local, state, and central disaster management coordination.
- **Public-Private Partnerships (PPPs):** Collaboration between the government, businesses, and non-governmental organizations in disaster risk reduction and response.

#### **Key Learning Outcomes:**



- Understand the role of government and international bodies.
- Learn about the disaster management policies in India and globally.
- Study the coordination mechanism among different disaster management stakeholders.

#### Unit 4: Crisis Communication and Media in Disaster Management

- **Communication in Disasters:** Importance of clear and effective communication during crises (e.g., alerts, instructions, updates).
- **Role of Media:** How media (both traditional and social) influences disaster management (e.g., spreading awareness, providing real-time information).
- **Public Relations in Crisis:** Managing relationships with the public during and after a disaster.
- **Challenges in Crisis Communication:** Overcoming misinformation, panic, and communication breakdowns during disasters.

#### Key Learning Outcomes:

- Understand the importance of communication in managing disasters.
- Analyze the role of media in disaster management.
- Develop strategies for effective crisis communication.

#### Unit 5: Disaster Management and Business Continuity

- **Business Continuity Planning (BCP):** Creating strategies for businesses to remain operational during and after a disaster.
- **Risk Assessment for Businesses:** Identifying potential risks that could disrupt business operations (e.g., natural disasters, cybersecurity threats).
- **Disaster Recovery Plans:** Developing plans for data recovery, employee safety, and resource allocation during crises.
- **Impact of Disasters on Businesses:** How disasters affect the economy, business operations, and employee well-being.
- **Case Studies:** Successful business continuity strategies post-disaster.

#### 1. *SUGGESTED READINGS-*

2. *"Introduction to International Disaster Management"* by Damon P. Coppola
3. *"Disaster Management: A Disaster Manager's Handbook"* by K. S. Verma

#### Key Learning Outcomes:

- Learn how to develop business continuity and disaster recovery plans.
- Assess business risks related to disasters.

Study real-life case studies of businesses coping with disasters

## **BBIII SEM Syllabus FOOD & NUTRITION (BBN-306 B )**

### **CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of etiquette and food and nutrition, focusing on how proper behavior and nutrition contribute to personal well-being and social harmony.

### **CourseContents**

#### Unit 1: Introduction to Food and Nutrition

- **Overview of Nutrition:** Definition, importance of nutrition in health and disease prevention.
- **Macronutrients:** Carbohydrates, proteins, and fats—functions, sources, and digestion.
- **Micronutrients:** Vitamins and minerals—types, roles in the body, deficiencies, and toxicity.
- **Balanced Diet:** Definition and components of a balanced diet, food pyramid, and daily nutrient requirements.
- **Food Security:** Global and national perspectives on food security, issues related to malnutrition and hunger.

#### Unit 2: Digestion and Metabolism

- **Digestive System:** Structure and function of the digestive system, stages of digestion, enzymes involved.
- **Absorption and Transport:** Absorption of nutrients in the small intestine, transport via blood and lymph.
- **Metabolism:** Definition, catabolism, anabolism, and metabolic pathways (glycolysis, Krebs cycle, and oxidative phosphorylation).
- **Energy Balance:** Concepts of energy intake, expenditure, and weight management, basal metabolic rate (BMR).
- **Disorders of Metabolism:** Common metabolic disorders such as diabetes, obesity, and metabolic syndrome.

#### Unit 3: Food Groups and Their Nutrients

- **Cereals and Grains:** Types (wheat, rice, oats), nutritional content, and uses.
- **Fruits and Vegetables:** Importance of vitamins, minerals, and fiber, role in disease prevention.
- **Dairy Products:** Nutritional importance of milk, cheese, yogurt; lactose intolerance.
- **Meat, Poultry, and Fish:** Protein content, fat profile, and micronutrient contribution.
- **Legumes, Nuts, and Seeds:** Plant-based proteins, healthy fats, and other nutrients.

#### Unit 4: Food Processing, Preservation, and Safety

- **Food Processing Techniques:** Methods like drying, freezing, canning, pasteurization, and their effects on nutrients.
- **Food Preservation:** Methods including refrigeration, salting, pickling, and their role in extending shelf life and maintaining nutritional value.
- **Food Safety:** Importance of food hygiene and sanitation, preventing foodborne illnesses, food handling standards.
- **Food Additives:** Types of additives (preservatives, colorants, flavor enhancers), their functions, safety, and regulation.
- **Contaminants in Food:** Pesticides, heavy metals, microbial contamination, and their impact on health.

#### Unit 5: Public Health Nutrition and Trends in Diet

- **Nutrition in Different Life Stages:** Nutritional requirements during infancy, childhood, adolescence, adulthood, pregnancy, and old age.
- **Nutritional Deficiencies:** Common deficiency diseases (e.g., scurvy, rickets, anemia) and their prevention.
- **Diet and Chronic Diseases:** Relationship between diet and conditions such as heart disease, cancer, diabetes, and obesity.
- **Global Nutrition Issues:** Malnutrition, overnutrition, and the role of organizations like WHO in addressing nutritional concerns.

- **Emerging Trends:** Functional foods, plant-based diets, superfoods, and food innovations (e.g., personalized nutrition).

### Suggested Resources for Each Unit:

#### 1. **Textbooks:**

- “Nutrition and Dietetics” by Roberta Larson Duyff
- “Advanced Nutrition and Human Metabolism” by Sareen S. Gropper and Jack L. Smith
- “Food Science” by Norman N. Potter & Joseph H. Hotchkiss

#### 2. **Research Journals:**

- The Journal of Nutrition
- Food Research International

International Journal of Food Science & Technology

## **BBIII SEM Syllabus ENVIRONMENT OF STUDIES (BBN-306 C)**

### **CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of the environment of studies, focusing on the various factors that influence learning, academic performance, and the overall educational experience.

### **CourseContents**

#### **Unit 1: Introduction to Environment Studies**

##### *Objective*

To provide an understanding of the environment and its components, the importance of studying environmental issues, and the interconnectedness of human activities and the environment.

##### *Key Topics:*

- 1. Concept of Environment**
  - Definition and scope
  - Components of the environment (Physical, Biological, and Cultural components)
  - The role of the environment in human life
- 2. Environmental Studies and its Importance**
  - Evolution of environmental studies
  - Interdisciplinary nature of environmental studies
  - Environmental ethics and values
- 3. Ecology and Ecosystems**
  - Basics of ecology: Organisms, populations, and communities
  - Ecosystem dynamics and processes (Energy flow, food chains, and webs)
  - Types of ecosystems (terrestrial and aquatic)

#### **Unit 2: Natural Resources and Their Management**

##### *Objective:*

To study the types of natural resources, their significance, issues related to their overuse, and the role of sustainable development in resource management.

##### *Key Topics:*

- 1. Types of Natural Resources**
  - Renewable and non-renewable resources
  - Forest resources, water resources, land resources, and mineral resources
  - Energy resources (Fossil fuels, solar energy, wind energy)
- 2. Resource Depletion and Conservation**
  - Causes of depletion of resources
  - Strategies for conservation and management
  - Sustainable resource management techniques
- 3. Biodiversity and its Conservation**
  - Definition of biodiversity (species, genetic, and ecosystem diversity)
  - Threats to biodiversity (habitat loss, climate change, pollution)
  - Conservation strategies (in-situ and ex-situ conservation)

## Unit 3: Environmental Pollution

### *Objective:*

To understand the different types of environmental pollution, their causes, impacts, and measures for prevention and control.

### *Key Topics:*

#### 1. **Types of Pollution**

- Air Pollution (Causes, effects, and control measures)
- Water Pollution (Causes, effects, and control measures)
- Soil Pollution (Causes, effects, and control measures)
- Noise Pollution (Causes, effects, and control measures)

#### 2. **Impact of Pollution on Ecosystems and Human Health**

- Effects on plant and animal life
- Impact on human health (Respiratory problems, skin diseases, etc.)
- Global warming and climate change

#### 3. **Pollution Control and Legal Framework**

- Pollution control measures (technological and policy interventions)
- Role of government agencies (Central Pollution Control Board, Ministry of Environment and Forests)
- Environmental Laws (Environment Protection Act, Water Act, Air Act)

## Unit 4: Environmental Policy and Legislation

### *Objective:*

To understand the role of government policies, regulations, and international agreements in addressing environmental issues.

### *Key Topics:*

#### 1. **National Environmental Policy**

- Objectives and strategies of the National Environmental Policy of India
- Governmental institutions responsible for environmental governance (MoEFCC, CPCB)
- Role of local bodies and NGOs in environmental management

#### 2. **Environmental Legislation in India**

- The Environment Protection Act, 1986
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981

#### 3. **International Environmental Initiatives**

- United Nations Environment Programme (UNEP)
- Earth Summit (1992), Kyoto Protocol, and Paris Agreement
- Sustainable Development Goals (SDGs) and their relation to the environment

## Unit 5: Sustainable Development and Environmental Management

### *Objective:*

To explore the concept of sustainable development, its importance, and practices for achieving environmental sustainability in business and society.

### *Key Topics:*

#### 1. **Concept of Sustainable Development**

- Definition of sustainability and sustainable development

- The three pillars of sustainability (Environmental, Social, and Economic)
- The role of sustainable development in global environmental protection
- 2. **Corporate Social Responsibility (CSR)**
  - Role of businesses in environmental sustainability
  - CSR initiatives for environmental protection
  - Green marketing and eco-friendly business practices
- 3. **Global Environmental Challenges**
  - Climate change and global warming
  - Water scarcity and pollution
  - Overpopulation and overconsumption
  - Strategies for a sustainable future (Renewable energy, Circular economy, Green technologies)

#### **SUGGESTED READINGS-**

1. *"Principles of Environmental Science: Inquiry and Applications"* by William P. Cunningham and Barbara Woodworth Saigo
2. *"Environmental Studies: A Textbook for Undergraduates"* by S. C. Soni
3. *"The Environment and You"* by Norman Myers

BBA:Second Year Course Structure Fourth  
Semester

SL.No.	Subject Code	Subject Name	Credit
1	BBN-401	Supply Chain Management	4
2	BBN-402/BBN-402A/BBN-402B	Research Methodology/Publication Ethics/Emerging Trends in Research	4
3	BBN-403	Specialised Accounting	4
4	BBN-404	Consumer Behaviour	4
5	BBN-405	Investment Analysis & Portfolio Management	4
6	BBN-406/ BBN-406A/ BBN-406B	Company Law/ Rural Sociology & Educational Psychology/ Science, Technology, and Society	4
		<b>Total</b>	24

Programme/Class:BBA	Year:Second	Semester:Fourth
Course/paper-10 (A)		
CourseCode:BBN-401	CourseTitle:SupplyChainManagement	
Courseoutcomes:TheobjectiveofthispaperistogivethebasicknowledgeabouttheSupplyChain Managementforgoodsandservices		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-2-1		
Unit	Topics	No.of Lectures Total=30
I	Introduction,DefinitionofSupplyChainManagement,Evolutionofthe ConceptofSupplyChainManagement,KeyDriversofSupplyChain Management, Typology of Supply Chains, Cycle View of Supply Chain, ProblemsinSCMandSuggestedSolutions	8
II	Introduction,ThreeComponentsofSCM,DemandManagement,Demand Forecasting;Introduction,SupplyManagement,Evolution of ERP, ConceptofERPinSCM,QuickResponseandAccurateResponseSystem inSCM,UseofOtherPlanningStrategies	7
III	Introduction,UnderstandingtheBenchmarkingConcept,Benchmarking Process, Benchmarking Procedure	8
IV	Introduction,NewDevelopmentsinSupplyChainManagement,Outsourcing Supply Chain Operations, Co-Maker ship, The Role of E- CommerceinSupplyChainManagement,GreenSupplyChain Management, Distribution Resource Planning, World Class Supply Chain Management	7
SuggestedReadings: 1. SupplyChainManagementbyMichelHHungo 2. SupplyChainManagementbySunil Chopra		
SuggestedContinuousEvaluationMethods: .....		
Suggestedequivalentonlinecourses: .....		
FurtherSuggestions: .....		



Programme/Class:BBA	Year:Second	Semester:Fourth
Course/paper-10 (B)		
CourseCode:BBN-402	CourseTitle:ResearchMethodology	
Courseoutcomes:TheobjectiveofthispaperistogivethebasicknowledgeabouttheResearchMethodology		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-3-0		
Unit	Topics	No. of Lectures Total=30
I	Introduction:MeaningofResearch,ObjectivesofResearch,Typesof Research, Research Process, Research Problem formulation; Research Design: Featuresofagoodresearchdesign;DifferentResearchDesigns;Measurement inResearch;Datatypes;Sources of Error	8
II	SamplingDesign:Census&SampleSurveys;StepsinSamplingDesign; Types of Sample designs-Probability & Non Probability sampling.	7
III	Processing & Analysis of Data: Processing operations; problems in processing; typesofanalysis,HypothesisTesting:Chi-squaretest,Z-test,t-test,F-test.	8
IV	Presentation:Diagrams;graphs;chars.Reportwriting;LayoutofResearch report;TypesofReports;MechanismofwritingaResearchreport; Precautions for writing report.	7
SuggestedReadings: 1. C.R.Kothari,ResearchMethodology 2. BanerjeeS.andRoyRamendu,FundamentalsofResearchMethodology		
SuggestedContinuousEvaluationMethods: .....		
Suggestedequivalentonlinecourses: .....		
FurtherSuggestions: .....		

## **BBA IVSEM Syllabus Publication Ethics (BBN-402A)**

### **CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of publication ethics, focusing on the ethical standards and best practices in academic and professional publishing. The course aims to provide students with an understanding of the key issues related to authorship, plagiarism, peer review, conflicts of interest, and the responsible conduct of research and publication.

### **Course Contents**

#### Unit 1: Introduction to Publication Ethics

**Objective:** To introduce students to the fundamental concepts of publication ethics and its importance in academic and professional contexts.

#### *Topics Covered:*

- Definition and Scope of Publication Ethics
- Importance of Ethical Practices in Research and Publication
- Key Ethical Issues in Publishing (Authorship, Conflicts of Interest, Peer Review)
- Ethical Guidelines by Major Publishing Bodies (COPE, Elsevier, Springer)
- Role of Publication Ethics in Maintaining Research Integrity

#### *Learning Outcomes:*

- Understand the significance of ethical practices in academic publishing.
- Familiarity with major ethical guidelines and codes of conduct for researchers and authors.

#### Unit 2: Authorship and Contribution

**Objective:** To explore the principles of authorship, criteria for assigning authorship, and the responsibilities of each contributor to the work.

#### *Topics Covered:*

- Defining Authorship: Criteria and Contributions
- Order of Authors: First, Corresponding, and Last Authors
- Responsibilities of Authors: Drafting, Revising, and Accountability
- Authorship Disputes and Resolutions
- Ghostwriting and Guest Authorship
- Contributions of Non-authors and Acknowledgments

#### *Learning Outcomes:*

- Gain a clear understanding of who qualifies as an author.
- Understand the ethical implications of authorship and contributions.

#### Unit 3: Plagiarism and Research Integrity

**Objective:** To discuss the issues of plagiarism, research misconduct, and how to ensure integrity in academic and professional writing.

### Topics Covered:

- Definition and Types of Plagiarism (Direct, Mosaic, Self-plagiarism)
- Methods of Detecting Plagiarism
- Consequences of Plagiarism in Research and Publishing
- Research Misconduct: Fabrication and Falsification of Data
- Best Practices for Avoiding Plagiarism
- Ethical Use of Sources: Citations, Quotations, and Paraphrasing

### Learning Outcomes:

- Understand what constitutes plagiarism and research misconduct.
- Learn best practices for preventing plagiarism and maintaining research integrity.

## Unit 4: Peer Review Process

**Objective:** To provide students with an understanding of the peer review process in academic publishing and its role in ensuring quality and ethics in research.

### Topics Covered:

- The Role and Importance of Peer Review in Publishing
- Types of Peer Review (Single-blind, Double-blind, Open Review)
- Responsibilities of Reviewers, Authors, and Editors
- Ethical Issues in Peer Review (Bias, Conflicts of Interest, Reviewer Misconduct)
- Handling Confidentiality and Conflicts of Interest in Peer Review
- Impact of Peer Review on Publication Ethics

### Learning Outcomes:

- Understand the peer review process and its role in scholarly communication.
- Identify the ethical challenges faced by reviewers, authors, and editors.

## Unit 5: Publication Ethics in the Digital Age

**Objective:** To examine the emerging ethical issues in digital publishing and the impact of digital platforms on the ethics of research and publication.

### SUGGESTED READINGS-

1. **Wager, E., & Williams, P. (2013).** *How to Handle Authorship Disputes: A Guide for New Researchers.* *The International Journal of Clinical Practice*, 67(6), 551-556.
2. **International Committee of Medical Journal Editors (ICMJE). (2019).** *ICMJE*
3. **Angell, M. (2009).** *The Truth About the Drug Companies: How They Deceive Us and What to Do About It.* Random House.

### Learning Outcomes:

- Understand the ethical issues surrounding digital and open-access publishing.
- Learn how to identify and avoid unethical publishing practices in the digital era.

## **BBA IV SEM Syllabus**

### **Emerging Trends in Research (BBN-402B)**

#### **COURSE OBJECTIVE-**

The objective of this course is to introduce students to the fundamental principles of emerging trends in research, focusing on the latest advancements, methodologies, and technologies shaping the landscape of academic and applied research.

#### **Unit 1: Introduction to Emerging Research Trends**

- **Topics Covered:**
  - Overview of emerging research trends in science, technology, and humanities.
  - Technological advancements driving research: AI, machine learning, big data, blockchain, etc.
  - Global challenges and opportunities: Climate change, pandemics, digital transformation, and equity.
  - The rise of interdisciplinary research and global collaboration.
  - Research funding trends and the rise of open science.

#### **Unit 2: Big Data and Data Science in Research**

- **Topics Covered:**
  - Big data: Concepts, sources, and characteristics (volume, variety, velocity).
  - Tools and technologies in data science: Python, R, Hadoop, Spark, and cloud computing.
  - Data analytics and machine learning in research: Predictive models, data mining, and pattern recognition.
  - Applications in various research fields: Healthcare, social sciences, environmental science, and business.
  - Ethical considerations: Data privacy, informed consent, and algorithmic bias.

#### **Unit 3: Artificial Intelligence (AI) and Machine Learning (ML) in Research.**

- **Topics Covered:**
  - Introduction to AI and machine learning: Types (supervised, unsupervised, reinforcement learning).
  - Applications of AI/ML in research: Automating literature reviews, hypothesis testing, and data analysis.
  - AI and ML in fields such as healthcare (e.g., predictive diagnostics, drug discovery), environmental science, and social research.
  - The ethical dimensions of AI and ML in research: Bias, transparency, and accountability in AI models.
  - AI-driven innovation: Robotics, natural language processing (NLP), and autonomous systems.

#### **Unit 4: Sustainability and Climate Change Research**

- **Topics Covered:**
  - Climate change science: Impacts, modeling, and solutions.
  - Role of technology in sustainability research: Renewable energy, smart cities, circular economy.
  - Research on sustainable agriculture, conservation, and resource management.
  - The role of AI, big data, and IoT in environmental monitoring and decision-making.
  - Global initiatives in sustainability research: UN Sustainable Development Goals, international collaborations.

#### **Unit 5: Ethical Issues in Emerging Research**

- **Topics Covered:**
  - Ethical principles in research: Integrity, accountability, transparency, and reproducibility.
  - Ethics in AI and data science: Consent, data ownership, and algorithmic accountability.
  - Ethical challenges in biotechnology and genomics: Gene editing, cloning, and bioengineering.
  - The ethics of surveillance, big data, and privacy concerns in research.
  - The role of institutional review boards (IRBs) and global ethical standards.

## Suggested Readings:

1. **"The Structure of Scientific Revolutions"** by Thomas S. Kuhn – A foundational text that explores how scientific paradigms shift over time, providing a framework for understanding emerging trends in research.
2. **"Big Data: A Revolution That Will Transform How We Live, Work, and Think"** by Viktor Mayer-Schönberger and Kenneth Cukier – Explains the transformative role of big data in contemporary research and its impact on various fields.
3. **"Data Science for Business"** by Foster Provost and Tom Fawcett – A comprehensive guide to understanding data science, with applications relevant to academic research.
4. **"Artificial Intelligence: A Guide for Thinking Humans"** by Melanie Mitchell – A broad and accessible overview of artificial intelligence, exploring its potential and ethical concerns.
5. **"Weapons of Math Destruction"** by Cathy O'Neil – Discusses how big data and algorithms, when used irresponsibly, can exacerbate inequality and social harm.

Programme/Class:BBA		Year:Second	Semester:Fourth
Course/paper-11 (A)			
CourseCode:BBN-403		CourseTitle:SpecialisedAccounting	
Courseoutcomes:Theobjectiveofthispaperistogivethebasicknowledgeaboutthespecialised Accounting			
Credits:3		Compulsory	
Max.Marks:25+75		Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-3-0			
Unit	Topics		No. of Lectures Total=30
I	AccountingofNon-tradingInstitutions,JointVentureandConsignment		8
II	AccountsofBankingcompaniesandGeneralInsurance companies		7
III	Department account and Branch account.Accounts related to Hire Purchase and Installment payment transactions, Royalty Accounts		8
IV	PartnershipAccounts:FinalAccount,ReconstitutionofPartnershipfirms: admission,retirementanddeathofapartner,DissolutionofPartnership (Excludinginsolvencyof Partner)		7
SuggestedReadings:			
1. Agarwal,B.D.,AdvancedAccounting			
2. Chawla&Jain,FinancialAccounting			
3. Chakrawarti,K.S.,Advanced Accounts			
4. Shukla,M.B.,FinancialAnalysisandBusiness Forecasting			
5. Jain&Naranag,AdvancedAccounts			
SuggestedContinuousEvaluationMethods:			
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Suggestedequivalentonlinecourses:			
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FurtherSuggestions:			
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Programme/Class:BBA		Year:Second	Semester:Fourth
Course/paper-11(B)			
CourseCode:BBN-404		CourseTitle:Consumer Behaviour	
Courseoutcomes:Theobjectiveofthispaperistogivethebasicknowledgeabouttheconsumerbehaviour			
Credits:3		Compulsory	
Max.Marks:25+75		Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-3-0			
Unit	Topics		No. of Lectures Total=30
I	CB,Consumerresearchprocess.CBmodels:Economicmodel,Psycho-analyticmodel, Sociological model, Howard & Sethmodel, Nicosia model, Engel-Kollat-Blackwell model.		8
II	Individualdeterminants:Perceptualprocess,consumerlearningprocess Introduction:Concept,importanceandscopeofCB,needforstudying, consumer attitude formation, attitude measurement, meaning and nature of personality, self concept.		7
III	Influences&ConsumerDecisionmaking:Family,referencegroup,personal, socialand culturalinfluenceonCB,ConsumerDecisionmakingprocess, Consumer Communication process, consumer satisfaction.		8
IV	IndustrialBuyingBehaviour:Participants,characteristicsof industrial markets, factors influencing industrial markets, stages of industrial buying process, Customer and marketing of services.		7
SuggestedReadings:			
1. Suja.R.Nair,ConsumerBehaviourinIndianPerspective			
2. Schiffman&Kanuk,ConsumerBehaviour			
3. Louden&Bitta,ConsumerBehaviour			
4. Bennet&Kasarji,Consumer Behaviour			
SuggestedContinuousEvaluationMethods:			
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Suggestedequivalentonlinecourses:			
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FurtherSuggestions:			
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Programme/Class:BBA	Year:Second	Semester:Fourth
Course/paper-12(A)		
CourseCode:BBN-405	CourseTitle:InvestmentAnalysis&PortfolioManagement	
Courseoutcomes:Theobjectiveofthispaperistogivethebasicknowledgeabouttheinvestmentanalysisandportfoliomanagementsubject3(A)		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-2-1		
Unit	Topics	No. of Lectures Total=30
I	Investments:Nature,scope,objectiveandProcessofinvestmentsanalysis, concept of return and risk analysis, measurement of return and risk: Systematic and Unsystematic Risk.	8
II	InvestmentAlternatives:InvestmentinstrumentofCapitalMarketandMoney Market, ValuationofFixedandVariablesecuritiesNonSecurityformsof Investment, Government Securities, Mutual Fund, Real Estate and Gold.	7
III	Fundamental Analysis: Economic analysis industry analysis and company analysis TechnicalAnalysis:Trends,indicators,indicesandmovingaverage applied in technical analysis.Efficient MarketHypothesis:weak, semi-strong and strong market and its testing techniques	8
IV	Portfolio Management: Meaning, importance and objectives of portfolio and portfolio management, Risk and Return- Definition types and importance.PortfolioAnalysis:RiskMeasurement;Estimatingrateofreturnand standarddeviationofportfolioreturns;EffectsofCombiningsecurities;	7
SuggestedReadings: 1.SecurityanalysisandPortfolioManagementbyPunithavathyPandian		
SuggestedContinuousEvaluationMethods: .....		
Suggestedequivalentonlinecourses: .....		
FurtherSuggestions: .....		



Programme/Class:BBA	Year:Second	Semester:Fourth
Course/paper-12 (B)		
CourseCode: BBN-406	CourseTitle:CompanyLaw	
Courseoutcomes:TheobjectiveofthispaperistogivethebasicknowledgeabouttheCompanyLaw		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:3-2-1		
Unit	Topics	No. of Lectures Total=30
I	Introduction:DefinitionandKindsofCompany,PromotionandIncorporationof Companies; Memorandum of Association, Articles of Association, Prospectus.	8
II	Shares,ShareCapital,Members,TransferandTransmissionofshares,Directors- Managing Director, Whole Time Director	7
III	CapitalManagement;Borrowingpowers,mortgagesandcharges,debentures, CompanyMeetings-kinds,quorum,voting,resolutions,minutes	8
IV	MajorityPowers andminority rights,Prevention of oppressionand mismanagement,windingupofcompanies,itsKindsand Conduct	7
SuggestedReadings:		
1. GrowerL.C.B.,PrinciplesofModernCompany Law		
2. RamaiyaA.,GuidetotheCompaniesAct		
3. Singh,Avtar,Company Law		
4. Kuchhal,S.C.,ModernIndianCompany Law		
5. Kapoor,N.D.,Company Law		
SuggestedContinuousEvaluationMethods:		
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Suggestedequivalentonlinecourses:		
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FurtherSuggestions:		
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## **BBA IV SEM Syllabus**

### **Rural Sociology & Educational Psychology (BBN-406A)**

#### **Course Objective:**

The objective of this course is to provide students with a comprehensive understanding of the socio-cultural dynamics of rural communities and their impact on education, as well as the psychological principles that affect learning and teaching processes. This course integrates the study of rural sociology, with a focus on rural life, rural-urban differences, and the challenges faced by rural education systems, alongside educational psychology, which examines the cognitive, emotional, and developmental aspects of learners in educational settings. By the end of the course, students will be equipped to apply sociological and psychological principles to improve education in rural contexts.

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#### **CONTENT:**

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#### **Unit 1: Introduction to Rural Sociology**

##### **Content:**

Definition, scope, and significance of rural sociology  
Rural vs. urban society: Characteristics and differences  
Rural communities: Structure and social organization  
Social change in rural societies: Factors and impact  
Importance of rural sociology in the context of education

##### **Key Concepts:**

Rural Society, Community, Social Organization, Social Change, Rural-Urban Continuum

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#### **Unit 2: Rural Institutions and Education**

##### **Content:**

The role of family, caste, religion, and local governance in rural areas  
Education in rural society: Challenges and opportunities  
The impact of social institutions on educational outcomes  
Role of rural schools in socialization and community development  
Barriers to education in rural areas: Economic, social, and infrastructural

##### **Key Concepts:**

Rural Education, Social Institutions, Education Inequality, Community Development

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#### **Unit 3: Theories of Educational Psychology**

##### **Content:**

Introduction to educational psychology  
Key theories of learning: Behaviorism, Cognitivism, Constructivism  
Developmental stages in children (Piaget, Vygotsky, Erikson)  
Motivation and learning theories: Intrinsic vs. extrinsic motivation  
Theories of intelligence and the impact on teaching methods

##### **Key Concepts:**

Learning Theories, Cognitive Development, Motivation, Intelligence, Instructional Strategies

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#### **Unit 4: Cognitive and Emotional Development in Education**

##### **Content:**

Cognitive development in children: Piagetian stages and their relevance to education  
Emotional and social development in the classroom  
Emotional intelligence and its role in learning  
The impact of socio-economic status on cognitive development  
Educational implications of cognitive and emotional development

##### **Key Concepts:**

Cognitive Development, Emotional Intelligence, Social Development, Classroom Dynamics

## **Unit 5: Applied Educational Psychology in Rural Contexts**

### **Content:**

Psychological issues affecting rural students (stress, motivation, learning disabilities)

Teacher-student interactions in rural schools

Applying educational psychology for improving rural education outcomes

Strategies for inclusive education in rural schools

Role of counseling and guidance in rural educational settings

### **Key Concepts:**

Learning Disabilities, Teacher-Student Interaction, Inclusive Education, Counseling, Rural Education Strategies

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### **Suggested Readings:**

#### **Rural Sociology:**

Bottomore, T. B. (1974). *Sociology: A Guide to Problems and Literature*. George Allen & Unwin.

Davis, K., & Moore, W. E. (1945). *Some Principles of Stratification*. *American Sociological Review*, 10(2), 242–249.

Singh, K. (2004). *Rural Sociology in India*. Dattsons Publishing.

#### **Educational Psychology:**

Woolfolk, A. (2019). *Educational Psychology* (14th ed.). Pearson Education.

Santrock, J. W. (2019). *Educational Psychology* (7th ed.). McGraw-Hill Education.

Ormrod, J. E. (2016). *Educational Psychology: Developing Learners* (9th ed.). Pearson Education.

#### **Developmental Psychology in Education:**

Berk, L. E. (2013). *Child Development* (9th ed.). Pearson Education.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.

**BBA IV SEM Syllabus**  
**Science, Technology and Society (BBN-406B)**

**CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of the relationship between science, technology, and society, focusing on how scientific advancements and technological innovations shape social structures, cultural norms, and economic development.

**Course Contents**

Unit 1: Introduction to Science, Technology, and Society (STS)

**Learning Objectives:**

- Understand the relationship between science, technology, and society.
- Analyze the role of science and technology in modern society.
- Learn about the historical development of scientific knowledge and technological advancements.

**Topics:**

1. **Definition and Scope of STS:** Key concepts and definitions of science, technology, and society.
2. **History of Science and Technology:** Evolution of scientific thinking and technological progress (Ancient to Modern).
3. **The Role of Science and Technology in Shaping Society:** Influence of scientific discoveries and technological inventions on culture, economy, and politics.
4. **Interdisciplinary Nature of STS:** Understanding the intersection of scientific knowledge, technological development, and societal needs.
5. **Science, Technology, and Innovation in Economic Development:** How advancements drive business and economic growth.

**Learning Outcome:** Students will gain a foundational understanding of the critical relationship between science, technology, and society, and how these elements influence global and local communities.

Unit 2: The Impact of Technology on Society

**Learning Objectives:**

- Examine the social, cultural, and ethical implications of technological advancements.
- Discuss how technology shapes lifestyle, communication, work, and relationships.
- Understand the role of technology in social change and progress.

**Topics:**

1. **Technological Innovation and Social Change:** How technological revolutions (Industrial Revolution, Information Age, Digital Transformation) influence societal structures.
2. **Communication Technologies:** Impact of the internet, social media, and mobile technologies on human interaction and culture.
3. **Work and Labor in a Technological World:** Automation, artificial intelligence, and robotics in reshaping labor markets and business practices.

4. **Technological Dependency and Digital Divide:** Issues of access to technology, digital inequality, and global technology gaps.
5. **Technology and Globalization:** The role of technology in bridging international borders and promoting a global economy.

**Learning Outcome:** Students will understand how technology shapes society and its individuals, influencing everything from the workplace to relationships and cultural identity.

### Unit 3: Ethical Issues in Science and Technology

#### Learning Objectives:

- Analyze the ethical challenges brought about by technological advancements.
- Understand the moral responsibilities of scientists, engineers, and businesses in the development of new technologies.

#### Topics:

1. **Ethics of Technological Development:** The need for ethical considerations in developing new technologies (e.g., AI, genetic engineering, nanotechnology).
2. **Privacy and Data Security:** Ethical implications of surveillance, data collection, and digital privacy in the age of big data.
3. **Environmental Ethics:** The role of technology in environmental conservation, sustainability, and climate change (green technologies, eco-friendly innovations).
4. **Biotechnology and Genetic Engineering:** Ethical debates surrounding gene editing (CRISPR), cloning, and biotechnology in health care.
5. **Artificial Intelligence and Ethics:** Implications of AI on decision-making, autonomy, and societal impact.

**Learning Outcome:** Students will develop a critical understanding of the ethical considerations in the development and deployment of technology, particularly in terms of privacy, autonomy, and sustainability.

### Unit 4: Technology and Economic Development

#### Learning Objectives:

- Explore the role of technology in driving economic growth and innovation.
- Understand how technological advancements affect business strategies and global markets.

#### Topics:

1. **The Role of Technology in Economic Growth:** How innovations in manufacturing, transportation, and communication shape economies.
2. **Technological Entrepreneurship:** The rise of startups and the role of technology in creating new industries (e.g., Silicon Valley).
3. **Digital Economy:** The shift towards e-commerce, fintech, and digital business models.
4. **Disruptive Technologies:** Understanding emerging technologies such as blockchain, cryptocurrencies, 3D printing, and their potential to disrupt traditional industries.
5. **Technology, Employment, and Wealth Distribution:** Impact of automation and artificial intelligence on jobs, wages, and wealth inequality.

**Learning Outcome:** Students will learn how businesses leverage technology for competitive advantage, as well as the broader economic implications of technological innovation.

## Unit 5: Science, Technology, and Global Challenges

### Learning Objectives:

- Examine how science and technology contribute to solving global issues.
- Discuss the ethical and societal challenges posed by global problems and technological solutions.

### Topics:

1. **Global Health and Biotechnology:** The role of science and technology in solving global health challenges (e.g., pandemics, vaccines, public health infrastructure).
2. **Climate Change and Sustainable Development:** The technological and scientific solutions to mitigate the effects of climate change (e.g., renewable energy, carbon capture).
3. **Technology and Global Security:** The impact of technology on national security, cyber security, and international relations.
4. **Technology and Global Governance:** The role of international institutions in regulating and guiding technological development (e.g., United Nations, World Health Organization).
5. **Humanitarian Technology:** The role of technology in addressing poverty, famine, and crisis management.

### SUGGESTED READINGS-

1. **Bijker, W. E., Hughes, T. P., & Pinch, T. (2012).** *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. MIT Press.
2. **Mitcham, C. (2014).** *Thinking Through Technology: The Path Between Engineering and Philosophy*. University of Chicago Press.
3. **Jasanoff, S. (2004).** *The Fifth Branch: Science Advisers as Policymakers*. Harvard University Press.

**Learning Outcome:** Students will develop an awareness of how science and technology are being used to address critical global challenges, along with an understanding of the ethical and practical constraints of these efforts.

BBA:ThirdYearCourseStructure Fifth Semester

SL.No.	Subject Code	Subject Name	Credit
1	BBN-501	Income Tax	4
2	BBN-502	Marketing Communication	4
2.1	BBN-502-A/ BBN-502B/ BBN-502C/ BBN-502D	Social Media Marketing/Perspectives on Contemporary Issues/Intelligent Automation/Creativity and Innovation	
3	BBN-503	Entrepreneurship & Small Business Management	4
4	BBN-504	Sales Management	4
5	BBN-505	Industrial Relations & Labour Laws	4
6	BBN-506	Company Accounts	4
		<b>Total</b>	24

Programme/Class:Degree	Year:Third	Semester:Fifth
Course/paper-13(A)		
CourseCode: BBN-501	CourseTitle:Income Tax	
<b>Courseoutcomes:</b>		
The aim of the course is to build knowledge, understanding about income tax among the student. The course seeks to give detailed knowledge about the subject matter by instilling the basic ideas about Income Tax. The outcome of the course will be as follows –		
To provide knowledge about Income Tax Act.		
To provide knowledge about gross income and taxable income. To give an overview about different deductions and exemptions.		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No.ofLectures Total=30</b>
<b>I</b>	Indian Income Tax Act, 1961: Basic Concepts- Income, Agriculture Income, Casual Income, Assessment Year, Previous Year, Gross Total Income, Total Income, Person, Tax Evasion, Tax Avoidance.	8
<b>II</b>	Basis of Charge: Scope of Total Income, Residence and Tax Liability, Income which does not form part of Total Income.	6
<b>III</b>	Heads of Income: Income from Salaries, Income from House Property. Profit and Gains of Business or Profession, Capital Gains, Income from other sources.	10
<b>IV</b>	Aggregation of Income, Set off and Carry forward of losses, deductions from gross total Income, Computation of total Income and Tax liability.	6
<b>Suggested Readings:</b>		
1. Mehrotra, H.C., Income Tax Law and Account		
2. Prasad, Bhagwati, Income Tax Law and Practice		
3. Chandra Mahesh and Shukla D.C., Income Tax Law and Practice		
4. Agarwal, B.K., Income Tax		
5. Jain, R.K., Income Tax		
<b>Suggested Continuous Evaluation Methods:</b>		
In addition to the theoretical inputs the course will be delivered through Assignments, Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
Suggested equivalent online courses: .....		
Further Suggestions: .....		



Programme/Class: Degree	Year: Third	Semester: Fifth
Course/paper-13(B)		
Course Code: BBN-502	Course Title: Marketing Communication	
<b>Course outcomes:</b>		
The aim of the course is to build knowledge, understanding and skills in marketing communication among the student. The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about IMC and advertising and their role in overall promotion strategies of the firm. The outcome of the course will be as follows –		
<ul style="list-style-type: none"> <li>• Apply an IMC approach in the development of an overall advertising and promotional plan.</li> <li>• Enhance creativity, critical thinking and analytical ability through developing an integrated marketing communication campaign</li> </ul>		
Credits: 3	Compulsory	
Max. Marks: 25+75	Min. Passing Marks:	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P: 2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	Marketing Communication: Meaning and its objectives, Integrated Marketing Communication (IMC): concepts and process, IMC promotion Mix, Advertising - Meaning, objectives its role and functions, Classification of advertising, economic, social and ethical issues in advertising, DAGMAR approach, STP strategies in advertising, Advertising Agencies,	7
<b>II</b>	Process in Advertising: Consumer and mental process in buying, AIDA model, Hierarchy of effects model, Information processing model, Advertising Budget – Top down and Build up approach, methods of advertising – Affordable method, arbitrary allocation method, percentage of sales method, competitive parity method, Objective and Task method.	7
<b>III</b>	Advertising Creativity: Meaning of creativity, Creative strategy, Creative tactics, Advertising Appeals, USP theory of creativity, Copywriting: Meaning and Definition of Copywriting, The Copywriter, Copywriting for Print, Copywriting guidelines, Radio Copywriting, TV Copywriting, Writing for the Web, Tips for writing good web content	8
<b>IV</b>	Media Planning and Strategy: Media Types and their characteristics; Setting Media objectives; Steps involved in media planning,	8
	evaluation of media, media scheduling strategy, Evaluation of advertising effectiveness – need and purpose of evaluation, pre-testing and post testing techniques, Advertising research, decision areas in international advertising.	
<b>Suggested Readings:</b>		
<ol style="list-style-type: none"> <li>1. George E Belch &amp; Michael A Belch: Advertising and promotion - An integrated Marketing Communication Perspective - McGraw Hill Education</li> <li>2. Chuna wala &amp; Sethia: Foundations of Advertising Theory &amp; Practice; Himalaya Publishing House</li> <li>3. Copley Paul: Marketing Communications Management Concepts &amp; theories, Cases and Practices; Butterworth Heinemann Publication.</li> <li>4. Aaker, David A. et al., Advertising Management, PHI,</li> </ol>		
<b>Suggested Continuous Evaluation Methods:</b>		
In addition to the theoretical inputs the course will be delivered through Assignments, Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
Suggested equivalent online courses: .....		
Further Suggestions: .....		

**BBA V SEM Syllabus**  
**SOCIAL MEDIA MARKETING(BBN-502A)**

**CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of social media marketing, focusing on the strategies, tools, and techniques used to effectively promote products, services, and brands on various social media platforms.

**CourseContents**

Unit 1: Introduction to Social Media Marketing

**Objective:** To provide an overview of social media marketing, its importance, and how it has evolved in the digital age.

- **1.1: Overview of Social Media Marketing**
  - Definition and scope of social media marketing.
  - Role of social media in modern marketing strategies.
  - Benefits of social media marketing for businesses.
  - Types of social media platforms: Facebook, Instagram, Twitter, LinkedIn, YouTube, TikTok, etc.
- **1.2: History and Evolution of Social Media**
  - Growth of the internet and rise of social media platforms.
  - Impact of social media on consumer behavior and businesses.
- **1.3: Understanding the Social Media Ecosystem**
  - The role of influencers, bloggers, and social media personalities.
  - Social media trends and their impact on marketing strategies.
- **1.4: Ethics and Legal Issues in Social Media Marketing**
  - Privacy concerns, terms of service, and ethical practices.
  - Handling customer feedback and criticism.

Unit 2: Social Media Strategy Development

**Objective:** To teach how to develop and implement a social media strategy that aligns with business goals.

- **2.1: Setting Social Media Goals and Objectives**
  - Defining SMART goals for social media marketing.
  - Aligning social media objectives with business goals.
  - Key Performance Indicators (KPIs) for social media success.
- **2.2: Target Audience Identification**
  - Understanding customer demographics and behavior.
  - Segmenting the audience: Psychographics, interests, and online behavior.
- **2.3: Creating a Social Media Marketing Plan**
  - Crafting a content calendar.
  - Choosing the right platforms for the target audience.
  - Budgeting for social media marketing campaigns.
- **2.4: Competitor Analysis**
  - Analyzing competitors' social media presence.
  - Tools for social media monitoring and analysis.

## Unit 3: Content Creation and Engagement

**Objective:** To equip students with skills for creating compelling content and engaging with audiences effectively.

- **3.1: Content Creation for Social Media**
  - Types of content: Text, images, videos, infographics, stories, live streams.
  - Content formats for different platforms: Facebook posts, Instagram stories, TikTok videos, etc.
  - Best practices for content creation and visual storytelling.
- **3.2: Writing for Social Media**
  - Crafting effective headlines and captions.
  - The importance of tone, voice, and brand personality.
  - Strategies for increasing engagement with content.
- **3.3: Social Media Engagement Techniques**
  - Building an online community.
  - Responding to comments, messages, and customer inquiries.
  - Encouraging user-generated content and collaborations.
- **3.4: Hashtags and Trends**
  - Importance of hashtags in social media visibility.
  - Leveraging trending topics for engagement.

## Unit 4: Social Media Advertising and Paid Campaigns

**Objective:** To understand the principles of paid advertising on social media platforms and how to execute successful campaigns.

- **4.1: Social Media Advertising Overview**
  - Introduction to paid social media marketing.
  - Benefits of social media advertising over traditional advertising.
  - Understanding paid ad formats on different platforms (Facebook Ads, Instagram Ads, LinkedIn Ads, etc.).
- **4.2: Creating and Managing Ads**
  - Setting up paid campaigns on Facebook, Instagram, and other platforms.
  - Targeting options: Demographics, interests, behavior, custom audiences.
  - Budgeting and bidding strategies for paid campaigns.
- **4.3: Analyzing Ad Performance**
  - Measuring ROI and success metrics for paid ads.
  - A/B testing for ad creatives and formats.
  - Adjusting campaigns based on performance data.
- **4.4: Advanced Social Media Advertising Techniques**
  - Retargeting and remarketing strategies.
  - Influencer marketing and partnerships.
  - Native ads, sponsored content, and affiliate marketing.

## Unit 5: Analytics, Monitoring, and Crisis Management

**Objective:** To teach the importance of monitoring and analyzing social media performance, as well as handling crises in the digital space.

- **5.1: Social Media Analytics**
  - Tools for tracking social media metrics (Google Analytics, Facebook Insights, Hootsuite, etc.).

- Key metrics: Engagement, reach, impressions, conversion rates, etc.
- Understanding and interpreting social media data to refine strategies.
- **5.2: Social Media Listening and Monitoring**
  - Importance of monitoring brand mentions and sentiment.
  - Social listening tools and techniques for gathering audience insights.
- **5.3: Crisis Management in Social Media**
  - Identifying and responding to social media crises.
  - Case studies of brands that handled social media crises well and poorly.
  - Developing a crisis communication plan for social media.
- **5.4: Measuring and Reporting Social Media ROI**
  - Tracking business outcomes from social media efforts.
  - Generating reports for clients or management.
  - Adjusting strategies based on performance data.

**Suggested Readings:**

1. *"The Road to Success: The Story of India's Most Successful Businessmen"* by Shashi Tharoor
2. *"The Art of Thinking Clearly"* by Rolf Dobelli "
3. *"Business Sutra: A Very Indian Approach to Management"* by Devdutt Pattanaik
4. *"My Life is My Message"* by Mohandas Karamchand Gandhi

**BBAV SEM Syllabus**  
**PERSPECTIVES ON CONTEMPORARY ISSUES(BBN-502B)**

**CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of contemporary global and societal issues, focusing on a broad range of challenges and opportunities faced by individuals, communities, and nations today.

**CourseContents**

Unit 1: Introduction to Contemporary Issues

**Objective:**

To provide an understanding of the significance and scope of contemporary issues in business and society.

*Topics:*

- Definition and scope of contemporary issues
- Globalization and its impact on business
- Economic, social, and political factors influencing contemporary issues
- Interdisciplinary perspectives on contemporary issues (business, environment, technology, etc.)
- Identifying and categorizing contemporary issues: Local, National, and Global
- Emerging trends in the world economy and business practices

*Learning Outcomes:*

- Understanding of key concepts related to contemporary issues
- Ability to categorize contemporary issues based on their scope and impact
- Familiarity with global trends and their effects on businesses

Unit 2: Economic and Environmental Issues

**Objective:**

To explore the economic and environmental challenges facing businesses and societies today.

*Topics:*

- Economic disparities: poverty, wealth inequality, and unemployment
- Economic crises: causes, effects, and case studies (e.g., the 2008 global financial crisis)
- Sustainability and corporate social responsibility (CSR)
- Climate change and its impact on business operations
- Environmental sustainability practices in business
- Green economy and the role of businesses in environmental conservation

*Learning Outcomes:*

- Critical analysis of the economic challenges affecting businesses
- Understanding the role of business in sustainable development
- Awareness of the environmental challenges and regulations impacting industries

### Unit 3: Technological Advances and Their Impact

**Objective:**

To examine how technological advancements shape contemporary business practices, industries, and societies.

*Topics:*

- The rise of artificial intelligence and automation in business
- Digital transformation in business operations
- Ethical issues in technology: data privacy, AI ethics, and cybersecurity
- The impact of the Internet of Things (IoT) and Big Data on industries
- Technological innovation in communication, transportation, and manufacturing
- The role of social media and digital marketing in contemporary business strategies

*Learning Outcomes:*

- Understanding the influence of technology on business models
- Ability to assess the ethical implications of technological advancements
- Exploring the opportunities and challenges presented by technological disruption

### Unit 4: Social and Cultural Issues

**Objective:**

To explore social, cultural, and demographic shifts that are influencing business practices and societal norms.

*Topics:*

- Global migration trends and their impact on the workforce
- Gender equality and diversity in the workplace
- Social justice movements and corporate responsibility
- The role of businesses in addressing racial, cultural, and ethnic diversity
- Corporate governance and ethical leadership in a diverse society
- The rise of millennial and Gen Z consumers: behavior and preferences

*Learning Outcomes:*

- Analyzing how social issues impact business decisions
- Understanding the importance of diversity, equity, and inclusion in business
- Assessing how businesses can adapt to changing cultural expectations

### Unit 5: Political and Legal Challenges

**Objective:**

To explore the political and legal issues affecting businesses in a contemporary global landscape.

*Topics:*

- Government regulations and their impact on business
- The role of international trade agreements and geopolitics in business strategy
- Political instability and its influence on global markets
- Ethical issues in corporate law: corruption, fraud, and governance

- Privacy laws and their effects on global business practices
- The role of lobbying and corporate influence in politics

*Learning Outcomes:*

- Understanding the impact of political and legal environments on businesses
- Analyzing global business risks related to political instability
- Exploring legal frameworks and their implications for corporate operations

**Suggested Readings:**

1. **Stiglitz, J. E. (2002).** *Globalization and its Discontents*. W.W. Norton & Company.
2. **McKibben, B. (2010).** *Eaarth: Making a Life on a Tough New Planet*. Times Books.
3. **Sen, A. (2009).** *The Idea of Justice*. Belknap Press.

## **BBA VSEM Syllabus Intelligent Automation (BBN-502C)**

### **CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of intelligent automation, focusing on the integration of artificial intelligence (AI), machine learning (ML), robotics, and advanced technologies into business and industrial processes.

### **Course Contents**

#### **Unit 1: Introduction to Intelligent Automation and Digital Transformation**

**Duration:** 3 Weeks

#### *Learning Objectives:*

- Understand the concept of Intelligent Automation (IA) and its role in business.
- Explore the intersection of artificial intelligence, robotic process automation (RPA), and machine learning in transforming business operations.
- Study the business cases and industry applications of IA.

#### *Topics Covered:*

1. **Introduction to Intelligent Automation (IA)**
  - Definition and components (AI, RPA, ML, and NLP)
  - Evolution of Automation: From Traditional to Intelligent Automation
  - Key Drivers of Digital Transformation
2. **Technologies Behind Intelligent Automation**
  - Robotic Process Automation (RPA)
  - Artificial Intelligence and Machine Learning
  - Natural Language Processing (NLP)
  - Internet of Things (IoT) in Automation
3. **Impact of Intelligent Automation on Business Processes**
  - Business Process Optimization and Streamlining
  - Cost Reduction and Efficiency Gains
  - Enhancing Customer Experience through Automation
4. **Industry Case Studies:**
  - Intelligent Automation in Finance, Healthcare, and Retail

#### **Unit 2: Robotic Process Automation (RPA)**

**Duration:** 3 Weeks

#### *Learning Objectives:*

- Develop a foundational understanding of RPA tools and their business applications.
- Gain practical knowledge of RPA design, deployment, and maintenance.

#### *Topics Covered:*

1. **Introduction to RPA**



- RPA vs Traditional Automation
- Key Benefits and Challenges
- Popular RPA Tools: UiPath, Automation Anywhere, Blue Prism
- 2. **RPA in Business**
  - Automating Back-office Operations
  - Customer Service Automation
  - Data Management and Reporting Automation
- 3. **RPA Implementation Life Cycle**
  - Planning, Designing, and Developing RPA Solutions
  - Deploying RPA in Business Functions
  - Monitoring, Managing, and Scaling RPA Solutions
- 4. **Hands-On Activities**
  - RPA Tool Demonstration and Basic Automation Design

### Unit 3: Artificial Intelligence and Machine Learning for Automation

#### *Learning Objectives:*

- Understand the role of AI and ML in automation.
- Explore AI-driven solutions and machine learning algorithms that enable smarter automation.

#### *Topics Covered:*

1. **Overview of Artificial Intelligence**
  - Definitions, History, and Evolution of AI
  - Types of AI: Narrow AI vs General AI
  - AI Algorithms and Their Applications in Automation
2. **Machine Learning (ML) Basics**
  - Supervised vs Unsupervised Learning
  - Key ML Algorithms: Decision Trees, Neural Networks, Clustering, Regression
  - Integrating ML into Business Automation
3. **AI and ML in Business Automation**
  - Predictive Analytics and Decision-Making Automation
  - Chatbots and Virtual Assistants for Customer Engagement
  - Fraud Detection and Risk Management Automation
4. **Case Studies:**
  - AI in Healthcare, Retail, and Marketing Automation

### Unit 4: Automation in Business Operations and Strategy

#### *Learning Objectives:*

- Examine the strategic implications of adopting Intelligent Automation in various business functions.
- Learn how to implement and scale automation across business operations.

#### *Topics Covered:*

1. **Intelligent Automation in Operations**
  - Automating HR, Finance, Sales, and Marketing
  - End-to-End Automation Solutions for Business Functions
2. **Strategic Integration of Automation**
  - Aligning Automation with Business Goals and Objectives
  - Change Management and Employee Training

- Overcoming Resistance to Automation in Business
- 3. **Measuring the Impact of Automation**
  - KPIs for Automation Success
  - ROI Analysis and Cost-Benefit Assessment
- 4. **Automation Governance and Risk Management**
  - Ethical Considerations in AI and Automation
  - Managing Automation Risks and Compliance Challenges

## Unit 5: The Future of Intelligent Automation and Emerging Trends

### *Learning Objectives:*

- Investigate the future potential of Intelligent Automation in business.
- Analyze emerging trends such as hyperautomation, AI-driven decision-making, and automation ethics.

### *Topics Covered:*

1. **Emerging Trends in Intelligent Automation**
  - Hyperautomation and its Implications
  - AI-driven Business Decision-Making and Autonomous Systems
  - Integration of Blockchain with Automation
2. **The Role of Automation in Industry 4.0**
  - Smart Manufacturing and AI in Supply Chains
  - Autonomous Vehicles and Robotics in Logistics
3. **The Human-AI Collaboration**
  - Re-skilling the Workforce in the Age of Automation
  - The Evolving Role of Employees in Automated Environments
4. **Future Challenges and Opportunities in Automation**
  - Ethical Challenges in Automation and AI
  - The Future Workforce: Collaborating with Machines

### SUGGESTED READINGS-

1. **Sutton, R. S., & Barto, A. G. (2018).** *Reinforcement Learning: An Introduction*. MIT Press.
2. **Avasarala, V. (2018).** *Robotic Process Automation and Cognitive Automation: The Next Phase*. Wiley.
3. **Binns, R. (2018).** *The Ethics of Artificial Intelligence and Robotics*. Stanford Encyclopedia of Philosophy.

## **BBA V SEM Syllabus Creativity and Innovation (BBN-502D)**

### **CO: COURSE OBJECTIVES**

The objective of this course is to introduce students to the fundamental principles of creativity and innovation, focusing on the processes, strategies, and tools that foster creative thinking and the development of innovative solutions.

### **CourseContents**

#### Unit 1: Introduction to Creativity and Innovation

**Objective:** To provide foundational knowledge about creativity and innovation, their definitions, and significance in business.

#### **Topics Covered:**

1. **Introduction to Creativity:** Definition, characteristics, and importance in business.
2. **Theories of Creativity:** Divergent thinking, convergent thinking, and cognitive processes.
3. **Introduction to Innovation:** Types of innovation—product, process, business model, and organizational innovation.
4. **The Innovation Process:** Stages of innovation—from idea generation to implementation.
5. **Creativity vs. Innovation:** Understanding the relationship and differences between creativity and innovation in the business context.

**Learning Outcome:** Students will understand the importance of creativity and innovation, and how they contribute to business growth.

#### Unit 2: Fostering Creativity

**Objective:** To explore techniques and methods to cultivate creativity within individuals and teams.

#### **Topics Covered:**

1. **Personal Creativity:** How to develop creative thinking at an individual level.
2. **Creative Problem Solving:** Techniques such as brainstorming, mind mapping, lateral thinking, and the SCAMPER method.
3. **Barriers to Creativity:** Identifying and overcoming internal and external factors that hinder creativity.
4. **Environmental Influences on Creativity:** Role of workplace culture, physical space, and organizational structure in fostering creativity.
5. **Creative Leadership:** Leading teams and organizations to think creatively and innovate.

**Learning Outcome:** Students will be able to apply creativity techniques and identify factors that influence creative thinking in business.

#### Unit 3: Innovation in Business Models and Strategy

**Objective:** To understand how businesses can leverage innovation to reshape their strategies and models.

## Topics Covered:

1. **Business Model Innovation:** Understanding how companies innovate their business models to gain competitive advantages.
2. **Disruptive Innovation:** What disruptive innovation is and how it changes industries.
3. **Strategic Innovation:** How companies can strategically innovate to maintain relevance in changing markets.
4. **Case Studies:** Analysis of companies that have successfully implemented innovative business models (e.g., Apple, Amazon, Netflix).
5. **The Role of Technology in Business Innovation:** Impact of emerging technologies (AI, blockchain, IoT) on innovation.

**Learning Outcome:** Students will develop an understanding of how businesses innovate their strategies and models to stay competitive.

## Unit 4: Innovation Management and Implementation

**Objective:** To explore how organizations can manage and implement innovative ideas effectively.

## Topics Covered:

1. **The Innovation Lifecycle:** Stages from idea generation to commercialization.
2. **Innovation Management Process:** Managing ideas, selection, development, and market introduction.
3. **Building an Innovation Culture:** Strategies for creating a culture that encourages risk-taking and experimentation.
4. **Innovation Teams and Collaboration:** Role of teams, cross-functional collaboration, and external partnerships in innovation.
5. **Challenges in Implementing Innovation:** Addressing resistance to change, resource allocation, and scalability.

**Learning Outcome:** Students will learn how to manage and implement innovation within organizations, and understand the challenges involved.

## Unit 5: Measuring and Commercializing Innovation

**Objective:** To equip students with the skills to measure and commercialize innovations effectively.

## Topics Covered:

1. **Measuring Innovation:** Key performance indicators (KPIs) for assessing innovation success.
2. **The Innovation Funnel:** How to prioritize and filter innovative ideas.
3. **IPR and Innovation:** Role of intellectual property rights (patents, trademarks) in protecting innovations.
4. **Commercializing Innovations:** From prototype to market – strategies for bringing new products or services to market.
5. **Innovation in Startups vs. Corporates:** Approaches to innovation in small businesses versus large organizations.

**Learning Outcome:** Students will gain insights into how to measure innovation and navigate the commercialization process to bring innovations to the market.

## Course Evaluation:

- **Assignments:** 20% (Case studies, essays on innovation practices)
- **Class Participation:** 10% (Active involvement in discussions, creativity workshops)
- **Mid-Term Exam:** 30% (Covering Units 1-3)

- **Final Exam:** 40% (Covering all 5 units, with case-based questions and application of concepts)

References:

1. **"Creative Confidence: Unleashing the Creative Potential Within Us All"** by Tom Kelley & David Kelley
2. **"The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail"** by Clayton Christensen
3. **"Innovation and Entrepreneurship"** by Peter Drucker
4. **"The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses"** by Eric Ries

Programme/Class: Degree		Year:Third	Semester:Fifth
Course/paper-14(A)			
CourseCode:BBN-503		CourseTitle:Entrepreneurshipandsmallbusinessmanagement	
<b>Courseoutcomes:</b>			
Theaimofthecourseistodevelopconceptofentrepreneurandentrepreneurshipamongthestudent.Thecourse seekstogivedetailedknowledgeaboutthesubjectmatter byinstillingthembasicideasabout entrepreneurship and small businesses. The outcome of the course will be as follows –			
Toprovideknowledgeaboutentrepreneurialconcept			
Toprovideknowledgeaboutentrepreneurshipdevelopment,EDPsandsupportsystemTogive an overview about project and project report preparation			
Togiveanoverviewaboutthesmallbusinesses			
Credits:3		Compulsory	
Max.Marks:25+75		Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0			
<b>Unit</b>	<b>Topics</b>		<b>No. of Lectures Total=30</b>
<b>I</b>	Entrepreneurship: Concept, Role & Importance in Indian Economy, Theories of Entrepreneurship, Entrepreneurs – Evolution of concept, Types of entrepreneurs, traits of entrepreneur, entrepreneurs Vs managers, Entrapreneurs, problemsfacedbyentrepreneurs, Women Entrepreneurs, RuralEntrepreneurs		8
<b>II</b>	Entrepreneurial Development and Institutional Support System: Entrepreneurship development, Concept and Significance, EntrepreneurialDevelopmentProgrammes(EDP),problemsofEDP, Institutionalsupporttoentrepreneurs,Arrangementoffinanceand support from financial institutions		8
<b>III</b>	Business Idea: Environmental analysis, Search for business idea, Identificationofprojects,Selectionofproject,Projectformulation, Projectreport,projectappraisal.		8
<b>IV</b>	SmallBusiness:Definitions,MSMEDAct2006,StrategicPlanning anditsstepsformallbusiness,Incentivesandsubsidiesavailableto smallbusiness,formsofownership,Registrationas SSI		6
<b>SuggestedReadings:</b>			
1. Entrepreneurship 10thEd(IndianEdition)2016byRobertHisrichMichaelPetersDeanShepherd, McGraw Hill			
2. Khanka,S.S.;EntrepreneurialDevelopment;S.Chandand Co.			
3. Kumar,Arya;Entrepreneurship;PearsonEducation.			
4. Desai, Vasant;DynamicsofEntrepreneurialDevelopmentandManagement;HimalayaPublishing			
5. Blundel,R.andLockett,N.;ExploringEntrepreneurshipPracticesandPerspectives;OxfordPublications.			
SuggestedContinuousEvaluationMethods:			
In addition to the theoretical inputs the course will be delivered throughAssignments, Presentation, Group Discussions.Thiswillinstillinstudentasenseofdecisionmakingandpracticallearning.			
Suggestedequivalentonlinecourses:.....			
FurtherSuggestions:.....			

Programme/Class: Degree	Year:Third	Semester:Fifth
Course/paper-14(B)		
CourseCode:BBN-504	CourseTitle:Salesmanagement	
<b>Courseoutcomes:</b>		
<p>The aim of the course is to build knowledge, understanding and skills in sales management among the student. The course seeks to give detailed knowledge about the subject matter by instilling them basic ideas about sales management. The outcome of the course will be as follows –</p> <p>To provide knowledge about sales personnel and salesmanship.</p> <p>To provide knowledge about personal selling and focus light on the different perspectives of managing sales force.</p> <p>To give an overview about importance of sales force in organization. To give an overview about concept of distribution channels.</p>		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	Introduction to Sales Management: Concept, Evolution of sales function, Objectives of sales management positions, Functions of Sales manager and their relation with other executives.	8
<b>II</b>	Salesmanship: Theories of personal selling, Types of Sales executives, Qualities of sales executives, Personal selling process, Showroom & exhibition,	8
<b>III</b>	Sales Organization and Relationship: Purpose of sales organization, Types of sales organization structures, Sales department external relations, Distributive network relations. Sales Force Management: Recruitment and Selection, Sales Training, Sales Compensation.	8
<b>IV</b>	Distribution Network Management: Types of Marketing Channels, Factors affecting the choice of channel, Types of middleman and their characteristics, Concept of physical distribution system.	6
<b>Suggested Readings:</b>		
<ol style="list-style-type: none"> <li>1. Cundiff, Still, Govoni, Sales Management</li> <li>2. Pradhan, Jakate, Mali, Salesmanship &amp; Publicity</li> <li>3. S.A. Chunawalla, Sales Management</li> </ol>		
<b>Suggested Continuous Evaluation Methods:</b>		
In addition to the theoretical inputs the course will be delivered through Assignments, Presentation, Group Discussions. This will instill in student a sense of decision making and practical learning.		
Suggested equivalent online courses:.....		
Further Suggestions:.....		

Programme/Class: Degree	Year:Third	Semester:Fifth
Course/paper-15(A)		
CourseCode:BBN-505	CourseTitle:IndustrialRelations&Labour Laws	
<b>Courseoutcomes:</b> Thiscoursewillhelpstudentsidentifyanddevelopanoverviewofindustrialrelations.Italsohelpinacquiring knowledge and understanding of Industrial Labour and General Laws.		
<ul style="list-style-type: none"> <li>• KnowledgeofIndustrialRelationframework</li> <li>• CompetencytounderstandtheimportanceofEmployeeRelationwithintheperspectiveofIndustrial Relation</li> <li>• KnowledgeaboutrelevantLawsofHRmanagement</li> <li>• CompetencytointerpretedandimplementtheLabourLawswithinorganization</li> <li>• CompetencytouseCollectiveBargainingandGrievanceredressal Mechanism</li> </ul>		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No.of Lectures Total=30</b>
<b>I</b>	IndustrialRelations:Role-Importance-TradeUnions-Industrial disputesandtheirResolutions.	6
<b>II</b>	ParticipativeManagement:Structure -Scope-CollectiveBargaining- WorksCommittee-JointManagementCouncils-Pre-Requisitefor successfulparticipation-RoleofGovernmentinCollectiveBargaining.	8
<b>III</b>	Industrial unrest: Employee dissatisfaction - Grievances - Disciplinary Action - Domestic Enquiry - Strikes - lockout - Prevention of Strikes - Lockouts.Discipline:Positive,negativediscipline,disciplinaryprocedure, Absenteeism,Turnover,Dismissal and Discharge.	8
<b>IV</b>	FactoriesAct:Meaning,Definition–Welfare–Safety–HealthMeasures. Workmen’s Compensation Act and International Labor Organization - RoleandFunction,GeneralprovisionsofBonusAct andGratuity Act	8
<b>SuggestedReadings:</b>		
5. SreenivasanM.R-IndustrialRelations&Laborlegislations.		
6. AswathappaK-HumanResourceandPersonnelManagement.		
7. SubbaRaop-HumanResourceManagementandIndustrial Relations.		
8. Monoppa-IndustrialRelations.5.S.C.Srivastava,IndustrialRelationofLabourLaws.		
SuggestedContinuousEvaluationMethods:		
In addition to the theoretical inputs the course will be delivered throughAssignments, Presentation, Group Discussions.Thiswillinstillinstudentasenseofdecisionmakingandpracticallearning.		
Suggestedequivalentonlinecourses:.....		
FurtherSuggestions:.....		



Programme/Class: Degree	Year:Third	Semester:Fifth
Course/paper-15(B)		
CourseCode:BBN-506	CourseTitle:CompanyAccounts	
<b>Courseoutcomes:</b>		
Theaimofthecourseistobuildknowledge,understandingandskillsintheareaofcompanyaccounts amongthestudent.Thecourseseekstogivedetailedknowledgeaboutthesubjectmatterbyinstilling thembasicideasaboutaccountingpracticesrelevant tocompanies.Theoutcomeofthecoursewillbeasfollows –		
<ul style="list-style-type: none"> <li>• Tounderstandjointstockcompaniesandknowledgeaboutsharesanddebentures</li> <li>• Tohaveunderstandingaboutfinalaccountsandaccountingpracticesrelatedtoamalgamation</li> </ul>		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	Joint Stock Companies: Its types and share capital, Issue, ForfeitureandRe-issueofshares,Redemptionofpreference shares, Issue and RedemptionofDebenture.	7
<b>II</b>	FinalAccounts:IncludingComputationofmanagerialRemuneration anddisposalofprofit.	7
<b>III</b>	AccountingforAmalgamationofcompaniesasper Accounting Standard14,AccountingforInternalreconstruction,Liquidationof Company.	8
<b>IV</b>	ConsolidatedBalanceSheetofHoldingCompanieswithone Subsidiaryonly,StatementofAffairsandDeficiency/Surplus, Receivers Receipt and Payment A/c.	8
<b>SuggestedReadings:</b>		
1. GuptaR.L.RadhaswamyM,CompanyAccounts		
2. Maheshwari,S.N.,CorporateAccounting		
3. MongaJ.R.,Ahuja,Girish,andSehgalAshok,Financial Accounting		
4. Shukla,M.C.,GrewalT.s.andGupta,S.C.AdvancedAccounts		
SuggestedContinuousEvaluationMethods:		
In addition to the theoretical inputs the course will be delivered throughAssignments, Presentation, Group Discussions.Thiswillinstillinstudentasenseofdecisionmakingandpracticallearning.		
Suggestedequivalentonlinecourses:.....		
FurtherSuggestions:.....		

BBA:ThirdYearCourseStructure Sixth Semester

<b>SL.No.</b>	<b>Subject Code</b>	<b>Subject Name</b>	<b>Credit</b>
1	BBN-601	Project Management	4
2	BBN-602	Goods & Service Tax	4
3	BBN-603	Auditing	4
4	BBN-604	International Trade	4
5	BBN-605	Strategic Mangement	4
6	BBN-606	Trainning & Development	4
		<b>Total</b>	<b>24</b>

Programme/Class:Degree	Year:Third	Semester:Sixth
Course/paper-16(A)		
CourseCode:BBN-601	CourseTitle:ProjectManagement	
<b>Courseoutcomes:</b>		
<ul style="list-style-type: none"> <li>• StudentswillbeabletounderstandthecharacteristicsofProjectandProjectManagementKnowledge</li> <li>• Thestudentswillunderstandthemanagerialprocessalongwithtools&amp;techniquesusedinProject management Knowledge</li> <li>• Studentswill understandtheschedulingandmonitoringprocessinProject.TheywillbeabletoapplyPERT and CPM method for project scheduling</li> <li>• Studentswillunderstandtheperspectivesinwhichoptimumdecisionsaretobetakenincaseofriskswith planned activities in project</li> </ul>		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	Definitions&CharacteristicsofProject,TypesofProjects,ProjectLifeCycle,Project Management Process: Introduction, Tools & Techniques of Project Management. ProjectTeamandScopeof ProjectManagement,ProjectOrganization.	6
<b>II</b>	Project Identification & Selection: Identification, Generation of ideas,Approaches to Project Screening and Selection, Project Rating Index. Market & Demand Analysis Techniques: Survey & Trend Projection Methods.ProjectRiskManagement	8
<b>III</b>	Project Costing: Fundamental components of Project Cost, Types of Costs: Direct, Indirect, Recurring, Non-Recurring, Fixed, Variable, Normal, Expedite costs. Project FinancingandBudgeting:SourcesofFinance,SocialCostBenefitAnalysis(SCBA)of Project,ProjectSchedulingandNetworkAnalysis:StepsinProjectSchedulingand Network design, Introduction to CPM and PERT,	8
<b>IV</b>	MonitoringandControl:Planning-MonitoringandControlCycle.ProjectManagement Information System. Milestone Analysis and Tracking Gantt chart. Earned Value Analysis (EVA): Planned Value(PV), Earned Value (EV), Cost Variance (CV), Schedule Variance (SV), Cost performance Index (CPI), Schedule performance Index (SPI). Project Termination: Types of Terminations, Project TerminationProcess	8
<b>SuggestedReadings:</b>		
<ol style="list-style-type: none"> <li>1. ProjectManagement-AManagerialApproach:JackR.MeredithBroyhillSamuelJ.Mantel,Jr(JohnWiley &amp; Sons)</li> <li>2. ProjectManagement:Mr.SanjivMarwah-(WileyDreamtech)</li> <li>3. Project-Preparation,Appraisal,BudgetingandImplementation:ChandraPrasanna-(TMH)</li> <li>4. ProjectManagementCoreTextBook:MRGopalan(Wiley)</li> <li>5. QuantitativeTechniquesinManagement:NDVohra(TMh)</li> <li>6. EntrepreneurshipandSmallBusinessManagement:MBSShukla</li> </ol>		
SuggestedContinuousEvaluationMethods:		
In addition to the theoretical inputs the course will be delivered throughAssignments, Presentation, Group Discussions.Thiswillinstillinstudentasenseofdecisionmakingandpracticallearning.		
Suggestedequivalentonlinecourses:		
.....		
FurtherSuggestions:		
.....		

Programme/Class:Degree		Year:Third	Semester:Sixth
Course/paper-16(B)			
CourseCode:BBN-602		CourseTitle:Goods&ServiceTax	
Courseoutcomes: The aim of the course is to build knowledge and understanding about GST among the student. The course seekstogivedetailedknowledgeaboutthesubjectmatterbyinstillingthembasicideasabout GST. The outcome of the course will be as follows – ToprovideknowledgeaboutindirecttaxesbeforeGST. ToprovideknowledgeaboutregistrationanddocumentationprocessunderGST.To give an overview about tax exemptions. Togiveanoverviewaboutfilingof GSTR.			
Credits:3		Compulsory	
Max.Marks:25+75		Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0			
Unit	Topics		No.of Lectures Total=30
I	<b>Introduction:</b> ConstitutionalframeworkofIndirectTaxesbeforeGST(Taxation Powers of Union & State Government); Concept of VAT: Meaning, Variants and Methods; Major Defects in the structureofIndirectTaxespriortoGST;OverviewofGST;StructureofGST(SGST,CGST, UTGST&IGST);GSTCouncil.		7
II	<b>Supply of Goods and Services</b> - Definition of supply; Place of Supply:Intra-State and Inter-State supply; Composite and Mixed supply; Import and Export; Supplies of goods and services liable tobe reverse charged; Time of supply; Nil rated supplies, Zero rated supplies, Exemptedsupplies&Non-GSTsupplies.		7
III	<b>Registrationand Documentation:(A)</b> Registration-Personsliableto registration;Compulsoryregistration;ProcedureofRegistration;ExemptionfromRegistration; Composition Scheme.		8
	<b>(B)</b> Documentation- Tax Invoice; Bill of Supply; Receipt Voucher;PaymentVoucher; Refund Voucher; DebitNote; CreditNote. <b>Returns:</b> GSTR 1 and GSTR 2, Monthly / Quarterly Return, Annual Return;TimeandprocedureoffilingofReturns.		
IV	<b>Input Tax Credit:</b> Introduction, Concept of Input Service Distributor,Legal Formalities for an ISD, Distribution of Credit, Claiming Input Tax Credit for inputs goods, Claiming Input Tax Credit for Capital Goods <b>PaymentofTax-</b> (a)ThroughInputTaxCredit(b)Bycash/bankaftergenerationofonlineChallan. <b>E-WayBill:</b> Introduction, Preparation ofE-WayBill,ImportantPointsforTransporter <b>GST Portal:</b> Introduction,GSTeco-system,GSTSuvidhaProvider (GSP), Uploading Invoices		8
<b>SuggestedReadings:</b> 1. AnandadayMishra,GSTLaw&Procedure,Taxman. 2. GoodsandServiceTaxActs. 3. RelevantGoodsandServicesTaxRules. <i>NityaTaxAssociatesBasicsofGSTTaxman</i> 4. PublicationonGSTbytheInstituteofCharteredAccountantsofIndia( <a href="http://www.icai.org">www.icai.org</a> ) 5. PublicationonGSTbytheCentralBoardofExciseandCustoms( <a href="http://www.cbec.org">www.cbec.org</a> ). 6. NityaTaxAssociatesBasicsofGSTTaxman			
<b>SuggestedContinuousEvaluationMethods:</b> In addition to the theoretical inputs the course will be delivered throughAssignments, Presentation, Group Discussions.Thiswillinstillinstudentasenseofdecisionmakingandpracticallearning.			
Suggestedequivalentonlinecourses:.....			
FurtherSuggestions:.....			

Programme/Class:Degree	Year:Third	Semester:Sixth
Course/paper-17(A)		
CourseCode:BBN-603	CourseTitle:Auditing	
<p>Courseoutcomes:  TheaimofthecourseistobuildknowledgeandunderstandingaboutAuditingamongthestudent.The outcome of the course will be as follows –  ToprovideknowledgeaboutAuditinganditsdifferenttypes.  Toprovideknowledgeaboutauditprocedureandauditoflimitedcompanies. Students will get an overview about special audit recent trends in auditing.</p>		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	Introduction:MeaningandobjectivesofAuditing,TypesofAudit, InternalAudit,AuditProgramme, AuditNotebook,Routine Checking andTestChecking	6
<b>II</b>	InternalCheckSystem:InternalControl,AuditProcedure: Vouching, VerificationofAssetsandLiabilities.	7
<b>III</b>	AuditofLimitedCompanies:CompanyAuditor-Appointment, Powers, Duties and Liabilities. Auditor’s Report and Audit Certificate.	7
<b>IV</b>	Special Audit: Audit of Banking Companies, Audit of Insurance Companies,AuditsofEducationalInstitutions,AuditofCooperative Societies, Efficiency Audit, Social Audit etc. Recenttrendsinauditing:NatureandSignificanceofCost Audit,Tax Audit,ManagementAudit	10
<p><b>SuggestedReadings:</b>  1. BasuB.K.,AninsightwithAuditing  2. GuptaKamal,ContemporaryAuditing</p>		
<p>SuggestedContinuousEvaluationMethods:  In addition to the theoretical inputs the course will be delivered throughAssignments, Presentation, Group Discussions.Thiswillinstillinstudentasenseofdecisionmakingandpracticallearning.</p>		
<p>Suggestedequivalentonlinecourses:  .....</p>		
<p>FurtherSuggestions:  .....</p>		

Programme/Class:Degree	Year:Third	Semester:Sixth
Course/paper-17(B)		
CourseCode:BBN-604	CourseTitle:InternationalTrade	
<b>Courseoutcomes:</b>		
TheaimofthecourseistobuildknowledgeandunderstandingaboutInternationalTradeamongthe student. The outcome of the course will be as follows –		
<ul style="list-style-type: none"> <li>• Toprovideknowledgeaboutdifferentmethodsofinternationaltrade.</li> <li>• Toprovideknowledgeaboutinternationaleconomicinstitutions.</li> <li>• StudentswillgetanoverviewaboutIndiaforeigntradeandIndia'strade policy.</li> </ul>		
Credits:3	Compulsory	
Max.Marks:25+75	Min.PassingMarks:	
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	Introduction:Basicsofinternationaltrade,internationaltradetheories, driversofinternational trade,restrainingforces, recenttrendsinworld trade.	6
<b>II</b>	Foreigntrade:Foreigntrade&economicgrowth,balanceoftrade, balance of payments, free trade, forms and restrictions.	7
<b>III</b>	Internationaleconomicinstitutions:IMF,WorldBank,WTO(in brief),Regionaleconomicgroupings-NAFTA,EU,ASEAN, SAARC.	7
<b>IV</b>	India's foreign trade: Recent trends in India's foreign trade, institutionalinfrastructureforexportpromotioninIndia,projects& consultancy exports. Trade Policy: India's Trade policy, export assistance,marketingplanforexports.	10
<b>SuggestedReadings:</b>		
3. Varshney&Bhattacharya,International Marketing		
SuggestedContinuousEvaluationMethods:		
In addition to the theoretical inputs the course will be delivered throughAssignments, Presentation, Group Discussions.Thiswillinstillinstudentasenseofdecisionmakingandpracticallearning.		
Suggestedequivalentonlinecourses:		
.....		
FurtherSuggestions:		
.....		

Programme/Class:Degree	Year:Third	Semester:Sixth
Course/paper-18(A)		
CourseCode:BBN-605	CourseTitle:StrategicManagement	
<b>Courseoutcomes:</b> TheaimofthecourseistobuildknowledgeandunderstandingaboutStrategicManagementamongthe student. The outcome of the course will be as follows –		
<ul style="list-style-type: none"> <li>• Todeveloplearningandanalyticalskillsamongthestudentstosolvebusinessproblemsandprovide strategic solutions.</li> <li>• Thecourseaimstoacquaintthestudentswithnature,scopeanddimensionsofBusinessPolicyand StrategyManagementProcess.</li> </ul>		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	WhatisStrategy? WhatareStrategicIntent;Mission;Objectivesand Goals; Policies; Program; Budget; Process of strategic management, Levelsofstrategy	6
<b>II</b>	Identifyingstrategicalternativesofbusiness;Environmentalappraisal – Internal environment; Key Success Factors; Role of Resources, Capabilities and Core Competencies; Competitive Advantage to Competitive Strategies; VRIO Model, External environmental analysis–PESTEL.	8
<b>III</b>	ConceptofValueChain,SWOTAnalysis;ToolsandTechniquesfor StrategicAnalysis–TOWSMatrix;GenericStrategies;Competitive Strategies - Porter’s 5 Forces Model; The Experience Curve, Grand Strategy,BCGMMatrix;FunctionalStrategies,Globalentrystrategies.	8
<b>IV</b>	OrganizationStructure;ResourceAllocation;ProjectsandProcedural issues. Integration of Functional Plans. Leadership and corporate culture; Evaluation and Control: Organizational Systems and Techniques of Strategic Evaluation and Control of Performance and Feedback.	8
<b>SuggestedReadings:</b>		
7. Lawrence,R.JauchandWilliamF.Glueck;StrategicManagementandBusinessPolicy,-McGraw–Hill		
8. Wheelen&Hunger,ConceptsinStrategicManagementandBusinessPolicy,12 <sup>th</sup> edition,Pearson Education.		
9. Kazmi,Azhar,(2008),StrategicManagementandBusinessPolicy,3rdEdition,McGrawHill Education.		
10. R.Srinivasan,StrategicManagementtheIndiancontext,PrenticeHalofIndia		
11. L.M.Prasad–StrategicManagement–Sultan Chand		
<b>SuggestedContinuousEvaluationMethods:</b>		
In addition to the theoretical inputs the course will be delivered throughAssignments, Presentation, Group Discussions.Thiswillinstillinstudentasenseofdecisionmakingandpracticallearning.		
<b>Suggestedequivalentonlinecourses:</b> .....		
<b>FurtherSuggestions:</b> .....		

Programme/Class:Degree	Year:Third	Semester:Sixth
Course/paper-18(B)		
CourseCode:BBN-606	CourseTitle:TrainingandDevelopment	
<b>Courseoutcomes:</b>		
<ul style="list-style-type: none"> <li>• ThefieldofTrainingandDevelopmentanditsroleinoptimizingperformance.</li> <li>• Applyingtheoreticalconceptsandmodelstotrainingdesign.</li> <li>• Designingtraininginterventionsusingavarietyofmethodologies.</li> <li>• Evaluatingtheeffectivenessoftraining&amp;developmentinterventions.</li> <li>• Assessingwhethertraining&amp;developmentisaviablecareer option.</li> </ul>		
Credits:3		Compulsory
Max.Marks:25+75		Min.PassingMarks:
TotalNo.ofLectures-Tutorials-Practical(inhoursperweek):L-T-P:2-0-0		
<b>Unit</b>	<b>Topics</b>	<b>No. of Lectures Total=30</b>
<b>I</b>	Introduction: Concepts and Rationale of Training and Development; DifferencebetweenTraining,Development&Education,overviewof training and development systems; organizing trainingdepartment; traininganddevelopmentpolicies;RequisitesofEffectiveTraining.	7
<b>II</b>	Training Needs Assessment (TNA): Meaning of TNA, Purpose and Methods of TNA, the Need Assessment Process – Organizational Analysis,PersonAnalysis,TaskAnalysis,OutputofTNA.Learning Theories.	7
<b>III</b>	Designing, Conducting & Evaluation of Training Program: Areas of training, Types of training, System’s Approach to Training, Training Methods,Designingatrainningprogram,contents&scheduling,study material, selecting a trainer, deciding method of training, Types of Teaching Aids in Training, Training Evaluation & Methods of Training Evaluation, Training Effectiveness Models - Kirkpatrick ModelofTrainingEffectiveness,CIROModel.	8
<b>IV</b>	Executive Development: Importance of Executive Development, Steps in the organization of a management Development Program/ Executive Development Program, Methods/ Techniques of Management Development Program, Special Issues in Training & Development–Legal Issues,Cross Cultural Preparation, Managing WorkforceDiversity,Sensitivity Training,Succession Planning.	8
<b>SuggestedReadings:</b>		
12. Noe, Raymond A., and Amitabh Deo Kodwani, Employee Training and Development, Tata McGraw Hill, 5th Edition, 2012.		
13. Rao VSP, Human Resource Management, Excel Books Publication, 3rd Edition. 2013.		
14. Rolf, P., and Udai Pareek, Training for Development, Sage Publications Pvt. Ltd.		
15. Jack J. Phillips, Handbook of Training Evaluation and Measurement Methods, Routledge.		
16. Dayal, Ishwar, Management Training in Organisations, Prentice Hal		
Suggested Continuous Evaluation Methods:		
In addition to the theoretical inputs the course will be delivered through Assignments, Presentation, and Group Discussions. This will instill in student a sense of decision making and practical learning.		
Suggested equivalent online courses:.....		
Further Suggestions:.....		





## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Business Studies & Entrepreneurship**

#### **Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Business Administration (BBA) Three Year**

**Programme Semester Pattern**

**(w.e.f. session 2013-14)**

**Approved and adopted in the year 2013 ( 1<sup>st</sup> meeting, Board of  
Studies)**

**(SYLLABUS FROM 2013 to 2020)**

**OLD SYLLABUS**

## **Programme Educational Objectives (PEOs)**

**PEO 1** Graduates will demonstrate a comprehensive understanding of core business concepts, including finance, marketing, management, and operations, enabling them to analyze and solve business problems effectively.

**PEO 2** Graduates will apply critical thinking and analytical skills to make informed decisions in complex business environments, considering ethical and social implications.

**PEO 3** Graduates will effectively communicate ideas and information in both written and verbal formats, demonstrating strong interpersonal skills necessary for teamwork and leadership roles.

**PEO 4** Graduates will understand the impact of globalization on business practices and appreciate diverse perspectives, fostering inclusivity in the workplace.

**PEO 5** Graduates will utilize current technologies and data analytics tools to enhance business operations and decision-making processes.

**PEO 6** Graduates will cultivate an entrepreneurial mindset, demonstrating creativity and innovation in developing new business ideas and strategies.

**PEO 7** Graduates will recognize the importance of ethical behavior and social responsibility in business, making decisions that contribute positively to society.

**PEO 8** Graduates will embrace continuous learning and adaptability, equipping them to navigate the evolving business landscape throughout their careers.

## **Programme Specific Objectives (PSO's)**

**PSO 1** Equip students with a foundational understanding of various business functions, including marketing, finance, operations, and human resources.

**PSO 2** Foster the ability to analyze complex business problems and make data-driven decisions using quantitative and qualitative methods.

**PSO 3** Instill a sense of ethical responsibility and integrity in business practices, preparing students to be ethical leaders in their future careers.

**PSO** Improve both written and verbal communication skills, enabling students to effectively present ideas and collaborate in diverse teams.

**PSO5** Inspire innovative thinking and the ability to recognize and capitalize on business opportunities in various environments.

**PSO6** Provide an understanding of global business practices and cultural diversity, preparing students for careers in an interconnected world.

### **Programme Outcome Objectives (POO's)**

**POO 1** Demonstrate a comprehensive understanding of core business concepts, theories, and practices across various disciplines, including finance, marketing, management, and operations.

**POO 2** Apply critical thinking and analytical skills to solve complex business problems and make informed decisions based on quantitative and qualitative data.

**POO 3** Exhibit effective verbal and written communication skills, enabling clear presentation of ideas and persuasive arguments in diverse business contexts.

**POO 4** Work effectively in teams, demonstrating leadership, interpersonal skills, and the ability to manage group dynamics to achieve common goals.

**POO 5** Understand and apply ethical principles and social responsibility in business decision-making, recognizing the impact of business actions on society and the environment.

**POO 6** Analyze and appreciate the impact of globalization on business practices and strategies, and demonstrate cultural awareness in diverse business environments.

**POO 7** Utilize modern technology and information systems to enhance business operations, including data analysis tools and management software.

**POO 8** Foster an entrepreneurial mindset by identifying opportunities, assessing risks, and developing innovative solutions to create value in the marketplace.

**POO 9** Commit to ongoing personal and professional development, recognizing the importance of staying current with industry trends and advancements.

**POO 10** Develop and implement effective business strategies that align with organizational goals and respond to market dynamics.

*Course Structure*

*Ordinance and Regulations*

**B.B.A. (Three Year, Six Semester Program) SYLLABUS w.e.f. Academic Session 2019-20  
as amended on 2019**

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**BBA FIRST YEAR**

**First Semester**

PAPER CODE	COURSE STRUCTURE	LOAD ALLOCATION/PER WEEK			CREDIT
		L	T	P	
BS311	Environmental Studies	4	0	0	4
BS311-A	Nutrition & Well being				
BS311-B	Disaster Management				
BS311-C	Geophysics				
BS312	Micro Economics	4	0	0	4
BS313	Financial Accounting	3	1	0	4
BS314	Management Principles & Applications	4	0	0	4
BS315	Business Organization	4	0	0	4
	<b>TOTAL</b>	<b>19</b>	<b>1</b>	<b>0</b>	<b>20</b>

**B.B.A. (Three Year, Six Semester Program) SYLLABUS w.e.f. Academic Session 2019-20  
as amended on 2019**

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**Second Semester**

PAPER CODE	COURSE STRUCTURE	LOAD ALLOCATION/PER WEEK			CREDIT
		L	T	P	
BS321	Business Law	4	0	0	4
BS321-A/ BS321B/BS321C/BS321D	Intellectual Property Law-1/ IT Law-1/ Competitive Law-1/ Tax Law-1				
BS322	Business Communication	4	0	0	4
BS322-A	Etiquate&Convesational Skills				
BS322-B	Corporate Communication				
BS322-C	Professional Communication				
BS322-D	Personality Development				
BS323	Cost Accounting	3	1	0	4
BS324/BS324A/BS324B/BS324C	Business Mathematics/Elementary Mathematics/Statistical Mathematics/	3	1	0	4
BS325	OrganisationalBehaviour	4	0	0	4
	<b>TOTAL</b>	<b>18</b>	<b>2</b>	<b>0</b>	<b>20</b>

**SECOND YEAR**

**Third Semester**

BS331	SEMESTER III				
	Macroeconomics	5	0	<b>P</b>	
BS332	Corporate Laws	5	0	0	5
BS332-A	Competition Law			0	5
BS332-B	IT Laws			0	5
BS333	Human Resource Management	5	0	0	5
BS334	Computer Applications in Business	4	0		
BS335	Income Tax Law & Practice	4	1		
	<b>TOTAL</b>	<b>23</b>	<b>1</b>	<b>0</b>	<b>5</b>
	SEMESTER III			<b>0</b>	<b>25</b>

**Fourth Semester**

PAPER CODE	COURSE STRUCTURE	LOAD ALLOCATION/PER WEEK			CREDIT
		L	T	P	
BS341	Business Statistics	4	1	0	5
BS342	Principles of Marketing	5	0	0	5
BS343	Indian Economy	5	0	0	5
BS344	E-Commerce	5	0	0	5
BS344-A	Web Development				
BS344-B	Data Analytics				
BS345	Entrepreneurship	5	0	0	5
	<b>TOTAL</b>	<b>24</b>	<b>1</b>	<b>0</b>	<b>25</b>

**B.B.A. (Three Year, Six Semester Program) SYLLABUS w.e.f. Academic Session 2019-20  
as amended on 2019**

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**THIRD YEAR**

**Fifth Semester**

<b>PAPER CODE</b>	<b>SEMESTER V</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
BS351	Fundamentals of Financial Management	4	1	0	5
BS352	Production & Operations Management	5	0	0	5
BS353	Corporate Accounting	4	1	0	5
BS3X1	F1/H1/M1	5	0	0	5
BS3X2	F2/H2/M2	5	0	0	5
	<b>FINANCE</b>				
BS3F1	Financial Markets, Institutions & Services				
BS3F2	Security Analysis and Portfolio Management				
	<b>MARKETING</b>				
BS3M1	Advertising & Consumer Behaviour				
BS3M2	Sales & Distribution				
	<b>HUMAN RESOURCE MANAGEMENT</b>				
BS3H1	Industrial Relations & Labour Laws				
BS3H2	Human Resource Planning				
	<b>TOTAL</b>	<b>23</b>	<b>2</b>	<b>0</b>	<b>25</b>



**B.B.A. (Three Year, Six Semester Program) SYLLABUS w.e.f. Academic Session 2019-20  
as amended on 2019**

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**Sixth Semester**

<b>PAPER CODE</b>	<b>SEMESTER VI</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
BS361	Business Policy & Strategy	5	0	0	5
BS362	Goods and Services Tax and Customs	4	1	0	5
BS3X3	F3/H3/M3	5	0	0	5
BS3X4	F4/H4/M4	5	0	0	5
BS365	<b>Project Report &amp; Viva</b>	5	0	0	5
	<b>FINANCE</b>				
BS3F4	Insurance & Risk Management				
BS3F5	Banking Principles & Operations				
	<b>MARKETING</b>				
BS3M4	Retail Management				
BS3M5	Services Marketing				
	<b>HUMAN RESOURCE MANAGEMENT</b>				
BS3H4	Training and Development of Human Resources				
BS3H5	Compensation Management				
	<b>TOTAL</b>	<b>24</b>	<b>1</b>	<b>0</b>	<b>25</b>

**Project Work/ Dissertation in lieu of one of the Elective Core discipline papers**

**LIST OF SPECIALISATION ELECTIVE COURSE (DSE):**

**Human Resource Management**

1. H1 - Industrial Relations & Labour Laws
2. H2:- Human Resource Planning
3. H3:- Training and Development of Human Resources
4. H4:- Compensation Management

**Marketing**

1. M1:- Advertising & Consumer Behaviour
2. M2:-Sales & Distribution
3. M3:- Retail Management
4. M4:- Marketing of Services

**Finance**

1. **F1**:- Financial Markets, Institutions & Services
2. **F2**:- Security Analysis and Portfolio Management
3. **F3**:- Insurance & Risk Management
4. **F4**:- Banking Principles & Operations

**ENVIRONMENTAL STUDIES**

**Sub. Code: BS311**

**L – 4, C – 4.**

**Course Objective**

The objective of this course is to provide students with a comprehensive understanding of the relationship between human activities and the environment. It explores the key principles of environmental science, sustainability, and ecological balance, focusing on how environmental issues such as climate change, resource depletion, and pollution affect both global ecosystems and human well-being.

**Unit 1**

Multidisciplinary nature of environmental studies Definition, scope and importance.

**Unit 2**

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.

- a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, Mining, dams and their effects on forest and tribal people.
- b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
- f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.

**Unit 3**

Ecosystems • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem. • Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem:-

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Unit 4**

Biodiversity and its conservation • Introduction – Definition: genetic, species and ecosystem diversity. • Biogeographically classification of India • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, National and local levels. • India as a mega- diversity nation V • Hot-spots of biodiversity. • Threats to biodiversity: habitat loss, poaching of

wildlife, man-wildlife conflicts. • Endangered and endemic species of India • Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### **Unit 5**

Environmental Pollution Definition • Cause, effects and control measures of: - a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards • Solid waste Management : Causes, effects and control measures of curban and industrial wastes. • Role of an individual in prevention of pollution. • Pollution case studies. • Disaster management: floods, earthquake, cyclone and landslides.

### **SUGGESTED READINGS-**

1. **"Environmental Science: A Global Concern"** by William P. Cunningham and Mary Ann Cunningham
2. **"Principles of Environmental Science: Inquiry and Applications"** by William P. Cunningham and Mary Ann Cunningham
3. **"Environmental Ethics: An Introduction to Environmental Philosophy"** by Joseph R. DesJardins

## **NUTRITION AND WELL-BEING**

**Sub. Code:** BS311 A

**L – 4, C – 4**

### **Objective:**

The objective of the course is to provide students with a comprehensive understanding of nutrition and its impact on well-being. The course focuses on how nutrition affects personal health, productivity, and decision-making in professional environments, while also covering topics like stress management, exercise, and corporate wellness initiatives.

### **CONTENTS:**

#### **Unit 1: Introduction to Nutrition and Health**

- **Concepts of Nutrition:**
  - Understanding the basic principles of nutrition, nutrients, and their functions.
  - Overview of macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins and minerals).
- **Role of Nutrients in the Body:**
  - Functions of proteins, carbohydrates, fats, vitamins, and minerals.
  - Understanding energy balance, metabolism, and nutrient requirements.
- **Water and Hydration:**
  - Importance of water for bodily functions and hydration guidelines.
  - Dehydration and its effects on health.
- **Balanced Diet:**
  - Importance of a balanced diet in maintaining health, with an emphasis on meal planning and portion control.
  - The food pyramid and dietary guidelines.

#### **Unit 2: Consumer Behavior in Nutrition and Well-being**

- **Consumer Behavior and Dietary Choices:**
  - How consumer preferences and behaviors influence nutrition choices.
  - Psychological, cultural, and social factors that affect food choices.
  - The impact of marketing and food advertisements on eating habits.
- **Nutrition and Mental Well-being:**
  - The relationship between diet and mental health (e.g., depression, anxiety, cognitive function).
  - Foods that support mental clarity and emotional regulation.

- **Mindful Eating:**
  - Principles of mindful eating and its benefits on personal well-being.
  - How mindful eating can improve focus and productivity.

### **Unit 3: Nutrition and Physical Health**

- **Nutrition and Physical Activity:**
  - The role of nutrition in exercise and sports performance.
  - Pre- and post-workout nutrition: optimizing energy, recovery, and performance.
- **Nutrition for Different Life Stages:**
  - Nutritional needs across the lifespan: from childhood to adulthood, pregnancy, and aging.
  - Special nutritional needs for various populations (e.g., athletes, the elderly, pregnant women).
- **Weight Management:**
  - Understanding weight gain and weight loss.
  - The role of diet, exercise, and behavior modification in managing weight.
  - Strategies for achieving and maintaining a healthy body weight.

### **Unit 4: Nutrition in the Workplace and Corporate Wellness**

- **Corporate Wellness:**
  - Importance of nutrition and well-being in the workplace.
  - The business case for workplace wellness programs (e.g., reduced absenteeism, increased productivity).
  - Designing a corporate wellness program: nutrition, exercise, and mental health initiatives.
- **Stress and Nutrition in the Workplace:**
  - Understanding stress and its impact on health.
  - How nutrition can help manage work-related stress and improve mental resilience.
- **Time Management and Healthy Eating:**
  - Strategies for busy professionals to maintain healthy eating habits.
  - Tips for meal planning and preparation in a corporate setting.

### **Unit 5: Nutrition Trends and Public Health**

- **Emerging Nutrition Trends:**
  - Plant-based diets, functional foods, superfoods, and nutritional supplements.
  - The growing demand for healthier food options in the market.
  - The impact of food technology and innovations (e.g., lab-grown meats, food delivery apps).
- **Public Health Nutrition:**
  - The role of public health initiatives in promoting nutrition and wellness.
  - Government policies on food labeling, dietary guidelines, and health education.
- **Sustainability and Nutrition:**
  - The connection between sustainable eating and environmental impact.
  - The business case for sustainability in food production and consumption

**Suggested Readings:**

1. **S. Rajagopalan:** *Nutrition and Wellness*, Oxford University Press.
2. **Melvin H. Williams:** *Nutrition for Health, Fitness, and Sport*, McGraw-Hill Education.
3. **Gretchen Rubin:** *Better Than Before: What I Learned About Making and Breaking Habits*, Crown Publishing Group.
4. **Jeffrey B. Blumberg, Robert R. Williams:** *The Science and Fine Art of Food and Nutrition*, McGraw-Hill Education

**Course Outcome:**

By the end of the course, students will:

- Understand the core principles of nutrition and how they affect physical and mental well-being.
- Be able to apply nutrition knowledge to improve personal productivity, workplace well-being, and quality of life.
- Design and implement basic wellness programs in corporate settings to enhance employee health and organizational efficiency.
- Stay informed about emerging trends in nutrition and public health, and understand the business implications of wellness-related industries.

## **DISASTER MANAGEMENT**

**Sub. Code:** BS 311 BL – 4, C – 4

### **Objective:**

The objective of this course is to provide students with a comprehensive understanding of disaster management, focusing on the prevention, preparedness, response, and recovery processes in disaster situations. The course aims to equip students with the skills to handle disasters effectively, both in terms of human and organizational responses, in a business context.

### **CONTENTS:**

#### **Unit 1: Introduction to Disaster Management**

- **Definition and Concept of Disaster:**
  - What constitutes a disaster?
  - Natural vs. man-made disasters.
  - Historical overview of major disasters and their impacts.
- **Types of Disasters:**
  - Natural Disasters: Earthquakes, floods, hurricanes, droughts, etc.
  - Technological/Man-made Disasters: Industrial accidents, nuclear disasters, oil spills, etc.
  - Biological Disasters: Pandemics, epidemics, etc.
  - Human-Caused Disasters: Terrorism, armed conflicts, and civil unrest.
- **Disaster Risk and Vulnerability:**
  - Risk assessment methodologies.
  - Vulnerability and exposure to disasters.
  - Understanding social, economic, and environmental vulnerabilities.

#### **Unit 2: Disaster Preparedness and Mitigation**

- **Disaster Preparedness:**
  - Planning and preparedness frameworks.
  - Early warning systems and communication strategies.
  - Role of government and international agencies in disaster preparedness.
  - Business continuity planning and disaster recovery planning.
- **Disaster Mitigation:**
  - Mitigation strategies for reducing the impact of disasters.
  - Structural and non-structural mitigation measures.
  - Land use planning and disaster-resilient infrastructure.
  - Case studies on successful mitigation efforts.
- **Role of Technology in Disaster Management:**



- Use of Geographic Information Systems (GIS), Remote Sensing, and satellite technology in disaster management.
- Information technology for real-time disaster monitoring.

### **Unit 3: Disaster Response**

- **Disaster Response Phases:**
  - Immediate, short-term, and long-term responses.
  - Coordinating response efforts among local, national, and international agencies.
  - Role of the military, NGOs, and other humanitarian organizations in disaster response.
- **Disaster Management Teams and Emergency Operations:**
  - Setting up Emergency Operations Centers (EOCs).
  - The Incident Command System (ICS) and National Incident Management System (NIMS).
  - Logistics and resource management during disasters.
  - Psychological first aid and managing mental health post-disaster.
- **Emergency Relief and Aid Distribution:**
  - Planning and coordinating emergency relief efforts.
  - Distribution of food, water, medical supplies, and temporary shelter.
  - Managing the needs of vulnerable groups (children, elderly, disabled).

### **Unit 4: Disaster Recovery and Rehabilitation**

- **Recovery Process:**
  - Phases of disaster recovery: Immediate recovery, intermediate recovery, and long-term recovery.
  - Rebuilding infrastructure, homes, and communities.
  - Managing funds and resources for recovery operations.
  - Economic, social, and environmental aspects of recovery.
- **Rehabilitation and Reconstruction:**
  - Principles of rehabilitation after a disaster.
  - Role of government, NGOs, and businesses in post-disaster reconstruction.
  - Sustainable reconstruction strategies and practices.
  - Case studies on successful recovery efforts.
- **Disaster Recovery in Business:**
  - Business continuity planning and recovery.
  - Financial recovery after a disaster: insurance, funding, and government aid.
  - Impact on supply chains and strategies for quick recovery.

### **Unit 5: International Disaster Management and Policy**

- **International Frameworks for Disaster Management:**
  - The role of the United Nations and its agencies (e.g., UNDRR, UNHCR, WHO) in disaster management.
  - International conventions and protocols: Sendai Framework, Hyogo Framework for Action, etc.
  - Global Disaster Alert and Coordination System (GDACS).

- **Disaster Management Policy and Governance:**
  - National disaster management policies and frameworks.
  - Roles of local, state, and national governments in disaster response and recovery.
  - Disaster risk reduction (DRR) policies and sustainable development goals (SDGs).
- **Role of Businesses in Disaster Management:**
  - Corporate Social Responsibility (CSR) in disaster relief.
  - Private sector preparedness and resilience planning.
  - The role of businesses in community-based disaster risk management.

**Suggested Readings:**

1. **Smith, K.:** *Environmental Hazards: Assessing Risk and Reducing Disaster*, Routledge.
2. **Alexander, D.:** *Principles of Emergency Planning and Management*, Oxford University Press.
3. **UNDRR (United Nations Office for Disaster Risk Reduction):** *Disaster Risk Reduction: A Global Review*, United Nations.
4. **Coppola, D. P.:** *Introduction to International Disaster Management*, Butterworth-Heinemann.

**Course Outcome:**

By the end of this course, students will:

- Have a clear understanding of disaster management concepts and processes.
- Be able to assess risks, prepare for and respond to various disaster scenarios.
- Understand the roles of different stakeholders in disaster management, including governments, businesses, and NGOs.
- Develop strategies for disaster recovery, business continuity, and post-disaster rehabilitation.

## GEOPHYSICS

Sub. Code: BS 311 C

L – 4, C – 4

### CO: COURSE OBJECTIVES

**CO-1** To familiarize students with fundamental geophysical principles and methods, particularly as they apply to resource exploration and environmental assessments.

**CO-2** To explore how geophysical techniques are utilized in industries such as mining, oil and gas, and renewable energy, and their impact on business decisions.

**CO-3** To teach students how to analyze market trends in the geophysical and environmental sectors, including demand for resources and regulatory impacts.

**CO-4** To understand the financial implications of geophysical projects, including investment analysis, cost estimation, and return on investment (ROI) assessments.

### Course Contents

**Unit I: Introduction to Geophysics** : Overview of Geophysics: Definition, history, and importance in industry.

Fundamental Concepts: Earth's structure, composition, and physical properties.

Geophysical Methods: Introduction to seismic, magnetic, electrical, and gravitational methods.

**Unit II: Policy Framework of Education in Pre-Independent Period Geophysical Data and Analysis:**

Data Collection Techniques: Methods of gathering geophysical data in the field.

Data Processing: Techniques for processing and interpreting geophysical data.

Case Studies: Analysis of real-world applications of geophysical data in business contexts.

**Unit III: Business Applications of Geophysics:** Resource Exploration: Role of geophysics in mining, oil and gas, and renewable energy sectors. Market Trends: Understanding demand for natural resources and how geophysical data influences market decisions. Project Management: Planning and executing geophysical projects with a business perspective

**Unit IV Sustainability: Best practices for environmentally responsible geophysical exploration:**

Regulatory Framework: Overview of laws and regulations affecting geophysical practices.

Ethical Considerations: Discussing the ethical responsibilities of businesses in geophysical exploration.)

Unit V: Communication and Professional Skills : **Technical Communication:** Skills for presenting geophysical findings to non-specialist audiences. **Interdisciplinary Collaboration:** Importance of teamwork in geophysical projects and business settings. **Career Development:** Exploring career opportunities in geophysics and related fields.

### Suggested Readings:

1. *"Geophysical Methods in Business Applications" by A. K. Jain*
2. *"Principles of Geology and Their Business Applications" by R. S. Sharma*
3. *"Business and Environmental Geophysics" by S. P. Singh*
4. *"Energy Resources and Management" by M. S. Venkatesh*

**COURSE OUTCOMES-**

**COs-1** Demonstrate a foundational understanding of key geophysical concepts and methods, including seismic, magnetic, and gravity techniques.

**COs-2** Analyze and articulate how geophysical techniques can be applied in various industries, such as oil and gas, mining, and environmental management.

**COs-3** Interpret geophysical data and translate complex scientific information into actionable business strategies.

**COs-4** Discuss ethical considerations and responsibilities in geophysical exploration and resource management.

## **MICRO ECONOMICS**

**Sub. Code: BS312**

**L – 4, C – 4.**

**Objective:** The objective of the course is to acquaint the students with the concepts of microeconomics dealing with consumer behavior. The course also makes the student understand the supply side of the market through the production and cost behavior of firms.

### **CONTENTS**

#### **Unit 1: Demand and Consumer Behaviour**

Concepts of revenue: marginal and Average: Revenue under conditions of Perfect and imperfect competition. Elasticity of demand: price, income and cross.

Consumer Behavior: Indifference curve analysis of consumer behavior; Consumer's equilibrium (necessary and sufficient conditions). Price elasticity and price consumption curve, income consumption curve and Engel curve, price change and income and substitution effects. Indifference curves as an analytical tool (cash subsidy v/s. kind subsidy). Revealed Preference Theory.

#### **Unit 2: Production and Cost**

Production isoquants, marginal rate of technical substitution, economic region of production, optimal combination of resources, the expansion path, isoclines, return to scale using isoquants. Cost of Production: Social and private costs of production, long run and short run costs of production. Economies and diseconomies of scale and the shape to the long run average cost. Learning curve and economies of scope.

#### **Unit 3: Perfect Competition**

Perfect competition: Assumptions. Equilibrium of the firm and the industry in the short and the long runs, including industry's long run supply curve. Measuring producer surplus under perfect competition. Stability Analysis – Walrasian and Marshallian. Demand – supply analysis including impact of taxes and subsidy.

#### **Unit 4: Monopoly**

Monopoly: Monopoly short run and long run equilibrium. Shifts in demand curve and the absence of the supply curve. Measurement of monopoly power and the rule of thumb for pricing. Horizontal and vertical integration of firms. The social costs of monopoly power including deadweight loss. Degrees of price discrimination.

#### **Unit 5: Imperfect Competition**

Monopolistic Competition and Oligopoly: Monopolistic competition price and output decision-equilibrium. Monopolistic Competition and economic efficiency Oligopoly and Interdependence – Cournot's duopoly model, Stackelberg model, kinked demand model. Prisoner's dilemma, collusive oligopoly – price-leadership model – dominant firm, cartels, sales maximization, Contestable market theory. Pricing Public Utilities.

**Suggested Readings:**

1. Pindyck, R.S., D.L. Rubinfeld and P.L. Mehta; *Microeconomics*, Pearson Education.
2. N. Gregory Mankiw, *Principles of Micro Economics*, Cengage Learning
3. Maddala G.S. and E. Miller; *Microeconomics: Theory and Applications*, McGraw-Hill Education.
4. Salvatore, D. Schaum's Outline: *Microeconomic Theory*, McGraw-Hill, Education.
5. Case and Fair, *Principles of Micro Economics*, Pearson Education
6. Kotsoyiannis, *Modern Micro Economic Theory*, Mac Millan
7. C. Snyder, *Microeconomic Theory: Basic Principles and Extensions*, Cengage Learning
8. Bilas, Richard A., *Microeconomics Theory: A Graphical Analysis*, McGraw-Hill Education.
9. Paul A. Samuelson, William D. Nordhaus, *Microeconomics*, McGraw-Hill Education.
10. Amit Sachdeva, *Micro Economics*, Kusum Lata Publishers

**Note: Latest edition of text books shall be used.**

## **FINANCIAL ACCOUNTING**

**Sub. Code: BS313**

**L – 3, T-1, C – 4.**

Objective: To familiarize students with the mechanics of preparation of financial statements, understanding corporate financial statements, their analysis and interpretation.

### **Course Contents**

**Unit I:** Introduction to Financial Accounting: Accounting as an Information System, Importance and Scope, Limitations; Users of accounting information, Concepts, Principles and Conventions – Generally Accepted Accounting Principles; The Accounting Equation; Nature of Accounts, Types of books (Primary and Secondary) and

**Unit II:** Rules of Debit and Credit; Recording Transactions in Journal; Preparation of Ledger Accounts; Opening and Closing Entries; Preparation of Trial Balance.

**Unit III:** Preparation of Financial Statements: Trading Account, Profit & Loss Account and Balance Sheet, Adjustment Entries.

**Unit IV:** Indian Accounting Standards (Ind-AS): Concept, benefits, procedure for issuing Ind-AS in India, salient features of Ind-AS issued by ICAI; International Financial Reporting Standards(IFRS): Main features, uses and objectives of IFRS, IFRS issued by IASB and concept of harmonization and convergence, obstacle in harmonization and convergence, suggestions for increased convergence and harmonization. Depreciation: Concept, Methods of charging depreciation, accounting treatment of depreciation.

**Unit V:** Financial Statement Analysis: Objective of financial statement analysis, sources of information; Techniques of financial statement analysis: Horizontal analysis, Vertical analysis and Ratio Analysis; Financial Ratios: Meaning and Usefulness of Financial Ratios. Analysis of ratios from the perspective of Stakeholders like Investors, Lenders, and ShorttermCreditors.Liquidity Ratios, Solvency Ratios, Profitability Ratios, and Turnover Ratios; Limitation of ratio analysis

### **Reading:**

1. Monga, J.R., *Financial Accounting: Concepts and Applications*, Mayur Paperbacks
2. Tulsian, P.C., *Financial Accounting*, Pearson
3. Maheshwari, S.N. &Maheshwari, S.K. , *Financial Accounting for B. Com., CA, CS, & ICWA (Foundation) Courses*, Vikas Publishing House Pvt. Ltd.
4. Ghosh, T.P., *Financial Accounting for Managers*, Taxman Allied Services (P) Ltd.
5. Balwani, Nitin, *Accounting and Finance for Managers*
6. Gupta, Ambrish: *Financial Accounting for Management*
7. Bhattacharyya, Asish K., *FinancialAccounting for Business Managers*
8. Jain, S.P. &Narang, K.L., *Advanced Accountancy*.

**MANAGEMENT PRINCIPLES AND APPLICATIONS**

**Sub. Code: BS314**

**L – 4, C – 4.**

**Objective:** The objective of the course is to provide the student with an understanding of basic management concepts, principles and practices.

**Unit1:Introduction**

- a. Concept: Need for Study, Managerial Functions – An overview; Co-ordination: Essence of Manager Ship
- b. EvolutionoftheManagementThought,ClassicalApproach–Taylor,Fayol, Neo-Classical and Human Relations Approaches – Mayo, Hawthorne Experiments,BehaviouralApproach,SystemsApproach,ContingencyApproach–Lawrence&Lorsch, MBO- Peter F. Drucker, Re-engineering - Hammer and Champy,MichaelPorter–Five-forceanalysis,Threegenericstrategiesandvalue- chain, analysis, Senge’s Learning Organization, ‘Fortune at the Bottom of the Pyramid’–C.K.Prahalad.

**Unit2:Planning**

- a. TypesofPlan–Anoverviewtohighlightthedifferences
- b. Strategicplanning–Concept,process,Importanceandlimitations
- c. Environmental Analysis and diagnosis (Internal and external environment) – Definition, Importance and Techniques (SWOT/TOWS/WOTS-UP, BCGMatrix, Competitor Analysis), Business environment; Concept and Components
- d. Decision-making–concept,importance;CommitteeandGroupDecision-making, Process, Perfect rationality and bounded rationality, Techniques (qualitative and quantitative,MIS,DSS)

**Unit3:Organizing**

Conceptandprocessoforganizing–Anoverview,Spanofmanagement,Different types of authority (line, staff and functional), Decentralization, Delegation of authority  
Formal and Informal Structure; Principles of Organizing; Network Organization Structure

**Unit 4: StaffingandLeading**

- a. Staffing:Conceptofstaffing,staffingprocess
- b. Motivation: Concept, Importance, extrinsic and intrinsic motivation; Major Motivation theories - Maslow’s Need-Hierarchy Theory; Herzberg’s Two-factor Theory,Vroom’sExpectationTheory.
- c. Leadership: Concept, Importance, Major theories of Leadership (Likert’s scale theory, Blake and Mouten’s Managerial Grid theory, House’s Path Goal theory, FredFielder’ssituationalLeadership),Transactionalleadership,Transformational Leadership, TransformingLeadership.
- d. Communication: Concept, purpose, process; Oral and written communication; Formal and informal communication networks, Barriers to communication, Overcomingbarrierstocommunication.



**Unit5:Control**

- a. Control: Concept, Process, Limitations, Principles of Effective Control, Major Techniques of control - Ratio Analysis, ROI, Budgetary Control, EVA, PERT/CPM.
- b. Emerging issues in Management

**Suggested Readings:**

1. Harold Koontz and Heinz Weihrich, *Essentials of Management: An International and Leadership Perspective*, McGrawHill Education
2. Stephen P. Robbins and Madhushree Nanda Agrawal, *Fundamentals of Management: Essential Concepts and Applications*, Pearson Education.
3. Newman, Summer, and Gilbert, *Management*, PHI
4. James H. Donnelly, *Fundamentals of Management*, Pearson Education.
5. Griffin, *Management Principles and Application*, Cengage Learning
6. Robert Kreitner, *Management Theory and Application*, Cengage Learning
7. T. N. Chhabra, *Management Concepts and Practice*, Dhanpat Rai & Co. (Pvt. Ltd.), New Delhi
8. Peter F. Drucker, *Practice of Management*, Mercury Books, London

**Note: Latest edition of text books may be used.**

**BUSINESS ORGANISATION**

**Sub. Code: BS315**

**L – 4, C – 4.**

**Course Objective-**

The objective of this course is to provide students with a comprehensive understanding of how businesses are structured, operate, and make strategic decisions. The course explores the core functions of a business organization, including management, marketing, finance, and human resources, while also emphasizing the dynamics of organizational behavior, leadership, and communication.

**Unit – I:**

Meaning and definition of business essentials & scope of business Classification of Business Activities, Meaning, Definition, Characteristics and objectives of Business Organisation, Evolution of Business Organisation . Modern Business, Business & Profession.

**Unit – II:**

Business Unit, Establishing a new business unit. Meaning of Promotion. Features for business, Plant location, Plant Layout & size of business unit.

**Unit – III:**

Forms of Business Organisation. Sole Proprietorship, Partnership, Joint Stock Companies & Co-operatives.

**Unit – IV:**

Business Combination Meaning Causes, Objectives, Types and Forms Mergers, Takeovers and Acquisitions.

**Unit – V:**

Business Finance: Financial need of Business methods & sources offinance. Security Market, Money Market, Study of Stock Exchange & SEBI.

**Suggested Readings:**

1. *Modern Business Organization* by S. A. Sherlekar
2. *Industrial Organization Management: Sherlekar, Patil, Paranjpe, Chitale*
3. *Business Organization and Management* By Jallo, Tata McGraw Hill
4. *Business Environment Text and Cases* By F. Cherunilam (Himalaya Publication House)
5. *Organizing and Financing of Small Scale Industry* By Dr. V. Desai
6. *Industrial Organization and Management* By Dr. C. B. Gupta, Publisher Sultan Chand & Co. Delh

**BUSINESS LAW**

**Sub. Code: BS321**

**L – 4, C – 4.**

**Course Objective-**

The objective of this course is to provide students with a comprehensive understanding of the legal principles and frameworks that govern business operations. The course focuses on key areas of business law, including contract law, intellectual property, employment law, torts, and regulatory compliance, while also addressing the legal implications of business decisions and transactions.

**Unit1: The Indian Contract Act, 1872: General Principle of Law of Contract**

- a) Contract – meaning, characteristics and kinds  
Essentials of a valid contract - Offer and acceptance, consideration, contractual capacity, free consent, legality of objects.
- b) Void agreements
- c) Discharge of a contract – modes of discharge, breach and remedies against breach of contract.
- d) Contingent contracts
- e) Quasi-contracts

**Unit2: The Indian Contract Act, 1872: Specific Contract**

- a) Contract of Indemnity and Guarantee
- b) Contract of Bailment
- c) Contract of Agency

**Unit3: The Sale of Goods Act, 1930**

- a) Contract of sale, meaning and difference between sale and agreement to sell.
- b) Conditions and warranties
- c) Transfer of ownership of goods including sale by a non-owner
- d) Performance of contract of sale
- e) Unpaid seller – meaning, rights of an unpaid seller against the goods and the buyer.

**Unit 4: Partnership Laws**

**A) The Partnership Act, 1932**

- a. Nature and Characteristics of Partnership
- b. Registration of a Partnership Firm
- c. Types of Partners
- d. Rights and Duties of Partners
- e. Implied Authority of a Partner
- f. Incoming and outgoing Partners
- g. Mode of Dissolution of Partnership

**B) The Limited Liability Partnership Act, 2008**

- a) Salient Features of LLP
- b) Differences between LLP and Partnership, LLP and Company
- c) LLP Agreement,
- d) Partners and Designated Partners

- e) Incorporation Document
- f) Incorporation by Registration
- g) Partners and their Relationship

**Unit 5: The Negotiable Instruments Act 1881**

- a) Meaning, Characteristics, and Types of Negotiable Instruments: Promissory Note, Bill of Exchange, Cheque
- b) Holder and Holder in Due Course, Privileges of Holder in Due Course.
- c) Negotiation: Types of Endorsements
- d) Crossing of Cheque
- e) Bouncing of Cheque

**Suggested Readings:**

1. M.C. Kuchhal, and Vivek Kuchhal, *Business Law*, Vikas Publishing House, New Delhi.
2. Avtar Singh, *Business Law*, Eastern Book Company, Lucknow.
3. Ravinder Kumar, *Legal Aspects of Business*, Cengage Learning.
4. SN Maheshwari and SK Maheshwari, *Business Law*, National Publishing House, New Delhi.
5. Sushma Arora, *Business Laws*, Taxman Publications.
6. Akhileshwar Pathak, *Legal Aspects of Business*, McGraw Hill Education, 6th Ed.
7. PCTulsian and BharatTulsian, *Business Law*, McGraw Hill Education

**Note: Latest edition of text books may be used.**

## **INTELLECTUAL PROPERTY LAW-1**

**Sub. Code:** BS321A

**L – 4, C – 4**

### **Objective:**

The objective of this course is to introduce students to the key concepts of Intellectual Property (IP) law, covering various types of intellectual property rights such as copyrights, trademarks, patents, and trade secrets. The course aims to provide a deep understanding of how IP is protected legally and its role in fostering innovation, creativity, and economic development.

### **CONTENTS:**

#### **Unit 1: Introduction to Intellectual Property**

- **Concept and Evolution of Intellectual Property:**
  - Definition of Intellectual Property.
  - Historical development of IP laws.
  - Importance of IP for economic and cultural growth.
  - Types of IP: Copyright, Trademark, Patent, Trade Secret, Geographical Indications.
  - Role of international treaties and organizations (WIPO, TRIPS, Berne Convention, etc.).
- **Fundamentals of IP Protection:**
  - The concept of ownership and protection of intellectual creations.
  - The relationship between IP and competition law.
  - The concept of infringement and remedies available.

#### **Unit 2: Copyright Law**

- **Concept and Scope of Copyright:**
  - Definition of copyright.
  - What is protectable under copyright?
  - Duration and territorial aspects of copyright protection.
  - The owner of copyright and related rights.
  - Moral rights and economic rights of authors.
  - International conventions for the protection of copyright.

- **Infringement of Copyright:**
  - Copyright infringement and remedies available.
  - Fair use and exceptions to copyright.
  - Case studies on copyright infringement (e.g., digital media and software piracy).

### **Unit 3: Patent Law**

- **Introduction to Patents:**
  - Definition of a patent and its purpose.
  - Patentable inventions: Novelty, inventive step, and industrial applicability.
  - Patent filing process: Application, examination, and grant.
  - Rights of the patentee: Exclusive rights and duration.
  - International patent protection: PCT (Patent Cooperation Treaty) and the role of WIPO.
- **Patent Infringement and Remedies:**
  - Types of patent infringement: Direct, indirect, and contributory infringement.
  - Defenses to patent infringement.
  - Remedies available: Injunctions, damages, and account of profits.
- **Case Law:**
  - Landmark cases related to patents (e.g., the Novartis case, Roche v. Cipla).

### **Unit 4: Trademark Law**

- **Introduction to Trademarks:**
  - Definition and types of trademarks: Word marks, logo marks, shape marks, etc.
  - Trademark registration process and requirements.
  - Rights of trademark owners and the duration of protection.
  - International protection of trademarks: Madrid Protocol and TRIPS.
- **Trademark Infringement and Remedies:**
  - Infringement of trademarks: Likelihood of confusion test.
  - Defenses to trademark infringement: Fair use and descriptive use.
  - Remedies: Injunctions, damages, and account of profits.
  - Passing off and trade dress protection.
- **Case Law:**
  - Landmark cases on trademark law (e.g., Coca-Cola v. Pepsico, Christian Louboutin v. YSL).

### **Unit 5: Trade Secrets and Other IP Rights**

- **Trade Secret Protection:**
  - Definition and scope of trade secrets.
  - Legal protection for trade secrets: Common law, contractual protection.
  - The concept of misappropriation and remedies available.
  - Famous trade secret cases: e.g., Coca-Cola's secret formula.
- **Other IP Rights:**
  - Geographical Indications (GIs) and their role in the global market.
  - Industrial Designs and layout-designs of integrated circuits.
  - Plant Variety Protection (PVP).

- Protection of traditional knowledge and folklore.
- **IP Licensing and Technology Transfer:**
  - Licensing of IP rights and contractual arrangements.
  - Technology transfer agreements: Principles, importance, and legal framework.

**Suggested Readings:**

1. **Cornish, W. R.:** *Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights*, Sweet & Maxwell.
2. **Bently, L., & Sherman, B.:** *Intellectual Property Law*, Oxford University Press.
3. **Merges, R. P., & Duffy, J. F.:** *Intellectual Property in the New Technological Age*, Aspen Publishers.
4. **Davison, M., & Kirk, D.:** *Australian Intellectual Property Law*, Cambridge University Press.

**Course Outcome:**

By the end of this course, students will:

- Understand the basic principles of IP law and its various types, including copyright, patents, trademarks, and trade secrets.
- Be able to navigate the IP registration process, infringement issues, and related legal procedures.
- Analyze and solve complex IP-related legal problems, focusing on real-world applications.
- Gain a global perspective on intellectual property law through the study of international treaties and practices.
- Develop a critical understanding of the role of IP in fostering innovation and creativity in the business and legal contexts.

**INFORMATION TECHNOLOGY LAW-1**

**Sub. Code:** BS321 B

**L – 4, C – 4**

**Objective:**

The objective of this course is to provide students with a thorough understanding of the legal aspects of information technology and digital commerce. The course will explore key concepts in IT law, including cybercrimes, data protection, e-commerce, intellectual property rights related to technology, and the regulatory frameworks governing the digital space.

**CONTENTS:**

**Unit 1: Introduction to Information Technology Law**

- **Overview of IT Law:**
  - Definition and scope of Information Technology Law.
  - Importance of law in the digital world.
  - Key areas of IT law: Cybersecurity, E-commerce, Data Privacy, Intellectual Property.
  - Role of government agencies, international bodies (e.g., UN, EU, WIPO), and national legal systems in regulating IT.
- **Legal Foundations of IT:**
  - Constitutional and statutory principles.
  - Jurisdiction in the digital world: Territorial boundaries, cross-border disputes, and international conventions.
  - Key legislative frameworks: Information Technology Act (India), GDPR (Europe), and others.

**Unit 2: Cybercrimes and Cybersecurity**

- **Cybercrimes:**
  - Definition and types of cybercrimes: Hacking, identity theft, cyberbullying, phishing, etc.
  - Legal provisions governing cybercrimes.
  - Case studies on significant cybercrime incidents and their legal outcomes.
  - Investigation and prosecution of cybercrimes.
- **Cybersecurity Laws:**
  - Cybersecurity policies and frameworks: NIST, ISO 27001, etc.
  - The role of cybersecurity in preventing crimes and securing data.
  - The role of government and private sector in ensuring cybersecurity.
  - Legal obligations of companies under cybersecurity laws.



### **Unit 3: E-Commerce and Digital Transactions**

- **E-Commerce Regulations:**
  - Legal principles of electronic contracts and digital signatures.
  - Framework for E-commerce transactions under the Information Technology Act, 2000 (India).
  - Consumer protection laws in digital transactions.
  - Dispute resolution mechanisms in online contracts.
  - Taxation and payment systems in e-commerce.
- **Legal Issues in Digital Transactions:**
  - Electronic funds transfer, payment gateways, and the role of banks.
  - Legal aspects of online payments: Security and fraud prevention.
  - Cross-border e-commerce and jurisdictional challenges.

### **Unit 4: Data Protection and Privacy Laws**

- **Data Privacy and Protection:**
  - Introduction to data privacy laws: GDPR (Europe), CCPA (California), and the IT Act (India).
  - Principles of data protection: Consent, transparency, purpose limitation, etc.
  - Rights of data subjects: Right to access, right to rectification, and right to erasure.
  - Data breaches and notification requirements.
  - Cross-border data transfers and legal challenges.
- **Corporate Responsibility and Data Handling:**
  - Legal obligations for data controllers and processors.
  - Privacy policies and compliance with data protection laws.
  - Case studies of major data breaches and their legal implications.

### **Unit 5: Intellectual Property in IT**

- **Intellectual Property (IP) in IT:**
  - Overview of IP law: Copyright, patents, trademarks, and trade secrets in the context of IT.
  - Protection of software, databases, and digital content.
  - Licensing and open-source software agreements.
  - IP protection in digital media, social networks, and e-commerce.
  - Enforcement of IP rights in the online environment.
- **Challenges and Future Trends:**
  - The evolving role of AI, blockchain, and cloud computing in IT law.
  - Legal challenges with digital innovations and new technologies.
  - The future of IP law in the digital age: AI-generated works, data ownership, etc.

**Suggested Readings:**

1. **Gopalan, N.:** *Cyber Law in India*, McGraw Hill Education.
2. **Dhar, A.:** *Information Technology and Law*, Oxford University Press.
3. **Biedenkapp, E. L.:** *Cyberlaw: A Legal Arsenal for Online Business*, Pearson Education.
4. **Sharma, S.:** *Cyber Law in India*, Asia Law House.
5. **Kerr, I.:** *Information Technology Law: The Law and Society*, Oxford University Press.
6. **Agarwal, V.:** *Cyber Law and E-Commerce*, Oxford University Press.
7. **Desai, D.:** *Data Protection and Privacy Laws*, LexisNexis.
8. **Bailey, M.:** *The Law of Digital Commerce*, Cambridge University Press.
9. **Sands, P.:** *International Economic Law and Policy*, Oxford University Press.
10. **Bennet, R.:** *E-Commerce Law: National and International Perspectives*, Routledge.

**Course Outcome:**

Upon completing this course, students will:

- Understand the key legal principles of IT law, including cybercrimes, data protection, and e-commerce regulations.
- Be familiar with the regulatory framework governing digital transactions and privacy laws.
- Be able to apply legal concepts to emerging issues such as cybersecurity, digital contracts, and the protection of digital assets.
- Be well-equipped to analyze complex legal issues in the context of rapidly evolving technology and digital business models.

## **COMPETITIVE LAW-1**

**Sub. Code:** BS321C

**L – 4, C – 4**

### **Objective:**

The objective of the course is to familiarize students with the fundamental principles of competition law and policy, focusing on the regulation of anti-competitive behavior, monopolistic practices, and the enforcement of fair competition in markets. The course will cover national and international competition laws, including case studies and the economic principles behind competitive markets.

### **CONTENTS:**

#### **Unit 1: Introduction to Competitive Law**

- **Overview of Competition Law:**
  - Definition and scope of competition law.
  - The role of competition law in promoting economic welfare and consumer protection.
  - History and evolution of competition law: Origins and development in different jurisdictions (EU, USA, India, etc.).
  - Key objectives of competition law: Promoting market efficiency, preventing market abuses, and protecting consumers.
- **Legal Framework of Competition Law:**
  - Major competition laws: The Sherman Act (USA), the Competition Act (India), EU competition rules (Article 101 and 102 TFEU), and others.
  - The role of regulatory bodies: Federal Trade Commission (FTC), European Commission (EC), Competition Commission of India (CCI), and others.
  - Jurisdictional challenges and enforcement mechanisms in cross-border competition cases.

#### **Unit 2: Anti-Competitive Agreements and Practices**

- **Cartels and Collusive Behavior:**
  - Definition and types of cartels: Price-fixing, market-sharing, bid-rigging, and supply restrictions.
  - The economic impact of cartels on market efficiency and consumer welfare.
  - Legal prohibitions and penalties for cartel behavior under competition laws.
  - Case studies: Key cartel investigations and decisions in various jurisdictions.
- **Restraints of Trade and Vertical Agreements:**

- Horizontal agreements: Agreements between competitors and their impact on competition.
- Vertical agreements: Agreements between firms at different levels of the supply chain (e.g., resale price maintenance, exclusive distribution).
- Analyzing market effects of vertical restraints under competition law.
- The "Rule of Reason" vs. "Per Se" approach to antitrust enforcement.

### **Unit 3: Abuse of Dominance and Monopolistic Practices**

- **Abuse of Market Dominance:**
  - Definition and elements of dominance in competition law.
  - Types of abuse: Predatory pricing, exclusive dealing, tying and bundling, refusal to deal, and price discrimination.
  - The legal standards for determining abuse: The "dominance test" and the "effect on competition" test.
  - Case studies: Abuse of dominance in major global markets (e.g., Microsoft, Google).
- **Monopolies and Market Power:**
  - The difference between monopolies and dominant market positions.
  - The role of monopolies in market regulation and concerns regarding their abuse.
  - Antitrust responses to monopolistic practices and the regulation of monopolies.
  - Remedies and enforcement actions in monopoly cases.

### **Unit 4: Merger Control and Market Concentration**

- **Mergers and Acquisitions:**
  - Definition and types of mergers: Horizontal, vertical, and conglomerate mergers.
  - Legal and economic analysis of mergers: Impact on market competition and consumer welfare.
  - Merger control frameworks: Notification, investigation, and approval procedures.
  - Case studies of landmark merger decisions: Google/DoubleClick, Facebook/WhatsApp, etc.
- **Market Concentration and Anti-Trust Concerns:**
  - The concept of market concentration: Market share, Herfindahl-Hirschman Index (HHI), and the significance of concentration ratios.
  - The effects of high market concentration on competition and consumer prices.
  - Legal tests for merger approval: Substantial Lessening of Competition (SLC), significant impediment to effective competition (SIEC) test.
  - Remedies for anti-competitive mergers: Divestitures, behavioral remedies, and merger conditions.

### **Unit 5: International and Regional Competition Law**

- **Globalization and Competition Law:**
  - The impact of globalization on market structures and the enforcement of competition law.
  - International cooperation in competition law enforcement: OECD, UNCTAD, and the role of multilateral treaties.

- Comparative analysis of competition laws in key jurisdictions: USA, EU, India, and China.
- International cartels and enforcement: The role of global regulatory bodies in dealing with cross-border anti-competitive practices.
- **Regional Competition Regimes:**
  - The European Union's competition law regime: Articles 101 and 102 TFEU.
  - Competition law in emerging economies: The BRICS nations and their approach to competition regulation.
  - Competition law and policy in India: Key provisions of the Competition Act, 2002, and the role of the Competition Commission of India (CCI).
  - Case studies of cross-border competition law enforcement in regional trade agreements (e.g., NAFTA, ASEAN).

**Suggested Readings:**

1. **Whish, R.:** *Competition Law*, 9th Edition, Oxford University Press.
2. **Baker, J. B., and Salop, S. C.:** *Antitrust: Analysis and Advocacy*, Foundation Press.
3. **Lowe, P. and K. L. B.:** *Competition Law in the EU and UK*, Hart Publishing.
4. **Kohler, M., and Drexler, J.:** *EU Competition Law and the Regulation of Mergers*, Edward Elgar Publishing.
5. **Puri, V.:** *Competition Law in India*, LexisNexis.
6. **Motta, M.:** *Competition Policy: Theory and Practice*, Cambridge University Press.
7. **Elhauge, E.:** *Global Antitrust Law and Economics*, Foundation Press.
8. **Bishop, S., and Walker, M.:** *The Economics of EC Competition Law: Concepts, Application and Measurement*, Sweet & Maxwell.
9. **Suffield, D.:** *Competition Law: A Practitioner's Guide*, Sweet & Maxwell.
10. **Whelan, R., and Fenton, M.:** *Global Antitrust Enforcement*, Cambridge University Press.

**Course Outcome:**

Upon completion of this course, students will:

- Understand the key concepts and principles of competition law and policy.
- Be able to analyze anti-competitive practices, mergers, and monopolistic behavior from both legal and economic perspectives.
- Gain familiarity with competition law enforcement agencies and regulatory frameworks at both national and international levels.
- Be equipped to critically evaluate competition policy and its impact on market efficiency and consumer welfare

**TAX LAW-1**

**Sub. Code:** BS321D

**L – 4, C – 4**

**Objective:**

The objective of this course is to introduce students to the fundamental principles of tax law, focusing on the various types of taxes, their impact on individuals and businesses, and the legal framework governing taxation. The course also aims to provide students with an understanding of tax administration, tax compliance, and the rights and obligations of taxpayers.

**CONTENTS:**

**Unit 1: Introduction to Taxation**

- **Overview of Taxation:**
  - Definition and importance of taxation in the economy.
  - Principles of taxation: Equity, efficiency, simplicity, and transparency.
  - Types of taxes: Direct taxes vs. indirect taxes.
  - Taxation system in India and other jurisdictions.
  - History and evolution of tax law.
- **Classification of Taxes:**
  - Direct taxes: Income tax, wealth tax, capital gains tax.
  - Indirect taxes: Goods and services tax (GST), excise duty, customs duty, and sales tax.
  - Overview of global tax systems and international tax law.

**Unit 2: Income Tax Law**

- **Income Tax Act, 1961:**
  - Definition of "income" under the Income Tax Act.
  - Residential status and its implications on tax liability.
  - Income from various sources: Salaries, business/profession, capital gains, house property, other sources.
  - Computation of total income and the concept of exemptions.
  - Tax deductions and rebates available under the Act.
- **Assessment and Taxation of Individuals:**

- Calculation of taxable income and tax payable for individuals.
- Provisions relating to deductions under Section 80C, 80D, 80G, etc.
- Taxation of non-resident individuals and foreign income.
- Tax evasion and avoidance: Concepts and differences.

### **Unit 3: Goods and Services Tax (GST)**

- **Overview of GST:**
  - Introduction to GST: Need for GST in India, GST vs. earlier tax regime.
  - Structure of GST: Central GST (CGST), State GST (SGST), Integrated GST (IGST).
  - Types of supply: Goods vs. services, taxable and non-taxable supplies.
  - Registration, GST returns, and compliance requirements.
- **GST Liability and Input Tax Credit (ITC):**
  - Calculation and determination of GST liability for goods and services.
  - Input Tax Credit mechanism and conditions for availing ITC.
  - GST exemptions and special provisions for small businesses and specific sectors.
  - GST audits, assessments, and refunds.

### **Unit 4: Corporate Taxation and Tax Planning**

- **Corporate Taxation:**
  - Taxation of companies: Resident vs. non-resident companies.
  - Corporate tax rates, minimum alternate tax (MAT), and other provisions.
  - Dividend distribution tax (DDT) and capital gains tax on corporate assets.
  - Transfer pricing rules for international transactions.
- **Tax Planning and Avoidance:**
  - Tax planning strategies for businesses.
  - Legal vs. illegal tax avoidance practices.
  - Tax sheltering and the role of tax havens.
  - Corporate restructuring and tax implications.

### **Unit 5: Tax Administration and Compliance**

- **Tax Authorities and Procedure:**
  - Roles and powers of the Income Tax Department, GST authorities, and other tax bodies.
  - Tax assessment procedures: Self-assessment, scrutiny assessment, re-assessment.
  - Filing of tax returns: Income tax return forms, GST returns.
  - Penalties, prosecutions, and tax litigation procedures.
- **Tax Disputes and Resolution:**
  - Dispute resolution mechanisms in tax law: Settlement Commission, Appellate Tribunal.
  - Role of Tax Tribunals, High Courts, and the Supreme Court in tax matters.
  - Judicial review and important case law in tax disputes.
  - Anti-avoidance and anti-evasion measures: GAAR (General Anti-Avoidance Rules).

**Suggested Readings:**

1. **Singh, A.:** *Income Tax Law and Practice*, Taxmann Publications.
2. **Bahl, S.:** *Goods and Services Tax Law and Practice*, CCH India.
3. **Chaturvedi, V. and Mehrotra, H.C.:** *Income Tax Law and Accounts*, Bharat Law House.
4. **Vasudevan, G.R.:** *Corporate Tax Planning and Management*, Taxmann.
5. **Mithani, D. and Desai, V.K.:** *Indirect Taxes*, Himalaya Publishing House.

**Course Outcome:**

Upon completion of this course, students will:

- Gain a comprehensive understanding of tax law and taxation policies in India and internationally.
- Learn how to compute taxes for individuals and corporations and comply with relevant tax laws.
- Understand the concepts of tax avoidance, tax planning, and the compliance process.
- Develop the ability to analyze and resolve tax disputes, and appreciate the role of tax authorities and courts in tax administration.



**BUSINESS COMMUNICATION**

**Sub. Code: BS322**

**L – 4, C – 4.**

**Course Objective:**

The objective of this course is to introduce students to the essential principles and practices of business communication. The course aims to develop students' skills in both written and verbal communication within a business context, emphasizing clarity, professionalism, and effectiveness. Students will gain an understanding of the various forms of business communication, including emails, reports, presentations, and interpersonal communication.

**Unit 1: Introduction:**

Nature of Communication, Process of Communication, Types of Communication (verbal & Non Verbal), Importance of Communication, Different forms of Communication  
Barriers to Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers

**Unit 2: Business Correspondence:**

Letter Writing, presentation, Inviting quotations, Sending quotations, Placing orders, Inviting tenders, Sales letters, claim & adjustment letters and social correspondence, Memorandum, Inter-office Memo, Notices, Agenda, Minutes, Job application letter, preparing the Resume.

**Unit 3: Report Writing:**

Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, and check lists for reports.

**Unit 4: Vocabulary**

Words often confused, Words often misspelt, common errors in English.

**Unit 5: Oral Presentation:**

Importance, Characteristics, Presentation Plan, Power point presentation, Visual aids.

**Suggested Readings:**

1. Bovee, and Thill, *Business Communication Essentials*, Pearson Education
2. Shirley Taylor, *Communication for Business*, Pearson Education
3. Locker and Kaczmarek, *Business Communication: Building Critical Skills*, McGraw Hill Education
4. Herta A Murphy, Herbert W Hildebrandt, Jane P. Thomas, *Effective Business Communication (SIE)*, McGraw Hill Education
5. Dona Young, *Foundations of Business Communication: An Integrative Approach*, McGraw Hill Education
6. Raymond V. Lesikar, Marie E. Flatley, Kathryn Rentz, Paula Lentz, and Neerja Pande, *Business Communication: Connecting in a Digital World (SIE)*, McGraw Hill Education

## **ETIQUETTE & CONVERSATIONAL SKILLS**

**Sub. Code:** BS322A

**L – 4, C – 4**

### **Objective:**

The objective of this course is to equip students with essential interpersonal communication skills, focusing on verbal and non-verbal communication, etiquette, and effective conversational techniques. The course aims to enhance students' ability to interact professionally in various social and business settings, develop self-confidence, and foster positive relationships.

### **CONTENTS:**

#### **Unit 1: Introduction to Etiquette and Communication**

- **Importance of Etiquette:**
  - Definition of etiquette and its role in social and professional settings.
  - The impact of good manners and etiquette on personal and professional life.
  - Differences in cultural and regional etiquettes.
  - Basic principles of politeness, respect, and consideration for others.
- **Types of Communication:**
  - Verbal communication: Tone, pitch, clarity, and pace.
  - Non-verbal communication: Body language, facial expressions, gestures, and posture.
  - Written communication: Email etiquette, formal letters, and business correspondence.
  - Listening skills: Active listening, paraphrasing, and feedback.

#### **Unit 2: Conversational Skills**

- **Effective Conversations:**
  - Understanding the flow of conversation: Opening, engaging, and closing a conversation.
  - Making small talk and starting conversations in various situations (e.g., social, business, formal).
  - Engaging in two-way communication: Asking open-ended questions, listening actively, and building rapport.
  - Overcoming conversational barriers: Nervousness, silence, and awkward moments.
- **Building Confidence in Conversations:**
  - Overcoming communication anxiety and self-doubt.

- Speaking with confidence, clarity, and purpose.
- Strategies to improve self-expression and articulate thoughts clearly.
- The art of storytelling and humor in conversation.

### **Unit 3: Professional Etiquette**

- **Business Etiquette:**
  - Professional greeting and introductions: Handshakes, eye contact, and formal titles.
  - Dining etiquette: Proper table manners, business meals, and social dining settings.
  - Workplace etiquette: Email writing, telephone etiquette, and maintaining professionalism in the office.
  - Attire and grooming: Dress codes for different occasions and professional settings.
- **Virtual Etiquette:**
  - Best practices for virtual communication (e.g., Zoom, Teams, email).
  - Managing virtual meetings: Punctuality, clear communication, and respectful participation.
  - Etiquette for online networking and social media presence.

### **Unit 4: Cross-Cultural Communication**

- **Cultural Sensitivity:**
  - Understanding cultural differences in communication styles and etiquette.
  - The impact of cultural awareness on effective communication.
  - Adapting communication styles to diverse cultural norms and practices.
  - Case studies of international business etiquette.
- **Global Networking and Diplomacy:**
  - Building a global network through effective communication.
  - Navigating diplomatic conversations and maintaining politeness in cross-cultural settings.
  - Business etiquette in international contexts.

### **Unit 5: Conflict Resolution and Handling Difficult Conversations**

- **Resolving Conflicts through Communication:**
  - Techniques for managing disagreements and resolving conflicts peacefully.
  - Managing emotions during difficult conversations.
  - Negotiation skills and finding win-win solutions.
  - Handling criticism and giving constructive feedback.
- **Dealing with Difficult People:**
  - Strategies for handling rude, aggressive, or difficult individuals.
  - Keeping conversations calm and respectful in tense situations.
  - Maintaining professionalism in challenging conversations.

**Suggested Readings:**

1. **Thompson, L.:** *The Etiquette Advantage in Business: Personal Skills for Professional Success*, McGraw-Hill.
2. **Gilbert, M.:** *The Essentials of Business Etiquette*, The Career Press.
3. **Cox, A. and Durst, A.:** *Mastering the Art of Conversation: A Guide to Building Strong Social Skills*, Wiley.
4. **Katzenbach, J.R. and Smith, D.K.:** *The Wisdom of Teams: Creating the High-Performance Organization*, Harper Business.

**Course Outcome:**

Upon successful completion of this course, students will:

- Develop the ability to engage confidently in professional and social conversations.
- Master essential business etiquette for various settings, including virtual communication.
- Improve interpersonal communication skills, including active listening and conflict resolution.
- Be able to navigate cross-cultural communication with sensitivity and professionalism.
- Demonstrate polished social skills that will enhance their personal and professional relationships.

## CORPORATE COMMUNICATION

**Sub. Code:** BS322B

**L – 4, C – 4**

Objective:

The aim of this course is to provide students with a comprehensive understanding of corporate communication principles and practices. It focuses on enhancing communication strategies in organizations, fostering effective internal and external communication, and building corporate reputation through public relations, branding, crisis communication, and digital media.

CONTENTS:

### *Unit 1: Introduction to Corporate Communication*

- **Concept of Corporate Communication:**
  - Definition and scope of corporate communication.
  - The role of communication in corporate success and organizational growth.
  - Key elements of corporate communication: message, audience, channel, and feedback.
  - The importance of corporate identity, image, and reputation.
- **Communication Models in Corporations:**
  - One-way and two-way communication models.
  - Models of corporate communication flow (top-down, bottom-up, and horizontal communication).
  - Integration of communication channels: oral, written, and non-verbal.

### *Unit 2: Corporate Branding and Public Relations*

- **Corporate Branding:**
  - The concept of corporate brand and its elements.
  - Brand building and management strategies.
  - The role of communication in shaping a company's brand image.
  - Corporate visual identity: logo, colors, typography, and design elements.
- **Public Relations (PR):**
  - Definition, objectives, and functions of PR.
  - Tools of PR: press releases, conferences, media relations, newsletters, and reports.
  - Building relationships with stakeholders: investors, customers, employees, and the community.
  - Crisis communication and the role of PR in reputation management.

*Unit 3: Internal Communication*

- **Internal Communication and Its Importance:**
  - The role of internal communication in enhancing organizational efficiency and employee engagement.
  - Channels of internal communication: emails, meetings, memos, intranet, and team collaboration tools.
  - Communication styles within teams and departments.
  - Leadership communication and its impact on employee motivation and organizational culture.
- **Employee Communication:**
  - The relationship between employee satisfaction and internal communication.
  - Best practices for effective employee communication: transparency, feedback, and recognition.
  - Managing change communication: communication during organizational change, mergers, and restructuring.

*Unit 4: External Communication and Media Relations*

- **Media Relations:**
  - The role of media in corporate communication.
  - Building and maintaining relationships with journalists and media houses.
  - Press releases, media kits, and interviews.
  - Strategies for positive media coverage and reputation management.
- **Advertising and Marketing Communications:**
  - The role of corporate communication in advertising.
  - Integration of advertising and PR strategies.
  - Digital marketing communication: social media, content marketing, and online advertising.
  - Corporate sponsorships, events, and promotions as part of external communication strategy.

*Unit 5: Crisis Communication and Reputation Management*

- **Crisis Communication:**
  - Definition and types of crises in a corporate context.
  - The importance of proactive crisis communication plans.
  - Crisis communication strategies: addressing the crisis, controlling the narrative, and managing public perception.
  - Case studies of successful and failed crisis communication strategies.
- **Reputation Management:**
  - Building and maintaining a positive corporate reputation.
  - The role of corporate communication in dealing with public perception.
  - Monitoring reputation: tools and strategies for measuring corporate image.
  - Online reputation management and managing digital media's impact on corporate image.

*Unit 6: Digital Corporate Communication and Social Media*

- **The Role of Digital Media in Corporate Communication:**
  - The rise of digital media in corporate communication strategies.
  - Social media platforms for corporate communication: Twitter, LinkedIn, Facebook, YouTube, etc.
  - The role of corporate blogs, podcasts, and webinars in engaging audiences.
  - Building an online presence and managing online communities.
- **Social Media Crisis and Brand Management:**
  - Managing social media crises and online reputation.
  - Responding to online customer feedback and criticism.
  - The role of influencers and social media advocates in corporate communication.
  - Ethical considerations in digital communication.

Suggested Readings:

1. **Cornelissen, J.:** *Corporate Communication: A Guide to Theory and Practice*, Sage Publications.
2. **Morris, T. and Powley, E.:** *Corporate Communication: Theory and Practice*, Oxford University Press.
3. **Van Riel, C. B. M., and Fombrun, C. J.:** *Essentials of Corporate Communication*, Routledge.
4. **Argenti, P. A.:** *Corporate Communication*, McGraw-Hill Education.
5. **Cutlip, S. M., Center, A. H., & Broom, G. M.:** *Effective Public Relations*, Pearson Education.

Course Outcome:

Upon completion of this course, students will:

- Understand the fundamentals of corporate communication and its applications in different contexts.
- Be equipped with skills in internal communication, media relations, and crisis management.
- Gain the ability to plan and implement effective corporate branding and PR strategies.
- Be capable of managing corporate reputation in both traditional and digital media landscapes.

**Note:** Latest editions of textbooks shall be used.

**PROFESSIONAL COMMUNICATION**

**Sub. Code:** BS322C

**L – 4, C – 4**

Objective:

The objective of this course is to develop students' skills in professional communication. It focuses on enhancing their ability to effectively convey information in written and oral forms, improve interpersonal communication, and understand the dynamics of communication in professional settings.

CONTENTS:

*Unit 1: Introduction to Professional Communication*

- **Concept of Professional Communication:**
  - Definition and importance of professional communication in the workplace.
  - Differences between formal and informal communication.
  - The role of communication in career development.
  - Components of communication: sender, message, channel, receiver, feedback, and noise.
- **Communication Process:**
  - The communication cycle and feedback loop.
  - Barriers to effective communication (physical, psychological, and semantic barriers).
  - Overcoming communication barriers.
  - Non-verbal communication: body language, facial expressions, and gestures.

*Unit 2: Written Communication Skills*

- **Business Writing:**
  - Structure and format of professional documents (letters, memos, reports, emails).
  - The importance of clarity, conciseness, and tone in written communication.
  - Writing persuasive and effective business emails.
  - Common writing styles: formal, informal, and semi-formal.
- **Reports and Proposals:**
  - Structure and components of a business report.
  - Writing proposals for projects and business solutions.
  - The importance of research and data in professional writing.
  - Executive summaries and their role in professional documents.

*Unit 3: Oral Communication and Presentation Skills*

- **Public Speaking and Presentations:**
  - The fundamentals of delivering effective presentations.
  - Structure of a presentation: introduction, body, and conclusion.



- Using visual aids and technology in presentations (e.g., PowerPoint, Prezi).
- Managing audience questions and feedback.
- **Speech Delivery:**
  - Vocal techniques: pitch, tone, and pace.
  - Managing stage fright and building confidence.
  - Effective use of gestures and eye contact.
  - Rehearsing and preparing for public speaking engagements.

*Unit 4: Interpersonal and Team Communication*

- **Interpersonal Communication:**
  - Understanding interpersonal dynamics in a professional setting.
  - Active listening and empathy in communication.
  - Conflict resolution techniques and negotiation skills.
  - The role of feedback in personal and professional growth.
- **Team Communication:**
  - Effective communication within teams: roles, responsibilities, and group dynamics.
  - Collaborative communication tools and techniques.
  - Managing virtual teams and remote communication.
  - Handling communication challenges in multicultural and diverse teams.

*Unit 5: Communication in Professional Settings*

- **Communication in Meetings:**
  - Types of meetings: formal, informal, brainstorming, and decision-making.
  - The role of the chairperson, facilitator, and note-taker in meetings.
  - Preparing an agenda and minutes.
  - Conducting and participating effectively in meetings.
- **Client and Customer Communication:**
  - Building relationships with clients and customers through effective communication.
  - Understanding client needs and expectations.
  - Professional telephone etiquette and virtual meetings.
  - Communication during negotiations and conflict resolution.

*Unit 6: Digital Communication and Social Media*

- **Digital Communication Tools:**
  - Using professional digital communication tools (email, messaging apps, video conferencing).
  - Writing professional emails, memos, and instant messages.
  - Understanding the digital etiquette for professional communication.
  - Maintaining professionalism on social media platforms (LinkedIn, Twitter, etc.).
- **Social Media and Online Branding:**
  - Managing your professional online presence and reputation.
  - Building a professional network through social media.
  - Ethical considerations in digital communication.

- Crisis communication in the digital age.

Suggested Readings:

1. **Mohan, K.:** *Business Communication: Principles, Methods and Techniques*, Tata McGraw-Hill Education.
2. **Lesikar, R. V., & Flatley, M. E.:** *Basic Business Communication: Skills for Empowering the Internet Generation*, McGraw-Hill.
3. **Bovee, C. L., & Thill, J. V.:** *Business Communication Today*, Pearson Education.
4. **Penrose, J. M., Rasberry, R., & Myers, D.:** *Business Communication: A Handbook for Professionals*, Pearson Education.
5. **Reinsch, N. L., & Shelby, K. H.:** *Business and Professional Communication: A Global Perspective*, Sage Publications.

Course Outcome:

Upon completion of this course, students will:

- Develop proficiency in both written and oral business communication.
- Gain the skills needed to manage effective communication in professional environments.
- Be able to create clear and concise reports, proposals, and presentations.
- Understand the dynamics of team communication and interpersonal relationships in the workplace.
- Be equipped to handle communication challenges in the digital world.

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**Note:** Latest editions of textbooks shall be used.

**PERSONALITY DEVELOPMENT**

**Sub. Code:** BS322D

**L – 4, C – 4**

Objective:

The objective of the course is to help students understand the key aspects of personality development. The course focuses on improving interpersonal skills, enhancing self-awareness, building confidence, and developing emotional intelligence to succeed in both personal and professional environments.

**CONTENTS:**

*Unit 1: Understanding Personality*

- **Introduction to Personality:**
  - Definition and components of personality.
  - Types of personalities (Introversion vs. Extraversion, Thinking vs. Feeling, etc.).
  - Personality development theories (Freud, Jung, Rogers, etc.).
  - The role of genetics and environment in shaping personality.
- **Self-Assessment:**
  - Methods of assessing one's own personality.
  - Self-reflection and self-awareness exercises.
  - Identifying strengths and areas for improvement.
  - The role of self-esteem and self-image in personality development.

*Unit 2: Building Self-Confidence and Self-Esteem*

- **The Importance of Self-Confidence:**
  - Understanding the relationship between self-esteem and self-confidence.
  - Techniques for improving self-confidence (positive thinking, visualization, setting achievable goals).
  - Overcoming self-doubt and fear of failure.
  - Role of body language in conveying confidence.
- **Building a Positive Self-Image:**
  - Strategies for developing a healthy self-image.
  - The impact of positive and negative self-talk.
  - Understanding the impact of social media on self-esteem and self-image.
  - Cultivating a mindset of success and growth.

*Unit 3: Effective Communication Skills*

- **Verbal Communication:**
  - Principles of effective speaking: clarity, tone, and pace.
  - Public speaking and presentations skills.

- Overcoming stage fright and speaking confidently in public.
- The role of storytelling in communication.
- **Non-Verbal Communication:**
  - Understanding body language, facial expressions, and gestures.
  - Reading and interpreting non-verbal cues in others.
  - The importance of eye contact, posture, and handshakes.
  - Using non-verbal communication to build rapport.
- **Listening Skills:**
  - Active listening and its importance in communication.
  - Techniques for improving listening skills (attentive listening, empathetic listening).
  - Barriers to effective listening and how to overcome them.
  - The role of feedback in communication.

*Unit 4: Emotional Intelligence (EQ)*

- **Understanding Emotional Intelligence:**
  - Definition and components of emotional intelligence: self-awareness, self-regulation, motivation, empathy, social skills.
  - The role of emotional intelligence in personal and professional success.
  - Techniques for enhancing emotional intelligence.
  - Managing emotions in challenging situations.
- **Building Empathy and Social Skills:**
  - The importance of empathy in personal and professional relationships.
  - Developing interpersonal skills for building positive relationships.
  - Conflict resolution and negotiation skills.
  - Effective team communication and collaboration.

*Unit 5: Time Management and Goal Setting*

- **Time Management Skills:**
  - Understanding the importance of time management in personal and professional life.
  - Techniques for effective time management (prioritization, the Eisenhower Matrix, Pomodoro Technique).
  - Avoiding procrastination and managing distractions.
  - Setting achievable deadlines and sticking to schedules.
- **Goal Setting and Motivation:**
  - The SMART goal-setting framework.
  - Strategies for staying motivated and focused on long-term goals.
  - Overcoming obstacles and setbacks in goal achievement.
  - The role of discipline and persistence in achieving success.

*Unit 6: Leadership and Teamwork*

- **Leadership Skills:**
  - Understanding different leadership styles (transformational, transactional, situational, etc.).

- Developing leadership qualities: vision, integrity, decisiveness, and responsibility.
- Leading by example and inspiring others.
- Decision-making and problem-solving in leadership roles.
- **Teamwork and Collaboration:**
  - The importance of teamwork in achieving organizational goals.
  - The role of communication and cooperation in successful teamwork.
  - Managing conflict and differing opinions in a team environment.
  - Building trust and respect within teams.

*Unit 7: Personal Grooming and Etiquette*

- **Personal Grooming:**
  - The importance of grooming in creating a positive first impression.
  - Tips for professional attire and appearance in different settings.
  - Hygiene and personal care as aspects of personality development.
  - The impact of grooming on self-confidence and public perception.
- **Etiquette and Manners:**
  - Social and professional etiquette: greetings, introductions, and table manners.
  - Networking etiquette in professional settings.
  - Handling professional and social situations with grace and respect.
  - Digital etiquette in the workplace and on social media.

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Suggested Readings:

1. **Baron, R. A.:** *Social Psychology: The Science of Everyday Life*, Pearson Education.
2. **Goleman, D.:** *Emotional Intelligence: Why It Can Matter More Than IQ*, Bantam Books.
3. **Covey, S. R.:** *The 7 Habits of Highly Effective People*, Free Press.
4. **Carnegie, D.:** *How to Win Friends and Influence People*, Pocket Books.
5. **Pease, A., & Pease, B.:** *The Definitive Book of Body Language*, Bantam.

Course Outcome:

Upon completion of this course, students will:

- Gain deeper self-awareness and insight into their own personality traits.
- Develop enhanced communication, emotional intelligence, and leadership skills.
- Learn how to set and achieve personal and professional goals effectively.
- Acquire the tools and strategies to enhance their self-confidence, self-esteem, and overall personality.
- Be able to navigate social and professional settings with poise and etiquette.

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**Note:** Latest editions of textbooks shall be used

## **COST ACCOUNTING**

**Sub. Code: BS323**

**L – 3, T-1, C – 4.**

**Course Objective:**

The objective of this course is to introduce students to the fundamental principles of cost accounting, focusing on the identification, measurement, and analysis of costs within a business. The course aims to provide students with an understanding of various costing methods, such as job order costing, process costing, and activity-based costing, and their application in decision-making.

**Unit1:Introduction**

Meaning, objectives and advantages of cost accounting; Difference between cost accounting and financial accounting; Cost concepts and classifications; Elements of cost; Installation of a costing system; Role of a cost accountant in an organisation

**Unit2:ElementsofCost:MaterialandLabour**

- a. Materials: Material/inventory control techniques. Accounting and control of purchases, storage and issue of materials. Methods of pricing of materials issues — FIFO, LIFO, Simple Average, Weighted Average, Replacement, Standard Cost. Treatment of Material Losses
- b. Labour: Accounting and Control of labour cost. Time keeping and time booking. Concept and treatment of idle time, over time, labour turnover and fringe benefits. Methods of wage payment and the Incentive schemes- Halsey, Rowan, Taylor's Differential piece wage.

**Unit3:ElementsofCost:Overheads**

Classification, allocation, apportionment and absorption of overheads; Under- and over-absorption; Capacity Levels and Costs; Treatments of certain items in costing like interest on capital, packing expenses, bad debts, research and development expenses; Activity based cost allocation.

**Unit 4: MethodsofCosting**

Unit costing, Job costing, Contract costing, Process costing (process losses, valuation of work in progress, joint and by-products), Service costing (only transport).

**Unit5:BookKeepinginCostAccounting**

Integral and non-integral systems; Reconciliation of cost and financial accounts

**Suggested Reading:**

1. Charles T. Horngren, Srikant M. Datar, Madhav V. Rajan, *Cost Accounting: A Managerial Emphasis*, Pearson Education.
2. Drury, Colin. *Management and Cost Accounting*. Cengage Learning.
3. Nigam, B.M. Lall and I.C. Jain. *Cost Accounting: Principles and Practice*. PHI Learning
4. Rajiv Goel, *Cost Accounting*. International Book House
5. Singh, Surender. *Cost Accounting*, Scholar Tech Press, New Delhi.

6. Jain, S.P. and K.L. Narang. *Cost Accounting: Principles and Methods*. Kalyani Publishers
7. Arora, M.N. *Cost Accounting – Principles and Practice*. Vikas Publishing House, New Delhi.
8. Maheshwari, S.N. and S.N. Mittal. *Cost Accounting: Theory and Problems*. Shri Mahavir Book Depot, New Delhi.
9. Iyengar, S.P. *Cost Accounting*. Sultan Chand & Sons

**Note: Latest edition of text books may be used.**

**BUSINESS MATHEMATICS**

**Sub. Code: BS324**

**L – 3, T-1, C – 4.**

**Course Objective :**

The objective of this course is to provide students with a solid foundation in the mathematical concepts and techniques essential for solving business-related problems. The course focuses on applying mathematical tools to areas such as financial analysis, accounting, budgeting, and economic decision-making.

**Unit 1: Matrices and Determinants**

- a. Algebra of matrices. Inverse of a matrix, Matrix Operation – Business Application
- b. Solution of system of linear equations (having unique solution and involving not more than three variables) using matrix inversion Method and Cramer's Rule, The Leontief Input Output Model (Open Model Only).

**Unit 2: Calculus I**

- a. Mathematical functions and their types - linear, quadratic, polynomial, exponential,
- b. Logarithmic function Concepts of limit, and continuity of a function
- c. Concept and rules of differentiation, Maxima and Minima involving second or higher order derivatives.
- d. Concept of Marginal Analysis, Concept of Elasticity, Applied Maximum and Minimum Problems including effect of Tax on Monopolist's optimum price and quantity, Economic Order Quantity.

**Unit 3: Calculus II**

- a. Partial Differentiation: Partial derivatives up to second order; Homogeneity of functions and Euler's theorem; Total differentials; Differentiation of implicit functions with the help of total differentials
- b. Maxima and Minima: Cases of two variables involving not more than one constraint including the use of the Lagrangian multiplier.
- c. Integration: Standard forms. Methods of integration – by substitution, by parts, and by use of partial fractions; Definite integration; Finding areas in simple cases
- d. Application of Integration to marginal analysis. Consumer's and Producer's Surplus, Rate of Sales and the Learning Curve

**Unit 4: Mathematics of Finance**

- a. Rates of interest - nominal, effective – and their inter-relationships in different compounding situations.
- b. Compounding and discounting of assuming different types of rates.
- c. Types of annuities, like ordinary, due, deferred, continuous, perpetual, and their future and present values using different types of rates of interest. Depreciation of Assets. (General annuities to be excluded)

**Unit 5: Linear Programming**

- a. Formulation of linear programming problem (LPP). Graphical solution to LPP. Cases of unique and multiple optimal solutions. Unbounded solutions, infeasibility, and redundant constraints.
- b. Solution to LPP using Simplex method – maximization and minimization cases. Shadow prices of the resources. Identification of unique and multiple optimal solutions, unbounded solution, infeasibility and degeneracy.

**Suggested Readings:**

1. Mizrahi and Sullivan. *Mathematics for Business and Social Sciences*. Wiley and Sons.
2. Budnick, P. *Applied Mathematics*. McGraw Hill Education.



**ELEMENTARY MATHEMATICS**

**Sub. Code:** BS324A

**L – 4, C – 4**

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**Objective:**

The objective of this course is to provide students with fundamental mathematical tools that are essential for solving problems in economics, business, and other fields. The course covers basic concepts of algebra, calculus, and matrices, which are foundational to the understanding of advanced economic and financial models.

**CONTENTS:**

*Unit 1: Algebra and Equations*

- **Basic Algebraic Concepts:**
  - Variables, constants, and coefficients.
  - Operations on real numbers.
  - Laws of exponents and logarithms.
  - Simplification and factorization of algebraic expressions.
  - Polynomial expressions.
- **Linear and Quadratic Equations:**
  - Solving linear equations (one variable, two variables).
  - Applications of linear equations in economics.
  - Solving quadratic equations by factorization, completing the square, and the quadratic formula.
  - Graphing quadratic functions.
- **Simultaneous Equations:**
  - Solving simultaneous linear equations using substitution and elimination methods.
  - Applications of simultaneous equations in economic models.

*Unit 2: Functions and Graphs*

- **Functions and Their Properties:**
  - Definition and types of functions (linear, polynomial, rational, exponential, logarithmic).
  - Domain and range of a function.
  - Graphs of functions (plotting linear, quadratic, and exponential functions).
  - Inverse functions and their properties.
- **Equations of Lines and Curves:**

- Slope-intercept form of a straight line.
- Equation of a line through two points.
- Parabolas, hyperbolas, and other basic curves.
- Applications in economic analysis (e.g., demand and supply curves).

*Unit 3: Matrix Algebra*

- **Introduction to Matrices:**
  - Definition and types of matrices (row, column, square, diagonal, identity, inverse).
  - Matrix operations (addition, subtraction, multiplication).
  - Determinants and their properties.
  - Inverse of a matrix and solving simultaneous equations using matrices.
- **Applications of Matrices:**
  - Economic applications of matrices (input-output models, Leontief matrix).
  - Matrix applications in solving linear equations and optimization problems.

*Unit 4: Differentiation and its Applications*

- **Introduction to Differentiation:**
  - Definition of derivative and basic rules of differentiation (sum, product, quotient, chain rules).
  - Derivatives of common functions (power functions, exponential functions, logarithmic functions).
  - Higher order derivatives.
- **Applications of Differentiation:**
  - Marginal analysis in economics (marginal cost, marginal revenue).
  - Optimization problems: finding maxima and minima (first and second derivative tests).
  - Elasticity of demand and its relationship with derivatives.
  - Rate of change and slope of curves in economic contexts.

*Unit 5: Integration and its Applications*

- **Introduction to Integration:**
  - Basic rules of integration (power rule, substitution rule).
  - Definite and indefinite integrals.
  - Integration of common functions (polynomials, exponential, and logarithmic functions).
- **Applications of Integration:**
  - Consumer surplus and producer surplus.
  - Total revenue and total cost calculations.
  - Area under curves and its economic interpretation.
  - Calculating the area between curves in economic contexts.

*Unit 6: Probability and Statistics*

- **Basic Probability Theory:**

- Introduction to probability and its rules (addition and multiplication rules).
- Conditional probability and Bayes' Theorem.
- Random variables and probability distributions (discrete and continuous).
- Expected value and variance of random variables.
- **Basic Statistics:**
  - Measures of central tendency (mean, median, mode).
  - Measures of dispersion (variance, standard deviation, range).
  - Correlation and regression analysis.
  - Applications of statistics in economic analysis (e.g., forecasting, trend analysis).

*Unit 7: Mathematical Optimization*

- **Optimization Techniques:**
  - Definition of optimization and its importance in economics.
  - Constrained optimization problems and the method of Lagrange multipliers.
  - Applications in economics: profit maximization, cost minimization, and utility maximization.
- **Constrained Optimization:**
  - Solving optimization problems under constraints.
  - First and second order conditions for optimization.
  - Economic applications of optimization (e.g., production functions, cost functions).

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Suggested Readings:

1. **Simon, C. P., & Blume, L.:** *Mathematics for Economists*, W.W. Norton & Company.
2. **Dowling, E. T.:** *Mathematics for Economics*, Schaum's Outline Series.
3. **Alpha C. Chiang & Kevin Wainwright:** *Fundamental Methods of Mathematical Economics*, McGraw-Hill Education.
4. **Kreyszig, E.:** *Advanced Engineering Mathematics*, Wiley.
5. **Berck, P., & W. A. Schrag:** *Mathematics for Economists*, Routledge.

Course Outcome:

Upon completion of this course, students will:

- Have a solid understanding of key mathematical concepts required for economic analysis.
- Be able to apply algebraic and calculus-based methods to solve economic problems.
- Understand the use of matrices in economic models and optimization.
- Be proficient in applying probability and statistics to economic data and decision-making.
- Have the skills to solve optimization problems in economics, such as profit maximization and cost minimization.

STATISTICAL MATHEMATICS

**Sub. Code:** BS324C

**L – 4, C – 4**

**Objective:**

The objective of this course is to introduce students to the mathematical techniques used in statistics, emphasizing their application in solving real-world problems. The course will cover probability theory, descriptive statistics, inferential statistics, and statistical methods, with a focus on their practical use in economics, business, and social sciences.

**CONTENTS:**

*Unit 1: Basic Concepts in Statistics*

- **Introduction to Statistics:**
  - Definition of statistics, types of data: qualitative and quantitative.
  - Levels of measurement: nominal, ordinal, interval, and ratio.
  - Collection, presentation, and organization of data.
  - Frequency distribution and graphical representations: histograms, bar charts, pie charts, and cumulative frequency curves.
- **Measures of Central Tendency:**
  - Mean, median, and mode: definition, calculation, and interpretation.
  - Properties and application of measures of central tendency.
  - Weighted mean and its applications.

*Unit 2: Measures of Dispersion and Skewness*

- **Measures of Dispersion:**
  - Range, variance, standard deviation, and coefficient of variation.
  - Interpretation of dispersion and its economic significance.
  - Relationship between mean and standard deviation in normal distribution.
- **Skewness and Kurtosis:**
  - Definition and measurement of skewness and kurtosis.
  - Interpretation of skewness: positive, negative, and zero skew.
  - Role of kurtosis in understanding the shape of the data distribution.

*Unit 3: Probability Theory*

- **Introduction to Probability:**
  - Basic concepts: sample space, events, and probability.
  - Laws of probability: addition, multiplication, and conditional probability.
  - Theorems of probability: Bayes' Theorem, total probability.
- **Random Variables and Probability Distributions:**

- Definition of random variables: discrete and continuous.
- Probability mass function (PMF) and probability density function (PDF).
- Expected value, variance, and standard deviation of random variables.
- **Important Probability Distributions:**
  - Binomial distribution: properties, applications, and examples.
  - Normal distribution: properties, standard normal distribution, and Z-scores.
  - Poisson distribution: application in modeling rare events.

#### *Unit 4: Sampling and Estimation*

- **Sampling Techniques:**
  - Types of sampling: random, stratified, systematic, and cluster sampling.
  - Sampling distribution and the central limit theorem (CLT).
  - Standard error of the mean and its significance.
- **Point Estimation and Interval Estimation:**
  - Definition of estimators and properties (unbiasedness, consistency, efficiency).
  - Confidence intervals for population parameters (mean, proportion).
  - Sample size determination for estimation.

#### *Unit 5: Hypothesis Testing*

- **Introduction to Hypothesis Testing:**
  - Formulation of null and alternative hypotheses.
  - Type I and Type II errors, significance level (alpha), and p-value.
  - One-tailed and two-tailed tests.
- **Tests for Population Mean and Proportion:**
  - Z-test and t-test for population mean.
  - Test for population proportion.
  - Chi-square tests for goodness of fit and independence.
- **Analysis of Variance (ANOVA):**
  - One-way ANOVA and its application in comparing multiple means.
  - F-distribution and its properties.
  - Assumptions of ANOVA and interpretation of results.

#### *Unit 6: Regression and Correlation*

- **Simple Linear Regression:**
  - Model of simple linear regression: assumptions, estimation, and interpretation.
  - Least squares method and its application in fitting a line.
  - Coefficient of determination (R-squared) and its significance.
- **Multiple Linear Regression:**
  - Model of multiple linear regression: assumptions, estimation, and interpretation.
  - Multicollinearity, heteroscedasticity, and model diagnostics.
- **Correlation Analysis:**
  - Definition and types of correlation: Pearson, Spearman, and Kendall's rank correlation.
  - Calculation and interpretation of correlation coefficient.

*Unit 7: Time Series Analysis and Forecasting*

- **Introduction to Time Series Data:**
  - Components of time series: trend, seasonal variation, cyclical variation, and irregular variation.
  - Methods for trend analysis: moving averages and exponential smoothing.
- **Time Series Forecasting:**
  - Forecasting methods: Naïve approach, ARIMA model, and seasonal adjustments.
  - Applications of time series forecasting in economics and business.

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Suggested Readings:

1. **Anderson, D. R., Sweeney, D. J., & Williams, T. A.:** *Statistics for Business and Economics*, Cengage Learning.
2. **Gujarati, D. N. & Porter, D. C.:** *Basic Econometrics*, McGraw-Hill Education.
3. **Keller, G.:** *Statistics for Management and Economics*, Cengage Learning.
4. **Mendenhall, W., Beaver, R. J., & Beaver, B. M.:** *Introduction to Probability and Statistics*, Cengage Learning.
5. **Walpole, R. E., Myers, R. H., & Myers, S. L.:** *Probability and Statistics for Engineers and Scientists*, Pearson.

Course Outcome:

Upon completion of this course, students will:

- Understand the fundamental concepts of statistical mathematics, including probability, sampling, estimation, and hypothesis testing.
- Be able to apply statistical methods to analyze economic and business data.
- Have a solid foundation in regression, correlation analysis, and time series forecasting.
- Be equipped to interpret statistical results and make informed decisions based on data analysis.

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**Note:** Latest editions of textbooks shall be used.

## **ORGANISATIONAL BEHAVIOUR**

**Sub. Code: BS325**

**L – 4, C – 4.**

### **Course Objective:**

The objective of this course is to provide students with a comprehensive understanding of the behaviors, dynamics, and interactions within organizations. The course focuses on how individual, group, and organizational factors influence workplace performance, communication, motivation, leadership, and decision-making.

### **Course Contents:**

#### **Unit 1**

Conceptual Foundations and Importance of organisation Behaviour, Management Challenges, A Paradigm Shift, Individual Behaviour at Work, Perception and Attribution: Concept, Nature, Process, Attitude: Components, functions and changing attitudes; Personality: Concept, Types and Theories of Personality: Learning: Concept and Theories of Learning, reinforcement, Right and Left brain concept, Emotional Intelligence.

#### **Unit II**

Motivation: Concepts and their application, Need (Maslow and Herzberg), Content & Process theories, Expectancy theory, Equity theory, goal Setting theory, Empowerment and economic incentives as motivational tools.

#### **Unit III**

Leadership: Leaders and Leadership Process: Traits, Behaviours, and situations theories, Blake & Mouton's: Managerial grid, Hersey & Blanchard's' situational Leadership Model, Likert's 4 system model, Fiedler's Leadership contingency theory, House's Path-goal theory, Contemporary Leadership issues: Charismatic, Transformational Leadership, Substitutes and Neutralizers for Leadership.

#### **Unit IV**

Group Dynamics: Definition, Stages of Group Development, Group Cohesiveness, Formal and Informal Groups, Group Processes and Decision Making, Dysfunctional Groups, Importance of team work in organisations, developing team leadership skills, Analysis of Interpersonal Relationship: Transactional Analysis, Johari Window.

#### **Unit V**

Organisational Change: Concept, Nature, Resistance to change, Managing resistance to change, Implementing Change, Kurt Lewin Theory of Change. Conflict: Concept, Sources, Types, Stages of conflict, Management of conflict.

**Readings:**

1. Robbins Stephen P.: *Organisational Behaviour*, Pearson Education, 12th Edition
2. Luthans Fred : *Organisational Behaviour*, Tata McGraw Hill
3. Davis, Keith: *Human Behaviour at Works*, Tata McGraw Hill, New Delhi.
4. Hersey Paul, Blanchard, Kenneth H and Johnson Dewey E.: *Management of Organisational Behaviour: Leading Human Resources*, Pearson Education, 8th Edition

**Supplementary Readings:**

1. Newstrom John W.: *Organisational Behaviour*, Tata McGraw Hill, 12th Edition
2. Mc Shane L. Steven, Glinow Mary Ann Von & Sharma Radha R. - *Organisational Behaviour*; Tata McGraw Hill, 3rd Edition



**MACRO ECONOMICS**

**Sub. Code: BS331**

**L – 5, C – 5.**

**Course Objective :**

The objective of this course is to provide students with a comprehensive understanding of the key principles and concepts of macroeconomics and their impact on national and global economies. The course focuses on how aggregate economic factors, such as GDP, unemployment, inflation, fiscal policy, and monetary policy, influence economic growth, stability, and public welfare.

**Unit1:Introduction**

Concepts and variables of macroeconomics, income, expenditure and the circular flow, components of expenditure. Static macroeconomic analysis short and the long run – determination of supply, determination of demand, and conditions of equilibrium

**Unit2:Economyintheshortrun**

IS–LM framework, fiscal and monetary policy, determination of aggregate demand, shifts in aggregate demand, aggregate supply in the short and long run, and aggregate demand- aggregate supply analysis.

**Unit3:Inflation,UnemploymentandLabormarket**

Inflation: Causes of rising and falling inflation, inflation and interest rates, social costs of inflation;Unemployment–naturalrateofunemployment,frictionalandwaitunemployment.

Labourmarketanditsinteractionwithproductionsystem;Phillipscurve,thetrade-offbetweeninflationandunemployment,sacrificeratio,roleofexpectationsadaptiveandrational

**Unit4:Openeconomy**

Openeconomy–flowsofgoodsandcapital,savingandinvestmentinasmallandalargeopen economy, exchange rates, Mundell – Fleming model with fixed and flexible prices in a small openeconomywithfixedandwithflexibleexchangerates,interest-ratedifferentialscaseofalargeeconomy.

**Unit5:**

BehavioralFoundations-Investment–determinantsofbusinessfixedinvestment, effect to tax, determinants of residential investment and inventory investment. Demand for Money – Portfolioandtransactionstheoriesofdemandforrealbalances,interestandincomeelasticities ofdemandforrealbalances.Supplyofmoney

**Suggested Readings**

1. Mankiw,N.Gregory.*PrinciplesofMacroeconomics*.CengageLearning
2. Froyen, *Macroeconomics*
3. RobertJ. Gordon,*Macroeconomics*,PearsonEducation

4. Branson, William H. *Macroeconomic Theory and Policy*. Harper Collins India Pvt. Ltd.
5. Rudiger Dornbusch, Stanley Fischer, and Richard Startz, *Macroeconomics*. McGraw Hill Education
6. Oliver J. Blanchard, *Macroeconomics*, Pearson Education
7. G.S. Gupta, *Macroeconomics: Theory and Applications*, McGraw-Hill Education
8. Shapiro, *Macroeconomic Analysis*,
9. Paul A Samuelson, William D Nordhaus, and Sudip Chaudhuri, *Macroeconomic*, McGraw Hill

**CORPORATE LAW**

**Sub. Code: BS332**

**L – 5, C – 5**

**Course Objective :**

The objective of this course is to provide students with a comprehensive understanding of the legal framework governing corporate entities and business operations. The course focuses on the formation, structure, and management of corporations, as well as the rights and responsibilities of directors, shareholders, and other stakeholders.

**UNIT1:Introduction**

Administration of Company Law [including National Company Law Tribunal (NCLT), National Company Law Appellate Tribunal (NCLAT), Special Courts]; Characteristics of a company; lifting of corporate veil; types of companies including one person company, small company, and dormant company; association not for profit; illegal association; formation of company, on-line filing of documents, promoters, their legal position, pre-incorporation contract; on-line registration of a company.

**UNIT2:Documents**

Memorandum of association, Articles of association, Doctrine of constructive notice and indoor management, prospectus-shelf and red herring prospectus, misstatement in prospectus, GDR; book-building; issue, allotment and forfeiture of share, transmission of shares, buyback and provisions regarding buyback; issue of bonus shares.

**UNIT3:Management**

Classification of directors, women directors, independent director, small shareholder's director; disqualifications, director identity number (DIN); appointment; Legal positions, powers and duties; removal of directors; Key managerial personnel, managing director, manager; Meetings: Meetings of shareholders and board of directors; Types of meetings, Convening and conduct of meetings, Requisites of a valid meeting, postal ballot, meeting through video conferencing, e-voting. Committees of Board of Directors - Audit Committee, Nomination and Remuneration Committee, Stakeholders Relationship Committee, Corporate Social Responsibility Committee

**UNIT4:**

**Dividends, Accounts, Audit:** Provisions relating to payment of Dividend, Provisions relating to Books of Account, Provisions relating to Audit, Auditors' Appointment, Rotation of Auditors, Auditors' Report, Secretarial Audit.

**Winding Up:** Concept and modes of Winding Up.

**Insider Trading, Whistle Blowing:** Insider Trading; meaning & legal provisions; Whistle-blowing: Concept and Mechanism.

**UNIT 5:DepositoriesLaw**

The Depositories Act 1996 – Definitions; rights and obligations of depositories; participants issuers and beneficial owners; inquiry and inspections, penalty.

**Suggested Readings:**

1. MCKuchhal, \_\_\_\_\_ and  
VivekKuchhal, *Modern Indian Company Law*, ShriMahavirBookDepot(Publishers), Delhi.
2. GKKapoorandSanjayDhamija, *Company Law*, BharatLawHouse, Delhi.

**COMPETITION LAW**

**Sub. Code:** BS322A

**L – 4, C – 4**

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**Objective:**

The objective of this course is to familiarize students with the key concepts of competition law, covering legal frameworks, market dynamics, antitrust laws, and their application in promoting fair competition and protecting consumers. The course will also explore the role of competition law in regulating monopolistic practices, cartels, and mergers and acquisitions.

**CONTENTS:**

*Unit 1: Introduction to Competition Law*

- **Concepts of Competition:**
  - Definition of competition and competitive markets.
  - The importance of competition in a market economy.
  - Economic efficiency, consumer welfare, and the role of competition.
  - Overview of competition law and its objectives: promoting competition and regulating anti-competitive practices.
- **Historical Development of Competition Law:**
  - Evolution of competition law in different jurisdictions (United States, European Union, India, etc.).
  - Key milestones and international conventions in competition law.
  - The role of international organizations: WTO, UNCTAD, OECD.
- **Objectives of Competition Law:**
  - Preventing anti-competitive agreements, abuse of dominant positions, and anti-competitive mergers.
  - Enhancing consumer welfare and fostering economic growth.
  - Regulatory frameworks and enforcement mechanisms.

*Unit 2: Anti-Competitive Agreements*

- **Types of Anti-Competitive Agreements:**
    - Horizontal agreements (e.g., cartels, price-fixing).
    - Vertical agreements (e.g., resale price maintenance, territorial restrictions).
    - Tacit collusion vs. explicit collusion.
    - Agreements that restrict competition (cartels, market-sharing agreements, price-fixing, etc.).
  - **Competition Law and Cartels:**
    - Definition of cartels and their harmful effects on markets and consumers.
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- Legal frameworks for cartel prohibition.
- Leniency programs and whistleblower policies.
- Case studies of notable cartel investigations.
- **Exemptions to Anti-Competitive Agreements:**
  - Legal exemptions under competition law (e.g., joint ventures, standardization agreements, etc.).
  - Rule of reason and per se violations in antitrust law.

#### *Unit 3: Abuse of Dominant Position*

- **Concept of Dominance:**
  - Definition of market dominance and the factors determining dominance.
  - Market share thresholds and their implications.
  - Abuse of market power and its impact on competition.
- **Forms of Abuse of Dominant Position:**
  - Predatory pricing, price discrimination, refusal to supply, tying and bundling.
  - Abuse through exclusionary practices, excessive pricing, and other exploitative practices.
- **Regulation of Abuse of Dominance:**
  - Legal standards for identifying abusive behavior.
  - Case studies of abuse of dominant position.
  - Enforcement and penalties for abuse.

#### *Unit 4: Mergers and Acquisitions*

- **Merger Control under Competition Law:**
  - Definition and significance of mergers and acquisitions.
  - Types of mergers: horizontal, vertical, and conglomerate mergers.
  - Economic analysis of mergers and their impact on competition.
- **Merger Review Process:**
  - Merger notification and review process in different jurisdictions.
  - Antitrust issues in mergers: market concentration, anti-competitive effects, and efficiencies.
  - Regulatory bodies and their role in merger control (e.g., the European Commission, US Federal Trade Commission, Competition Commission of India).
- **Case Studies of Mergers and Acquisitions:**
  - High-profile cases in antitrust law (e.g., Google/DoubleClick, Facebook/WhatsApp).
  - Economic and legal analysis of merger cases.

#### *Unit 5: Competition Law in India*

- **The Competition Act, 2002:**
  - Key provisions and objectives of the Indian Competition Act.
  - Regulatory bodies: Competition Commission of India (CCI) and its role.
  - Framework for preventing anti-competitive practices, abuse of dominance, and regulating mergers and acquisitions.

- **Anti-Competitive Agreements under Indian Law:**
  - Legal provisions regarding cartels and anti-competitive agreements in India.
  - Significant cases handled by the Competition Commission of India (CCI).
  - Policy and enforcement challenges in the Indian context.
- **Regulation of Mergers and Acquisitions in India:**
  - Guidelines and thresholds for merger control in India.
  - Case studies of mergers reviewed by the CCI.
  - Examination of market impact and anti-competitive concerns in Indian merger cases.

*Unit 6: International Competition Law and Policy*

- **Global Overview of Competition Laws:**
  - Key competition law frameworks around the world: US (Sherman Act, Clayton Act), EU (EU competition law), and others.
  - International coordination and cooperation in enforcing competition laws.
- **International Cartels and Cross-Border Enforcement:**
  - Legal challenges in cross-border cartel enforcement.
  - International cartel cases and cooperation between competition authorities.
  - OECD, UNCTAD, and other international bodies in the regulation of competition.
- **Global Trends in Competition Policy:**
  - Emerging issues in global competition law: digital markets, big data, and platform monopolies.
  - New challenges in regulating technology giants (e.g., Google, Amazon, Facebook).

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Suggested Readings:

1. **Whish, R., & Bailey, D.:** *Competition Law*, Oxford University Press.
2. **Lowe, P., & Rainer, B.:** *Competition Law: A Guide to the Merger Control Regulation*, Bloomsbury Professional.
3. **Katz, M. L., & Shapiro, C.:** *Antitrust and Competition Policy*, MIT Press.
4. **Bellamy, C.:** *Bellamy & Child: European Union Law of Competition*, Oxford University Press.
5. **Trebilcock, M. J., & Howse, R.:** *The Regulation of International Trade*, Routledge.

Course Outcome:

Upon completion of this course, students will:

- Understand the principles and frameworks of competition law.
  - Be able to analyze and assess anti-competitive behavior, abuse of dominance, and merger control.
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IT LAW

**Sub. Code:** BS332

**L – 4, C – 4**

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**Objective:**

The objective of this course is to provide students with an understanding of the legal aspects related to Information Technology. This includes intellectual property, data protection, cybercrimes, e-commerce, and legal regulations governing online transactions. The course also aims to acquaint students with emerging issues in the digital economy, such as blockchain and artificial intelligence, and how these technologies interact with legal frameworks.

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**CONTENTS:**

*Unit 1: Introduction to IT Law*

- **Overview of IT Law:**
    - Definition and scope of Information Technology law.
    - Role of IT law in the digital age and its importance in regulating online and offline business transactions.
    - Relationship between technology and law: Challenges in regulating fast-evolving technologies.
  - **Constitutional and Legal Framework for IT:**
    - Basic principles of IT law and its legal foundations.
    - National and international regulatory bodies overseeing IT law.
    - Overview of key international treaties and conventions on IT governance (e.g., Convention on Cybercrime, WTO and TRIPS Agreement).
  - **E-Governance and Legal Frameworks:**
    - Role of e-governance in modern democracies.
    - Legal frameworks supporting e-governance: E-Signatures, digital contracts, and public records in the digital domain.
    - Key acts and policies shaping e-governance, such as the National E-Governance Plan (NEGP) and Digital India initiative.
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*Unit 2: Intellectual Property (IP) in the Digital Age*

- **Overview of Intellectual Property:**
    - Introduction to IP law: Copyright, Trademark, Patent, and Trade Secrets.
    - The impact of the digital environment on IP rights and protection.
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- Importance of protecting digital content and online creations.
- **Copyright and Digital Content:**
  - Copyright law and digital content: Software, databases, and online works.
  - Fair use, licenses, and Digital Rights Management (DRM).
  - Enforcement of copyright in the digital age and the role of Internet Service Providers (ISPs).
- **Patents and Software:**
  - Patentability of software, algorithms, and digital inventions.
  - The patenting process and issues related to software patents.
  - Patent infringement in the digital space and litigation.
- **Trademark and Domain Names:**
  - Trademark law and its relevance in cyberspace.
  - Domain names as trademarks and disputes (e.g., cybersquatting).
  - ICANN and the regulation of domain names.

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*Unit 3: Cybercrimes and Legal Issues*

- **Overview of Cybercrimes:**
  - Definition and types of cybercrimes: Hacking, identity theft, phishing, cyberstalking, and online fraud.
  - Cybercrime legislation in different jurisdictions (e.g., Cybercrime laws in India, the US, and the EU).
  - Key issues in enforcement: Challenges in jurisdiction and international cooperation in tackling cybercrime.
- **Cybercrime Investigation and Law Enforcement:**
  - Role of law enforcement agencies in investigating cybercrimes.
  - Tools and technologies used for cybercrime investigation.
  - Challenges of digital forensics and evidence gathering.
- **Laws Relating to Data Protection:**
  - Introduction to data protection laws: The right to privacy, data security, and encryption.
  - Key legislations: The Personal Data Protection Bill (India), GDPR (Europe), and CCPA (California).
  - Role of organizations in data protection, including obligations and penalties.

*Unit 4: E-Commerce and Digital Transactions*

- **Legal Framework for E-Commerce:**
  - Regulatory frameworks governing e-commerce transactions.
  - Electronic contracts, digital signatures, and their legal validity.
  - Consumer protection in e-commerce transactions.
  - E-commerce dispute resolution: Mediation, arbitration, and online dispute resolution (ODR).
- **Cybersecurity and Legal Issues in E-Commerce:**
  - Cybersecurity challenges in e-commerce: Protecting transactions and customer data.
  - Legal obligations of businesses to protect consumer information.



- Cybersecurity laws and regulations (e.g., NIST Cybersecurity Framework, IT Act 2000 in India).
- **Consumer Protection in the Digital Age:**
  - Consumer rights in online transactions.
  - E-commerce platforms and their role in protecting consumers.
  - Role of consumer protection laws in regulating digital transactions (e.g., the Consumer Protection (E-commerce) Rules 2020 in India).

*Unit 5: The Digital Economy and Emerging Technologies*

- **Blockchain and Legal Implications:**
  - Overview of blockchain technology and its applications in business and law.
  - Legal challenges in the use of blockchain: Smart contracts, cryptocurrencies, and decentralized applications (dApps).
  - Regulatory issues around cryptocurrencies and Initial Coin Offerings (ICOs).
- **Artificial Intelligence (AI) and Law:**
  - Impact of AI on legal frameworks: Ethical issues, liability, and accountability.
  - AI in law enforcement: Surveillance, profiling, and predictive policing.
  - Legal regulations concerning AI technologies and autonomous systems.
- **Privacy and Ethical Issues in the Digital Economy:**
  - Privacy concerns in the digital economy: Data collection, profiling, and surveillance.
  - The concept of "digital rights" and ethical implications of technology use.
  - Ethical considerations in AI, data usage, and cybersecurity.

Suggested Readings:

1. **Brettel, M., & Spengler, T.:** *Cyber Law: The Law of the Internet and Information Technology*, Springer.
2. **Sigh, P., & Chauhan, V.:** *Cyber Laws and IT Protection in India*, University Press.
3. **Taylor, L., & Gannon, M.:** *Information Technology and the Law*, Routledge.
4. **Bada, A., & Dlamini, S.:** *The Law of Cyberspace*, Oxford University Press.
5. **Rouse, M., & Cooper, A.:** *E-Commerce and the Law*, Cengage Learning

Course Outcome:

Upon completion of this course, students will:

- Understand the fundamental principles of IT law and its application in digital transactions, intellectual property, and cybersecurity.
- Be equipped to analyze and assess legal challenges posed by emerging technologies such as blockchain and artificial intelligence.
- Gain practical knowledge of the regulation of e-commerce, digital contracts, and data protection.
- Develop the ability to apply IT law to real-world situations and contribute to policy discussions on digital governance.

## HUMAN RESOURCE MANAGEMENT

**Sub. Code: BS333**

**L – 5, C – 5.**

### **Course Objective :**

The objective of this course is to provide students with a comprehensive understanding of the principles, strategies, and practices involved in managing human resources within an organization. The course focuses on key HR functions such as recruitment, selection, training and development, performance management, compensation and benefits, and employee relations.

### **Unit1:Introduction**

Human Resource Management: Concept and Functions, Role, Status and competencies of HR Manager, HR Policies, Evolution of HRM, HRM vs HRD. Emerging Challenges of Human Resource Management; Workforce diversity; Empowerment; Downsizing; VRS; Human Resource Information System

### **Unit2:AcquisitionofHumanResource**

Human Resource Planning- Quantitative and Qualitative dimensions; job analysis – job description and job specification; Recruitment – Concept and sources; Selection – Concept and process; test and interview; placement and induction

### **Unit3:TrainingandDevelopment**

Concept and Importance; Identifying Training and Development Needs; Designing Training Programme; Role-Specific and Competency-Based Training; Evaluating Training Effectiveness; Training Process Outsourcing; Management Development; Career Development.

### **Unit 4:PerformanceAppraisal**

Nature, objectives and importance; Modern techniques of performance appraisal; potential appraisal and employee counseling; job changes - transfers and promotions; Compensation: concept and policies; job evaluation; methods of wage payments and incentive plans; fringe benefits; performance linked compensation.

### **Unit5:Maintenance**

Employee health and safety; employee welfare; social security; Employer-Employee relations-an overview; grievance-handling and redressal; Industrial Disputes: causes and settlement machinery

### **Suggested Readings:**

1. Gary Dessler. *A Framework for Human Resource Management*. Pearson Education.
2. DeCenzo, D.A. and S.P. Robbins, *Personnel/Human Resource Management*, Pearson Education.
3. Bohlendar and Snell, *Principles of Human Resource Management*, Cengage Learning
4. Ivancevich, John M. *Human Resource Management*. McGraw Hill.
5. Wreather and Davis. *Human Resource Management*. Pearson Education.
6. Robert L. Mathis and John H. Jackson. *Human Resource Management*. Cengage Learning.
7. TN Chhabra, *Human Resource Management*, Dhanpat Rai & Co., Delhi

## **COMPUTER APPLICATIONS IN BUSINESS**

**Sub. Code: BS334**

**L – 4, P-2, C – 5,**

**Objectives:** To provide computer skills and knowledge for commerce students and to enhance the student understanding of usefulness of information technology tools for business operations.

### **Unit 1: Computer System:**

Hardware: input devices, output devices, and peripheral devices. Software: system software, operating system - Windows, application software, antivirus, computer networks. Internet applications.

### **Unit 2: Word Processing**

Introduction to word Processing, Word processing concepts, Use of Templates, Working with word document: Editing text, Find and replace text, Formatting, spell check, Autocorrect, Autotext; Bullets and numbering, Tabs, Paragraph Formatting, Indent, Page Formatting, Header and footer, Tables: Inserting, filling and formatting a table; Inserting Pictures and Video; Mail Merge: including linking with Database; Printing documents

#### **Creating Business Documents using the above facilities**

### **Unit 3: Preparing Presentations**

Basics of presentations: Slides, Fonts, Drawing, Editing; Inserting: Tables, Images, texts, Symbols, Media; Design; Transition; Animation; and Slideshow.

#### **Creating Business Presentations using above facilities**

### **Unit 4: Spreadsheet and its Business Applications**

**Spreadsheet concepts,** Managing worksheets; Formatting, Entering data, Editing, and Printing a worksheet; Handling operators in formula, Project involving multiple spreadsheets, Organizing Charts and graphs

**Generally used Spreadsheet functions:** Mathematical, Statistical, Financial, Logical, Date and Time, Lookup and reference, Database, and Text functions

### **Unit 5: Creating Business Spreadsheet**

**Creating spreadsheet in the area of:** Loan and Lease statement; Ratio Analysis; Payroll statements; Capital Budgeting; Depreciation Accounting; Graphical representation of data; Frequency distribution and its statistical parameters; Correlation and Regression

### **Suggested Readings:**

1. "The Digital Transformation Playbook: Rethink Your Business for the Digital Age" by David L. Rogers
2. "Information Systems for Managers: Text and Cases" by G. C. C. K. P. K. and D. S. H.

## INCOME TAX LAW AND PRACTICE

Sub. Code: BS335

L – 4, T-1, C – 5.

### Course Objective :

The objective of this course is to provide students with a comprehensive understanding of the principles, provisions, and practical applications of income tax law. The course focuses on how income tax laws affect individuals, businesses, and organizations, with an emphasis on the computation of taxable income, tax deductions, exemptions, and the filing of tax returns. Students will explore key topics such as the scope of income, tax rates, tax planning strategies, and the role of tax authorities.

### Unit1:Introduction

**Basic concepts:** Income, agricultural income, person, assessee, assessment year, previous year, gross total income, total income, maximum marginal rate of tax; Permanent Account Number (PAN) **Residential status;** Scope of total income on the basis of residential status  
Exempted income under section 10

### Unit2:ComputationofIncomeunderdifferentheads-1

Income from Salaries; Income from house property

### Unit3:ComputationofIncomeunderdifferentheads-2

Profits and gains of business or profession; Capital gains; Income from other sources

### Unit4:ComputationofTotalIncomeandTaxLiability

Income of other persons included in assessee's total income; Aggregation of income and set-off and carry forward of losses; Deductions from gross total income; Rebates and reliefs. Computation of total income of individuals and firms; Tax liability of an individual and a firm; five leading cases decided by the Supreme Court

### Unit5:PreparationofReturnofIncome

Filing of returns: Manually, On-line filing of Returns of Income & TDS; Provision & Procedures of Compulsory On-Line filing of returns for specified assesses.

### Note:

1. There shall be a practical examination of 20 Marks on E-filing of Income Tax Returns using a software utility tool. The student is required to fill appropriate Form and generate the XML file.
2. There shall be 4 Credit Hrs. for Lectures + one Credit hr. (Two Practical Periods per week per batch) for Practical Lab + one credit Hr for Tutorials (per group)
3. Latest edition of textbooks and Software may be used.

### Suggested readings:

1. Singhania, Vinod K. and Monica Singhania. *Students' Guide to Income Tax*, University Edition. Taxman Publications Pvt.Ltd., New Delhi.
2. Ahuja, Girish and Ravi Gupta. *Systematic Approach to Income Tax*. Bharat Law House, Delhi.

### Journals

1. IncomeTaxReports.CompanyLawInstituteofIndiaPvt.Ltd.,Chennai.
2. Taxman.TaxmanAlliedServicesPvt.Ltd.,New Delhi.
3. CurrentTaxReporter.CurrentTaxReporter,Jodhpur.

**Software**

1. VinodKumarSinghania,e-filingofIncomeTaxReturnsandComputationofTax,  
TaxmanPublicationPvt.Ltd,NewDelhi.Latestversion
2. 'ExcelUtility'availableat`incometaxindiaefiling.gov.in`

## BUSINESS STATISTICS

**Sub. Code: BS341**

**L – 4, T-1, C – 5.**

### **Course Objective:**

The objective of this course is to provide students with a comprehensive understanding of statistical methods and techniques used in business decision-making. The course focuses on how to collect, analyze, interpret, and present data to make informed decisions in various business contexts.

### **Unit1:StatisticalDataandDescriptiveStatistics**

- a. Nature and Classification of data: univariate, bivariate and multivariate data; time-series and cross-sectional data
- b. Measures of Central Tendency
  - i. Mathematical averages including arithmetic mean, geometric mean and harmonic mean. Properties and applications.
  - ii. Positional Averages  
Mode and Median (and other partition values including quartiles, deciles, and percentiles) (including graphic determination)
- c. Measures of Variation: absolute and relative.  
Range, quartile deviation, mean deviation, standard deviation, and their coefficients, Properties of standard deviation/variance
- d. Skewness: Meaning, Measurement using Karl Pearson and Bowley's measures; Concept of Kurtosis

### **Unit2:ProbabilityandProbabilityDistributions**

- a. Theory of Probability. Approaches to the calculation of probability; Calculation of event probabilities. Addition and multiplication laws of probability (Proof not required); Conditional probability and Bayes' Theorem (Proof not required)
- b. Expectation and variance of a random variable
- c. Probability distributions:
  - i. Binomial distribution: Probability distribution function, Constants, Shape, Fitting of binomial distribution
  - ii. Poisson distribution: Probability function, (including Poisson approximation to binomial distribution), Constants, Fitting of Poisson distribution
  - iii. Normal distribution: Probability distribution function, Properties of normal curve, Calculation of probabilities

### **Unit3:SimpleCorrelationandRegressionAnalysis**

- a. **Correlation Analysis:** Meaning of Correlation: simple, multiple and partial; linear and non-linear, Correlation and Causation, Scatter diagram, Pearson's co-efficient of correlation; calculation and properties (Proof not required). Correlation and Probable error; Rank Correlation
- b. **Regression Analysis:** Principle of least squares and regression lines, Regression equations and estimation; Properties of regression coefficients; Relationship between Correlation and Regression coefficients; Standard Error of Estimate and its use in interpreting the results.

### **Unit 4:IndexNumbers**

Meaning and uses of index numbers; Construction of index numbers: fixed and chain base: univariate and composite. Aggregate and average of relatives – simple and weighted

Tests of adequacy of index numbers, Base shifting, splicing and deflating. Problems in the construction of index numbers; Construction of consumer price indices: Important share price indices, including BSE SENSEX and NSE NIFTY

### **Unit 5: TimeSeriesAnalysis**

Components of time series; Additive and multiplicative models; Trend analysis: Fitting of trend line using principle of least squares—linear, second degree parabola and exponential. Conversion of annual linear trend equation to quarterly/monthly basis and vice-versa; Moving averages; Seasonal variations: Calculation of Seasonal Indices using Simple averages, Ratio-to-trend, and Ratio-to-moving averages methods. Uses of Seasonal Indices

#### **Note:**

- 1. Latest edition of textbooks may be used.**

#### **Suggested Readings:**

1. Levin, Richard, David S. Rubin, Sanjay Rastogi, and H M Siddiqui. *Statistics for Management*. 7th ed, Pearson Education.
2. David M. Levine, Mark L. Berenson, Timothy C. Krehbiel, P. K. Viswanathan, *Business Statistics: A First Course*, Pearson Education.
3. Siegel Andrew F. *Practical Business Statistics*. McGraw Hill Education.
4. Vohra N.D., *Business Statistics*, McGraw Hill Education.
5. Murray R Spiegel, Larry J. Stephens, Narinder Kumar. *Statistics (Schaum's Outline Series)*, McGraw Hill Education.
6. Gupta, S.C. *Fundamentals of Statistics*. Himalaya Publishing House.
7. Anderson, Sweeney, and Williams, *Statistics for Students of Economics and Business*, Cengage Learning.

## PRINCIPLES OF MARKETING

Sub. Code: BS342

L – 5, C – 5.

**Objective:** The objective of this course is to provide basic knowledge of concepts, principles, tools and techniques of marketing.

**Contents:**

**Unit1:Introduction:**

Nature, scope and importance of marketing; Evolution of marketing; selling vs marketing; Marketing mix, Marketing environment: concept, importance, and components (Economic, Demographic, Technological, Natural, Socio-Cultural and Legal).

**Unit2:**

**a. Consumer Behaviour:** Nature and Importance, Consumer buying decision process; Factors influencing consumer buying behaviour.

**b. Market segmentation:** concept, importance and bases; Target market selection; Positioning concept, importance and bases; Product differentiation vs. market segmentation.

**Unit3:Product:**

Concept and importance, Product classifications; Concept of product mix; Branding, packaging and labeling; Product-Support Services; Product life-cycle; New Product Development Process; Consumer adoption process.

**Unit4:**

**a. Pricing:** Significance. Factors affecting price of a product. Pricing policies and strategies.

**b. Distribution Channels and Physical Distribution:** Channels of distribution - meaning and importance; Types of distribution channels; Functions of middleman; Factors affecting choice of distribution channel; Wholesaling and retailing; Types of Retailers; e-tailing, Physical Distribution.

**Unit5:**

**a. Promotion:** Nature and importance of promotion; Communication process; Types of promotion: advertising, personal selling, public relations & sales promotion, and their distinctive characteristics; Promotion mix and factors affecting promotion mix decisions;

**b. Recent developments in marketing:** Social Marketing, online marketing, direct marketing, services marketing, green marketing, Rural marketing; Consumerism

**Suggested Readings:**

1. Kotler, Philip, Gary Armstrong, Prafulla Agnihotri. *Principles of Marketing*. 17th edition. Pearson Education.
2. Michael, J. Etzel, Bruce J. Walker, William J Stanton and Ajay Pandit. *Marketing: Concepts and Cases*. (Special Indian Edition), McGraw Hill Education
3. William D. Perreault, and McCarthy, E. Jerome. *Basic Marketing*. Pearson Education.
4. Majaro, Simon. *The Essence of Marketing*. Pearson Education, New Delhi.
5. The Consumer Protection Act 1986.
6. Iacobucci and Kapoor, *Marketing Management: A South Asian Perspective*. Cengage Learning.
7. Dhruv Grewal and Michael Levy, *Marketing*. McGraw Hill Education.
8. Chhabra, T.N., and S.K. Grover. *Marketing Management*. Fourth Edition. Dhanpat Rai & Company.
9. Neeru Kapoor, *Principles of Marketing*, PHI Learning
10. Rajendra Maheshwari, *Principles of Marketing*, International Book House



## INDIAN ECONOMY

Sub. Code: BS343

L – 5, C – 5.

### Course Objective:

The objective of this course is to provide students with a comprehensive understanding of the structure, growth, and challenges of the Indian economy. The course focuses on key economic concepts such as economic planning, industrial development, agriculture, services, and trade, while also examining the role of government policies, fiscal management, and monetary systems in shaping economic outcomes.

### Unit 1: Basic Issues in Economic Development

Concept and Measures of Development and Underdevelopment; Human Development

### Unit 2: Basic Features of the Indian Economy at Independence

Composition of national income and occupational structure, the agrarian scene and industrial structure

### Unit 3: Policy Regimes

- a) The evolution of planning and imports substituting industrialization.
- b) Economic Reforms since 1991.
- c) Monetary and Fiscal policies with their implications on economy

### Unit 4: Growth, Development and Structural Change

- a) The experience of Growth, Development and Structural Change in different phases of growth and policy regimes across sectors and regions.
- b) The Institutional Framework: Patterns of assets ownership in agriculture and industry; Policies for restructuring agrarian relations and for regulating concentration of economic power;
- c) Changes in policy perspectives on the role of institutional framework after 1991.
- d) Growth and Distribution; Unemployment and Poverty; Human Development; Environmental concerns.
- e) Demographic Constraints: Interaction between population change and economic development.

### Unit 5: Sectoral Trends and Issues

- a) Agriculture Sector: Agrarian growth and performance in different phases of policy regimes i.e. pre green revolution and the two phases of green revolution; Factors influencing productivity and growth; the role of technology and institutions; price policy, the public distribution system and food security.
- b) Industry and Services Sector: Phases of Industrialisation – the rate and pattern of industrial growth across alternative policy regimes; Public sector – its role, performance and reforms; the small scale sector; Role of Foreign capital.
- c) Financial Sector: Structure, Performance and Reforms. Foreign Trade and balance of Payments: Structural Changes and Performance of India's Foreign Trade and Balance of Payments; Trade Policy Debate; Export policies and performance; Macro Economic Stabilisation and Structural Adjustment; India and the WTO, Role of FDI, Capital account convertibility,

### Suggested Readings:

1. Puri and Mishra, *Indian Economy*, Himalaya Publishing House
2. ICDhingra, *Indian Economics*, Sultan Chand & Sons
3. Gaurav Dutt and Ashwini Mahajan, *Indian Economy*, S. Chand & Company.
4. Ahluwalia, Montek S. State-level Performance under Economic Reforms in India in A.O. Krueger. (Ed.). *Economic Policy Reforms and the Indian Economy*, The University of Chicago Press.

5. Khanna, Sushil. Financial Reforms and Industrial Sector in India. *Economic and Political Weekly*. Vol. 34. No. 45.
6. Uma Kapila (Ed), *Indian Economy since Independence*, Relevant articles.
7. Rangarajan, C. and N. Jadhav. Issues in Financial Sector Reform. Bimal Jalan. (Ed). *The Indian Economy*. Oxford University Press, New Delhi.

**Note: Latest edition of text books may be used.**

## E-COMMERCE

**Sub. Code: BS344**

**L – 5, C – 5.**

### **Course Objective:**

The objective of this course is to provide students with a comprehensive understanding of the principles, technologies, and business models that drive e-commerce. The course focuses on how online platforms and digital tools are transforming traditional business practices, enabling companies to reach global markets, and enhancing customer experiences.

### **Unit1:Introduction:**

Meaning, nature, concepts, advantages, disadvantages and reasons for transacting online, types of E-Commerce, e-commerce business models (introduction , key elements of a business model and categorizing major E-commerce business models), forces behind e-commerce.

**Technology used in E-commerce:** The dynamics of world wide web and internet (meaning, evolution and features); Designing, building and launching e-commerce website (A systematic approach involving decisions regarding selection of hardware, software, outsourcing vs. in-house development of a website)

### **Unit 2: Security and Encryption:**

Need and concepts, the e-commerce security environment: (dimension, definition and scope of e-security), security threats in the E-commerce environment (security intrusions and breaches, attacking methods like hacking, sniffing, cyber-vandalism etc.), technology solutions (Encryption, security channels of communication, protecting networks and protecting servers and clients),

### **Unit 3: IT Act 2000 and Cyber Crimes**

IT Act 2000: Definitions, Digital signature, Electronic governance, Attribution, acknowledgement and dispatch of electronic records, Regulation of certifying authorities, Digital signature certificates, Duties of subscribers, Penalties and adjudication, Appellate Tribunal, Offences and Cyber-crimes

### **Unit 4: E-payment System:**

Models and methods of e-payments (Debit Card, Credit Card, Smart Cards, e-money), digital signatures (procedure, working and legal position), payment gateways, online banking (meaning, concepts, importance, electronic fund transfer, automated clearing house, automated ledger posting), risks involved in e-payments.

### **Unit 5: On-line Business Transactions:**

Meaning, purpose, advantages and disadvantages of transacting online, E-commerce applications in various industries like (banking, insurance, payment of utility bills, online marketing, e-tailing (popularity, benefits, problems and features), online services (financial, travel and career), auctions, online portal, online learning, publishing and entertainment) Online shopping (amazon, snap deal, Alibaba, flipkart, etc.)

**Note: Latest edition of text books may be used.**

### **Suggested Readings**

1. Kenneth C. Laudon and Carlo Guercio Traver, *E-Commerce*, Pearson Education.
2. David Whiteley, *E-commerce: Strategy, Technology and Applications*, McGraw Hill Education

## WEB DEVELOPMENT

**Sub. Code:** BS344A

**L – 4, C – 4**

Objective:

The objective of this course is to introduce students to the core concepts of web development, covering both front-end and back-end technologies. Students will gain hands-on experience with designing, developing, and maintaining interactive, responsive, and dynamic websites. By the end of the course, students will be proficient in using modern web development tools, frameworks, and technologies to create fully functional web applications.

### CONTENTS:

#### *Unit 1: Introduction to Web Development*

- **Overview of Web Development:**
  - What is Web Development? Understanding the difference between front-end and back-end.
  - Basic structure of the web: Client-server model.
  - Web browsers and servers, HTTP/HTTPS protocol.
  - The concept of web hosting and domain names.
- **Web Technologies:**
  - Introduction to the core web technologies: HTML, CSS, JavaScript.
  - The role of databases in web development.
  - Tools and platforms for web development: IDEs, Version control with Git/GitHub.
  - Introduction to responsive web design and mobile-first approach.

#### *Unit 2: Front-End Web Development*

- **HTML (HyperText Markup Language):**
  - Structure of a web page: Tags, attributes, and elements.
  - Basic HTML tags: <html>, <head>, <body>, <h1> - <h6>, <p>, <div>, <a>, <img>, <form>.
  - Tables, lists, and forms.
  - Introduction to semantic HTML for better SEO and accessibility.
- **CSS (Cascading Style Sheets):**
  - Introduction to CSS: Inline, internal, and external styles.
  - Selectors, properties, and values.
  - The box model: Margin, padding, border, content.
  - Positioning elements using CSS (absolute, relative, fixed, and sticky).
  - Layout techniques: Flexbox, Grid system.
  - Media queries for responsive design.
- **JavaScript (JS):**
  - Introduction to JavaScript: Syntax, variables, data types, operators.
  - Functions, loops, conditionals, and events.
  - DOM manipulation: Selecting elements, modifying content, and handling user events.
  - Introduction to JSON (JavaScript Object Notation) and AJAX.
  - Client-side validation of forms using JavaScript.

*Unit 3: Advanced Front-End Development*

- **JavaScript Libraries and Frameworks:**
  - Introduction to jQuery for DOM manipulation and handling AJAX requests.
  - Using Bootstrap framework for responsive design.
  - Introduction to CSS preprocessors (SASS, LESS).
- **Single Page Applications (SPAs):**
  - Understanding the concept of SPAs: Advantages and challenges.
  - Introduction to modern JavaScript frameworks: React.js, Angular, and Vue.js.
  - Understanding Components, Props, and State in React.js.
  - Building a simple SPA with React.js.
- **Web APIs and AJAX:**
  - Introduction to Web APIs: Fetching data from external sources.
  - Working with external APIs using JavaScript (e.g., JSONPlaceholder API).
  - Making asynchronous HTTP requests using Fetch API and XMLHttpRequest.
  - Using AJAX for dynamic content updates without reloading the page.

*Unit 4: Back-End Web Development*

- **Introduction to Server-Side Development:**
  - Overview of the back-end and its interaction with the front-end.
  - Understanding HTTP requests and responses, and the role of web servers (Apache, Nginx).
  - Introduction to server-side scripting languages: PHP, Node.js, Python.
- **Node.js and Express.js:**
  - Overview of Node.js: Asynchronous programming and event-driven architecture.
  - Introduction to npm (Node Package Manager) and installing dependencies.
  - Building a basic server with Express.js: Routing and middleware.
  - Handling HTTP requests: GET, POST, PUT, DELETE.
  - Working with RESTful APIs in Node.js.
- **Databases and Back-End Integration:**
  - Introduction to databases: Relational (MySQL, PostgreSQL) vs NoSQL (MongoDB).
  - Introduction to Object-Relational Mapping (ORM) tools: Sequelize for SQL databases.
  - CRUD operations (Create, Read, Update, Delete) in databases.
  - Connecting a Node.js app with MongoDB using Mongoose.

*Unit 5: Full-Stack Development*

- **Full-Stack Web Development:**
  - Understanding Full-Stack development: Combining front-end and back-end technologies.
  - Building a simple Full-Stack application with React.js (front-end) and Node.js/Express (back-end).
  - Communicating between front-end and back-end using AJAX, Fetch API, or Axios.
  - Authentication and Authorization: Introduction to session-based authentication and JWT.
- **Web Application Deployment:**
  - Introduction to cloud platforms: Heroku, AWS, Netlify, etc.
  - Deploying front-end applications (React, Angular, Vue) on Netlify.
  - Deploying full-stack applications on Heroku with Node.js and MongoDB.

- Introduction to Continuous Deployment and Version Control with Git/GitHub.
- **Security Best Practices:**
  - Introduction to common security threats: SQL Injection, XSS (Cross-Site Scripting), CSRF (Cross-Site Request Forgery).
  - Basic security measures: Data validation, password hashing, HTTPS, secure cookie handling.

**Suggested Readings:**

1. **Jon Duckett:** *HTML & CSS: Design and Build Websites*, Wiley.
2. **David Flanagan:** *JavaScript: The Definitive Guide*, O'Reilly Media.
3. **Kyle Simpson:** *You Don't Know JS (book series)*, O'Reilly Media.
4. **Brad Traversy:** *Modern Web Development*, Traversy Media (available on Udemy).
5. **Ben Frain:** *Responsive Web Design with HTML5 and CSS3*, Packt Publishing.

**Course Outcome:**

Upon successful completion of this course, students will be able to:

- Develop and deploy responsive and interactive websites using HTML, CSS, and JavaScript.
- Build dynamic web applications using front-end libraries and frameworks like React.js, Angular, or Vue.js.
- Set up and manage a server-side environment using Node.js, Express.js, and databases (MongoDB, MySQL).
- Understand the principles of Full-Stack web development and integrate front-end and back-end systems.
- Deploy web applications to cloud platforms such as Heroku, Netlify, and AWS.
- Ensure security and best practices in web application development.

**Note:** Latest editions of textbooks shall be used.

## DATA ANALYTICS

**Sub. Code:** BS344B

**L – 4, C – 4**

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### Objective:

The objective of the course is to provide students with a comprehensive understanding of data analytics concepts and methodologies. The course focuses on equipping students with the tools and techniques required to analyze, interpret, and present data effectively, enabling them to make data-driven decisions. Topics include statistical analysis, data visualization, data cleaning, predictive modeling, and machine learning.

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### CONTENTS:

#### *Unit 1: Introduction to Data Analytics*

- **Introduction to Data Analytics:**
    - What is data analytics? Importance and applications in business, economics, and various sectors.
    - Types of data: Qualitative vs Quantitative, Structured vs Unstructured.
    - The data analytics workflow: Data collection, cleaning, analysis, interpretation, and presentation.
    - Tools and software used in data analytics: Excel, Python, R, and Tableau.
    - Overview of descriptive, diagnostic, predictive, and prescriptive analytics.
  - **Data Collection & Data Types:**
    - Types of data sources: Primary and Secondary data.
    - Methods of data collection: Surveys, Experiments, Observations, Data mining.
    - Understanding data types: Nominal, Ordinal, Interval, and Ratio scales.
    - Data storage and retrieval: Relational databases, data lakes, and cloud-based storage.
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#### *Unit 2: Data Cleaning and Preprocessing*

- **Data Cleaning:**
  - Importance of data quality: Missing data, duplicates, outliers.
  - Techniques for data cleaning: Handling missing values (imputation, deletion), removing duplicates, handling outliers.
  - Data transformation: Normalization, standardization, encoding categorical variables.
  - Dealing with errors and inconsistencies in data.
- **Exploratory Data Analysis (EDA):**
  - Descriptive statistics: Mean, median, mode, variance, standard deviation.
  - Data visualization techniques: Histograms, Box plots, Pie charts, and Bar graphs.
  - Identifying patterns and trends in data using graphical methods.
  - Introduction to Python libraries for EDA: Pandas, NumPy, Matplotlib, Seaborn.

*Unit 3: Statistical Analysis for Data Analytics*

- **Probability and Distributions:**
  - Basic concepts in probability: Events, outcomes, conditional probability.
  - Probability distributions: Normal distribution, Binomial distribution, Poisson distribution.
  - Central Limit Theorem and its importance in data analysis.
  - Descriptive statistics vs inferential statistics.
- **Hypothesis Testing and Statistical Inference:**
  - Formulation of hypotheses: Null and alternative hypotheses.
  - Types of tests: t-test, z-test, Chi-square test.
  - P-value, significance level, and confidence intervals.
  - Introduction to regression analysis: Linear regression and multiple regression.
  - Correlation vs causation.

*Unit 4: Predictive Analytics and Machine Learning*

- **Introduction to Predictive Analytics:**
  - What is predictive analytics? Applications in forecasting and trend analysis.
  - Types of predictive models: Regression, classification, time series forecasting.
  - Overview of machine learning: Supervised vs unsupervised learning.
  - Basic machine learning algorithms: Linear regression, decision trees, k-Nearest Neighbors (k-NN).
- **Supervised Learning:**
  - Classification models: Logistic regression, Support Vector Machines (SVM), k-NN, Decision Trees, Random Forest.
  - Model evaluation metrics: Accuracy, precision, recall, F1-score, ROC curve, and AUC.
  - Overfitting and underfitting: Bias-variance tradeoff.
- **Unsupervised Learning:**
  - Clustering algorithms: K-means, hierarchical clustering, DBSCAN.
  - Dimensionality reduction techniques: Principal Component Analysis (PCA), t-SNE.
  - Applications of unsupervised learning: Customer segmentation, anomaly detection.

*Unit 5: Data Visualization and Interpretation*

- **Data Visualization:**
  - Importance of effective data visualization in decision-making.
  - Visualization principles: Choosing the right chart type, color schemes, and layout.
  - Advanced data visualization techniques: Heatmaps, scatter plots, 3D plots.
  - Using Tableau and Power BI for creating interactive dashboards and reports.
- **Interpretation and Communication of Results:**
  - Translating data analysis into actionable insights.
  - Communicating findings to non-technical audiences.
  - Writing data reports and giving presentations.
  - Storytelling with data: Creating compelling narratives using data insights.



Suggested Readings:

1. **R. N. Choudhury & R. B. Agarwal:** *Data Analytics: Concepts, Tools, and Applications*, PHI Learning.
2. **Jeffrey D. Camm, James J. Cochran, et al.:** *Data Science for Business*, O'Reilly Media.
3. **Nina Zumel, John Mount:** *Practical Data Science with R*, Manning Publications.
4. **Harvard Business Review:** *Competing on Analytics: The New Science of Winning*, Harvard Business Press.
5. **Cathy O'Neil & Rachel Schutt:** *Doing Data Science: Straight Talk from the Frontline*, O'Reilly Media.

Course Outcome:

Upon successful completion of this course, students will be able to:

- Understand and apply key concepts in data analytics, including statistical analysis, data cleaning, and visualization.
- Use tools such as Python, R, Excel, and Tableau to analyze and interpret data.
- Implement predictive models using machine learning algorithms and evaluate their performance.
- Present data-driven insights in an accessible and compelling manner to support decision-making in business or other domains.
- Solve real-world problems using data analysis techniques and effectively communicate findings.

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**Note:** Latest editions of textbooks shall be used.

## ENTREPRENEURSHIP

**Sub. Code: BS345**

**L – 5, C – 5.**

**Objective:** The purpose of the paper is to orient the learner toward entrepreneurship as a career option and creative thinking and behavior.

**Contents:**

### **Unit 1: Introduction**

Meaning, elements, determinants and importance of entrepreneurship and creative behavior; Entrepreneurship and creative response to the society's problems and at work; Dimensions of entrepreneurship: intrapreneurship, technopreneurship, cultural entrepreneurship, international entrepreneurship, netpreneurship, ecopreneurship, and social entrepreneurship

### **Unit 2: Entrepreneurship and Micro, Small and Medium Enterprises**

Concept of business groups and role of business houses and family business in India; The contemporary role models in Indian business: their values, business philosophy and behavioral orientations; Conflict in family business and its resolution

**Unit 3:** Public and private system of stimulation, support and sustainability of entrepreneurship. Requirement, availability and access to finance, marketing assistance, technology, and industrial accommodation, Role of industries/entrepreneur's associations and self-help groups, The concept, role and functions of business incubators, angel investors, venture capital and private equity fund.

### **Unit 4: Sources of business ideas and tests of feasibility.**

Significance of writing the business plan/ project proposal; Contents of business plan/ project proposal; Designing business processes, location, layout, operation, planning & control; preparation of project report (various aspects of the project report such as size of investment, nature of product, market potential may be covered); Project submission/ presentation and appraisal thereof by external agencies, such as financial/non-financial institutions

### **Unit 5: Mobilizing Resources**

Mobilizing resources for start-up. Accommodation and utilities; Preliminary contracts with the vendors, suppliers, bankers, principal customers; Contract management: Basic start-up problems

### **Suggested Readings:**

1. Kuratko and Rao, *Entrepreneurship: A South Asian Perspective*, Cengage Learning.
2. Robert Hisrich, Michael Peters, Dean Shepherd, *Entrepreneurship*, McGraw-Hill Education
3. Desai, Vasant. *Dynamics of Entrepreneurial Development and Management*. Mumbai, Himalaya Publishing House.
4. Dollinger, Mare J. *Entrepreneurship: Strategies and Resources*. Illinois, Irwin.
5. Holt, David H. *Entrepreneurship: New Venture Creation*. Prentice-Hall of India, New Delhi.
6. Plsek, Paul E. *Creativity, Innovation and Quality*. (Eastern Economic Edition), New Delhi: Prentice-Hall of India. ISBN-81-203-1690-8.
7. Singh, Nagendra P. *Emerging Trends in Entrepreneurship Development*. New Delhi: ASEED.
8. SSKhanka, *Entrepreneurial Development*, Chand & Co, Delhi.
9. K Ramachandran, *Entrepreneurship Development*, McGraw-Hill Education
10. SIDBI Report on Small Scale Industries Sector.

**Note: Latest edition of text books may be used.**

**BBA Semester – V**

**FUNDAMENTALS OF FINANCIAL MANAGEMENT**

**Sub. Code: BS351**

**L – 4, T-1, C – 5.**

**Course Objective :**

The objective of this course is to provide students with a comprehensive understanding of the key principles and concepts of financial management and their application in business decision-making. The course focuses on how financial planning, budgeting, and financial analysis support the growth and sustainability of an organization

**Unit1: Introduction**

Nature, scope and objective of Financial Management, Time value of money, Risk and return (including Capital Asset Pricing Model), Valuation of securities – Bonds and Equities

**Unit 2: Investment Decisions**

The Capital Budgeting Process, Cash flow Estimation, Payback Period Method, Accounting Rate of Return, Net Present Value (NPV), Net Terminal Value, Internal Rate of Return (IRR), Profitability Index, Capital budgeting under Risk – Certainty Equivalent Approach and Risk-Adjusted Discount Rate.

**Unit 3: Financing Decisions**

Cost of Capital and Financing Decision: Sources of long-term financing Estimation of components of cost of capital. Methods for Calculating cost of equity capital, Cost of Retained Earnings, Cost of Debt and Cost of Preference Capital, Weighted Average cost of capital (WACC) and Marginal cost of capital. Capital structure – Theories of Capital Structure (Net Income, Net Operating Income, MM Hypothesis, Traditional Approach). Operating and financial leverage; Determinants of capital structure

**Unit 4: Dividend Decisions**

Theories for Relevance and irrelevance of dividend decision for corporate valuation; Cash and stock dividends; Dividend policies in practice

**Unit 5: Working Capital Decisions**

Concepts of working capital, the risk-return trade off, sources of short-term finance, working capital estimation, cash management, receivables management, inventory management and payables management.

**Note:**

- 1. There shall be 4 Credit Hrs. for Lectures + one Credit hr for Tutorials (per group)**
- 2. Latest edition of textbooks may be used.**

**Suggested Readings**

1. James C. Van Horne and Wockowitz, *Fundamentals of Financial Management*, Pearson Education
2. Levy H. and M. Sarnat. *Principles of Financial Management*. Pearson Education
3. Brigham and Houston, *Fundamentals of Financial Management*, Cengage Learning
4. Prasanna Chandra, *Fundamentals of Financial Management*. McGraw Hill Education
5. Rustagi, R.P. *Fundamentals of Financial Management*. Taxman Publications Pvt.Ltd.
6. Singh, Surrender and Kaur, Rajeev. *Fundamentals of Financial Management*. Mayur Paperback, New Delhi.
7. Pandey, I.M. *Financial Management*. Vikas Publications.
8. Bhabatosh Banerjee, *Fundamentals of Financial Management*, PHI Learning

**PRODUCTION & OPERATIONS MANAGEMENT**

**Paper Code:BS352**

**L – 5, C – 5.**

**Objectives:**

To develop basic understanding of concepts, theories and techniques of production process and operation management

**Unit I**

Introduction to Operation Management and Forecasting of Demand: Why study OM, Five P's of Production, Types of Transformation: Forecasting, Quantitative & Qualitative Techniques in Forecasting

**Unit II**

Waiting Line & Inventory Management: Economics of Waiting Line, Queuing System, and four Waiting Line Models alongwith application: Inventory management and analysis, Inventory Models.

**Unit III**

Quality Management & Statistical Quality Control: TQM, Quality Specification, Design Quality, Quality at Source, Zero Defects, Cost of Quality, Continuous Improvement, Benchmarking, Poka – Yokes, Quality Awards; Statistical Quality Control: Acceptance Sampling, AQL & LTPD, P—Chart, X & R Chart.

**Unit IV**

Facility Location and Layout: Issue in Facility Location, Plant Location Methods, Factor Rating, Centre of Gravity Methods, Analytic Delphi Method, Four Basic Lay out Formats, Assembly Line Balancing, splitting Tasks, Problems in Facility Layout.

**Suggested Readings**

1. N.J. Aquilano, R.B. Chase & F.R. Jacob: *Operation Management for Competitive Advantage*, Tata Mac Graw –Hill, 9th Edition.
2. R.C. Manocha: *Production & Operation Management* (Latest Edition).
3. S.P. Gupta; *Statistical Method*, Sultan Chand,
4. E.S. Buffa; *Modern Production Management*, John Wiley Ed. 2002.
5. S.N. Charry; *Production and Operation Management*, Tata McGraw-Hill, 2000.
6. Paneerselvam: *Production and Operation Management*, Prentice Hall, 2003.
7. D.D. Sharma; *Total Quality Management*, Sultan Chand & Sons, Ed. 2002.

**CORPORATE ACCOUNTING**

**Paper Code: BS353**

**L – 4, T-1, C – 5**

**Objectives:** To help the students to acquire the conceptual knowledge of the corporate accounting and to learn the techniques of preparing the financial statements.

**Contents**

**Unit 1. Accounting for Share Capital & Debentures**

Issue, forfeiture and reissue of forfeited shares: concept & process of book building; Issue of rights and bonus shares; Buy back of shares; Redemption of preference shares; Issue and Redemption of Debentures

**Unit 2. Final Accounts**

Preparation of profit and loss account and balance sheet of corporate entities, excluding calculation of managerial remuneration, Disposal of company profits

**Unit 3. Valuation of Goodwill and Valuation of Shares**

Concepts and calculation: simple problem only

**Unit 4. Amalgamation of Companies**

Concepts and accounting treatment as per Accounting Standard: 14 (ICAI) (excluding inter-company holdings). Internal reconstruction: concepts and accounting treatment excluding scheme of reconstruction.

**Unit 5. Accounts of Holding Companies/Parent Companies**

Preparation of consolidated balance sheet with one subsidiary company. Relevant provisions of Accounting Standard: 21 (ICAI).

**Unit 6. Banking Companies**

Difference between balance sheet of banking and non-banking company; prudential norms. Asset structure of a commercial bank. Non-performing assets (NPA).

**Unit 7. Cash Flow Statement**

Concepts of funds. Preparation of cash flow statement as per Indian Accounting Standard (Ind-AS): 7.

**Note:**

- 1. The relevant Indian Accounting Standards in line with the IFRS for all the above topics should be covered.**
- 2. Any revision of relevant Indian Accounting Standard would become applicable immediately.**

**Suggested Readings:**

2. J.R. Monga, *Fundamentals of Corporate Accounting*. Mayur Paper Backs, New Delhi.
3. M.C. Shukla, T.S. Grewal, and S.C. Gupta. *Advanced Accounts*. Vol.-II. S. Chand & Co., New Delhi.
4. S.N. Maheshwari, and S. K. Maheshwari. *Corporate Accounting*. Vikas Publishing House, New Delhi.
5. Ashok Sehgal, *Fundamentals of Corporate Accounting*. Taxman Publication, New Delhi.
6. V.K. Goyal and Ruchi Goyal, *Corporate Accounting*. PHI Learning.
7. Jain, S.P. and K.L. Narang. *Corporate Accounting*. Kalyani Publishers, New Delhi.
8. P.C. Tulsian and Bharat Tulsian, *Corporate Accounting*, S. Chand
9. Amitabha Mukherjee, Mohammed Hanif, *Corporate Accounting*, McGraw Hill Education
10. Compendium of Statements and Standards of Accounting. The Institute of Chartered Accountants of India, New Delhi.

**Note: Latest edition of text books may be used.**

**BBA Semester – VI  
BUSINESS POLICY & STRATEGY**

**Paper Code :BS361**

**L – 5, C – 5**

**Objectives:**

The course aims to acquaint the students with the nature, scope and dimensions of Business Policy and Strategy Management Process.

**Unit I**

Introduction: Nature, scope and importance of the course on Business Policy; Evolution of this course – Forecasting, Long-range planning, strategic planning and strategic management. Strategic Management Process: Formulation Phase – vision, mission, environmental scanning, objectives and strategy; implementation phase – Strategic Activities, Evaluation and Control.

**Unit II**

Environmental Analysis: Need, Characteristics and categorization of environmental factors; approaches to the environmental scanning process – structural analysis of competitive environment; ETOP a diagnosis tool.

**Unit III**

Analysis of Internal Resources: Strengths and Weakness; Resource Audit; Strategic Advantage Analysis; Value-Chain Approach to Internal Analysis; Methods of analysis and diagnosing Corporate Capabilities – Functional Area Profile and Resource Deployment Matrix, Strategic Advantage Profile; SWOT analysis.

**Unit IV**

Formulation of Strategy: Approaches to Strategy formation; major strategy options – Stability, Growth and Expansion, Diversification, Retrenchment, Mixed Strategy; Choice of Strategy – BCG Model; Stop-Light Strategy Model; Directional Policy Matrix (DPM) Model, Product/Market Evolution – Matrix and Profit Impact of Market Strategy (PIMS) Model; Major Issues involved in the Implementation of strategy: Organization structure; leadership and resource allocation.

**Suggested Readings:**

1. Ghosh, P. K.; *Strategic Planning and Management*, Sultan Chand & Sons, New Delhi, 8th ed., 2000.
2. Kazmi, Azhar; *Business Policy*, Tata McGraw-Hill, New Delhi, 2000.
3. Suri R.K.; *Business Policy & Strategic Management*, Brijwasi Publisher & Distributor, 2005
4. Thompson, Arthur A. and A. J. Strickland; *Strategic Management*, McGraw Hill, New York, 1999.
5. Ansoff, H.Igor, "Corporate Strategy", Penguin.
6. McCarthy, Minichiello & Curran; *Business Policy and Strategy: Concepts and Readings*, Richard D. Irwin and AITBS, Delhi, 4th ed., 1996.
7. Jauch and Glueck; *Business Policy and Strategic Management*, McGraw-Hill.

**BBA: Semester – VI**

**GOODS AND SERVICES TAX AND CUSTOMS**

**Sub. Code: BS362**

**L – 4, T-1, C – 5**

**Objective:** To provide basic knowledge and equip students with application of principles and provisions of the Goods and Services Tax and Customs.

**Unit I: Introduction :** Constitutional framework of Indirect Taxes before GST (Taxation Powers of Union & State Government); concept of indirect tax, differentiation between direct tax and indirect tax, Major Defects in the structure of Indirect Taxes prior to GST; Meaning of GST Rationale for GST; Structure of GST ( SGST, CGST, UTGST & IGST); GST Council, GST Network

**Unit II: levy and collection of tax:** Taxable event-“Supply” of Goods and Services; Place of Supply: Within state, Interstate, Import and Export; Time of supply; Valuation for GST- Valuation rule; Exemption from GST; Classification of Goods and Services.

**Unit III: Input Tax Credit :** Eligible and Ineligible Input Tax Credit; Tax Credit in respect of Capital Goods; Recovery of Excess Tax Credit; Availability of Tax Credit in special circumstances; Transfer of Input Credit (Input Service Distribution); Payment of Taxes;

**Unit IV: Registration, assessment, refund, offences and penalty:** Provision for registration of existing manufacturer and new manufacturer to GST, assessment, provision for offences and penalties, appeal and revisions.

**Unit V: Customs law:** Basic concepts of customs law, role of customs in international trade, important term and definition under customs act 1962-: Assessable Value, Baggage, Bill of entry, Bill of lading, export manifest, types of customs duties; Baggage rules and exemptions.

**Note: In case of any subsequent notifications/amendments regarding GST or customs law by the government, the syllabus would be updated accordingly.**

**Suggested Readings:**

1. The Central Goods and Services Tax, 2017
2. The Integrated Goods and Services Tax, 2017
3. The Union Territory Goods and Services Tax, 2017
4. The Goods and Services Tax (Compensation to States), 2017
5. The Constitution (One hundred and First Amendment) Act,
6. Nitya Tax Associates; Basic of GST: Taxman's
7. B. Vishwanathan: Basic of Good & services tax in India, New Century publication, ed.2016



## **SPECIALISATION ELECTIVE COURSE**

### **Specialization 1:- Human Resource Management**

#### **BS3H1: Industrial Relations & Labour Laws**

**L – 5, C – 5.**

**Objective:** To enable the student to learn the concepts of industrial relations including trade unions, collective bargaining, discipline and various labour enactments.

#### **Contents:**

##### **Unit 1: Industrial Relations**

Concept of Industrial Relations; Nature of Industrial Relations; Objectives of IR; Factors affecting IR in changing Environment, Evolution of IR in India; Role of State; Trade Union; Employers' Organization; Human Resource Management and IR Role of ILO in Industrial Relations, International Dimensions of IR

##### **Unit 2: Trade Union**

Trade Union: Origin and growth, unions after Independence, unions in the era of liberalization; Factors Affecting Growth of Trade Unions in India, Multiplicity & Recognition of Trade Unions; Major Provisions of Trade Union Act 1926

##### **Unit 3: Collective Bargaining and Workers' Participation in Management**

a) Collective Bargaining: Meaning, Nature, Types, Process and Importance of Collective Bargaining, pre-requisites, issues involved; Status of Collective Bargaining in India, Functions and role of Trade Unions in collective bargaining

b) Workers' Participation in Management: Consent, practices in India, Works Committees, Joint management councils; Participative Management and co-ownership; Productive Bargaining and Gain Sharing

##### **Unit 4: Discipline and Grievance Redressal**

Discipline: Causes of indiscipline, Maintenance of discipline and misconduct; Highlights of domestic enquiries; Principle of Natural Justice; Labor turnover; Absenteeism; Grievance: Meaning of Grievance, Grievance redressal machinery in India, Grievance handling procedure; salient features of Industrial Employment (Standing orders) Act 1946

##### **Unit 5:**

a) **The Industrial Disputes Act, 1947:** Definitions of Industry, workman, and Industrial Dispute; Authorities under the Act: Procedure, Powers and Duties of Authorities; Strikes and Lock outs: Lay-off and Retrenchment: Provisions relating to Layoff, Retrenchment, and closure

b) **The Factories Act, 1948:** Provisions relating to Health, Safety, Welfare facilities, working hours, Employment of young persons, Annual Leave with wages

##### **Suggested Readings:**

1. PK Padhi, *Industrial Relations and Labour Law*, PHI Learning
2. Arun Monappa, *Industrial Relations and Labour Law*, McGraw Hill Education
3. SCSrivastav, *Industrial Relations and Labour Law*, Vikas Publishing House
4. C.S Venkata Ratnam, *Industrial Relations*, Oxford University Press
5. P.L. Malik's *Handbook of Labour and Industrial Law*, Vol 1 and 2, Eastern Book Company
6. R.C. Sharma, *Labour Law*



## SPECIALISATION ELECTIVE COURSE

### Specialization 1:- Human Resource Management

#### BS3H2: Human Resource Planning

L – 5, C – 5.

#### Objective:

The objective of this paper is to develop a conceptual as well as a practical understanding of Human Resource Planning, Development and Development in Organizations.

#### Unit - I: Human Resource Planning

Human Resource Planning Process, Tools and Methods of Analysis; Employee integration with the Organization (Induction, Socialization Process, Placement)

#### Unit - II: Human Resource Development

Concepts, Objectives, Role and Significance; Structure of HRD System; Role of Training in HRD; Career Planning, Succession Planning; Skills and Multi-Skill Development.

#### Unit - III: Measurement Tools in Human Resource Planning

Human Resource Information System; Human Resource Audit; Human Resource Accounting – Concepts and Methods

#### Unit - IV: HRD- Strategies, Experiences and Emerging Issues

HR Strategy; Human Resource Retention Strategies; Task Analysis; Counselling and Monitoring; HRD Practices in Indian Corporate Sector. Quality of Work Life and Role Efficiency; Developing Self-Renewal – OD and Research.

#### Unit – V

**Case Studies:** The List of the Case studies shall be provided in the class.

Note: A single case relating to the issues detailed under one or more of the first four units shall be given as Unit V. As far as possible the theoretical questions and the case should not relate to the same issues / topics.

#### Suggested Readings:

1. Pareek & Rao: *Designing & Managing Human Resource System*, IBH, New Delhi
2. Bhattacharya: *Human Resource Planning*, Excel Books, New Delhi.
3. Beardwell & Holden: *Human Resource Management*, McMillan India Ltd.
4. Arthur, M. *Career Theory Handbook*, Englewood Cliff, Prentice Hall Inc.
5. Belkaoui, A. R. and Belkaoui, J. M.: *Human Resource Valuation: A Guide to Strategic and Techniques*, Greenwood, Quorum Books

**SPECIALISATION ELECTIVE COURSE**

**Specialization 1:- Human Resource Management**

**BS3H4: Training & Development of Human Resources**

**L – 5, C – 5.**

**Objective:**

The purpose of this paper is to provide an in-depth understanding of the role of Training in the HRD, and to enable the course participants to manage the Training systems and processes.

**Unit -I:**

Nature and Importance of Training in Organization Development and Individual Development. Learning through Training; Knowledge and Skill Development Organizational Set-up and Responsibility for Training.

**Unit -II:**

Making Training Effective, Designing, Budgeting and Organizing for Training Programme. Instructional Objectives and Lesson Planning, Learning Process.

**Unit -III:**

Developing Training Climate, and Pedagogy; Developing Training Modules; Trainer and Training Styles; Evaluation and Follow-up of Training Programme; Facilities Planning and Training Aids; Training Communication; Training and Development in India

**Unit - IV:**

Comprehensive Case Study equivalent to Two Units.

**Note:** A compulsory comprehensive case (running into not more than 3 to 4 printed pages) relating to the issues detailed under one or more of the first three units shall be given as Unit IV. As far as possible the theoretical questions and the case should not relate to the same issues / topics. The case study will be equivalent to two unit's value

**Suggested Readings:**

1. Beunet, Roger ed.: *Improving Training Effectiveness*, Aldershot, Gower.
2. Buckley R & Cople, Jim: *The Theory & Practice of Training*, London, Kogan & Page
3. Lynton, R Pareek, U.: *Training for Development*, 2<sup>nd</sup>ed. New Delhi, Vistaar
4. Pepper, Allan D.: *Managing the Training and Development Function*, Aldershot, Gower
5. Rae, L.: *How to Measure Training Effectiveness*, Aldershot, Gower
6. Reid, M. A. etc.: *Training Interventions: Managing Employee Development* 3<sup>rd</sup>ed. London, IPM
7. Senge, P.: *The Fifth Discipline: The Art and Practice of the Learning Organization*, London, and century

**SPECIALISATION ELECTIVE COURSE**

**Specialization 1:- Human Resource Management**

**BS3H5: Compensation ManagementL – 5, C – 5.**

**Objective:** To familiarize students about concepts of performance and compensation management and how to use them to face the challenges of attracting, retaining and motivating employees to high performance.

**Unit I**

Introduction- Concept, Philosophy, History from performance appraisal to performance development. Contemporary PMS.

**Unit II**

4 dimensions of PMS, Performance Planning, Feedback and coaching, performance appraisal outcome and reward. Performance Planning, Goal Sheet, Goal Alignment, Coaching and mentoring processes. Alignment with organizational goals. Performance Counselling-Planning for new cycle, Strategic PMS, International Aspects of PMS.

**Unit III**

Incentives for production employees, Modern trends in compensation-from wage and salary to cost to company concept, compensation surveys, managers & executives. Incentives for other professionals: Developing effective incentive plans. Supplementary pay benefits, insurance benefits, retirement benefits, employee services benefits & Incentive practices in industry.

**Unit IV**

Wages in India: Minimum wage, fair wage and living wage. Methods of state regulation of wages. wage differentials & national wage policy Regulating payment of wages, wage boards, Pay commissions, dearness allowances, linking wages with productivity,.

**Readings:**

1. Milkovich& Newman , *Compensation*, 9th Edition
2. T.J.Bergman , *Compensation Decision Making*, 4th Ed
3. National commission on labour, report, Labour Law Reviews Govt. of India.
4. Harvard Business review on compensation :
5. Rober E. Sibson, *Compensation*, 5th Ed
6. Richard Henderson, *Compensation management in a knowledge*, 7th Ed, based world.
7. T.N.Chhabra&SavithaRastogi *Compensation management*, 2007
8. Gary Dessler , *Human Resource Management*(2007)

## **SPECIALISATION ELECTIVE COURSE**

### **Specialization 2:- Marketing**

#### **BS3M1: Advertising & Consumer BehaviourL – 5, C – 5.**

#### **Objective:**

Designed for students planning to make a career in the field of Marketing. The course objective is to familiarize them with the world of media and advertising which has gradually emerged as an industry with reference to India. Effort has also been made to provide them with practical exposure to the field through illustrations, case studies, and exercises in various aspects of the craft of advertising and media planning.

#### **Unit - I: Introduction:**

Promotion mix and a comparative analysis of promotional tools. Career options in media and advertising. Functions of an Ad. Agency. The 5 M framework for advertising management. Designing a promotional/advertising campaign.

#### **Unit - II: Advertising Objectives:**

Objectives of advertising. DAGMAR approach. Functions, advantages and limitations of advertising. Effects of advertising. Social, Ethical and Legal Issues in Advertising.

#### **Unit -III: Consumer Behavior**

Nature, Importance; Types of Consumers, Basic Determinants of Consumer Behavior, Consumer Decision Making Process, Motivation, Motivation Research.

#### **Unit -IV: Cultural, Social and Economic Factors Affecting Consumer Behavior**

Consumer Attitude Formation and Change, Group Influence, Buying Roles, Status and Family Influences, Consumer Behavior and Marketing Communication.

#### **Unit – V**

**Case Studies:** The List of the Case studies shall be provided in the class

#### **Suggested Readings:-**

1. C. Glenn Walters: *Consumer Behavior*, Richard D. Irvin Inc., Homewood, Illinois
2. Douglas W. Mellott Jr.: *Fundamentals of Consumer Behavior*, McMillan Publishing Co., New York.
3. Chunawala, S. A.: *Foundation of Advertising – Theory and Practice*, HPH
4. Aaker, David A., Batra, Rajiv, Myers, John G.: *Advertising Management*, New Age International Publishers
5. Mathur, U. C.: *Advertising Management*, New Age International Publishers
6. George E Belch, Michael A Belch, KeyoorPurani, *Advertising and Promotion : An IntegratedMarketingCommunicationsPerspective(SIE)*, McGrawHillEducation
7. Burnett, Wells, andMoriatty.*Advertising:PrinciplesandPractice*.5thed.PrenticeHalof India, NewDelhi.

## **SPECIALISATION ELECTIVE COURSE**

### **Specialization 2:- Marketing**

#### **BS3M2: Sales & DistributionL – 5, C – 5.**

#### **Objective:**

The course will focus on manufacturer's perspective on sales and distribution and understanding of their management.

#### **Unit I**

The Selling Process: Preapproach – acquiring product knowledge, acquiring competition and market knowledge, Identifying and qualifying prospects – sources of prospecting, conditions for qualification, Opening a sale – methods of approaching, Sales presentation – presentation strategies and methods, Sales demonstration – planning effective demonstration, use of sales tools, Handling objection – types of objections, determining hidden objections, strategies for handling objections, Closing a sale – trial close, closing techniques, Post sales follow up.

#### **Unit II:**

Introduction to sales force management: Objectives of Sales management, Role of a sales manager; Managing Sales force – Recruitment, Selection, Training, Compensation and evaluation of sales force; Sales Territory Coverage: Sales Territory Concept, Reasons for establishing sales territories, procedures for selling up sales territories

#### **Unit - III:**

Distribution Management – Meaning, Nature, Objectives and Constraints, Channel Design, Channel Levels, Managing Channel members, Channel Conflict and Management.

#### **Unit –IV:**

- (a). Market Logistics – Objectives, Logistics Decision, Nature and Scope of Sales Management.
- (b). Personal Selling, Sales Organization, Warehousing.

#### **Unit – V**

**Case Studies:** The List of the Case studies shall be provided in the class.

#### **Suggested Readings:-**

1. Still, Cundiff&Govani – *Sales Management*, 5th Edition. Prentice Hall of India
2. Charles Futrell – *Fundamentals of Selling*.
3. Ingram, Avila, Schwepker – *Sales Management*.
4. Hair, Anderson & Mehta – *Sales Management*.
5. Anderson – *Professional Sales Management*.
6. *Professional Selling A trust based approach*, Ingram, Laforge, Avita: Harcourt College Publications.
7. *Smart Selling*, Christopher Power.
8. *What makes a good salesman*, David Mayer and H M Greenberg
9. *Management of Sales force*, Stanton, Bursnick and Spiro.

## **SPECIALISATION ELECTIVE COURSE**

### **Specialization 2:- Marketing**

#### **BS3M3: Retail Management**

**L – 5, C – 5.**

#### **Objective:**

The primary objective of the course is to have students develop marketing competencies in retailing and retail consulting. The course is designed to prepare students for positions in the retail sector or positions in the retail divisions of consulting companies. Besides learning more about retailing and retail consulting, the course is designed to foster the development of the student's critical and creative thinking skills.

#### **Unit I:**

Introduction to retailing Definition, Characteristics, Evolution of Retailing in India, Retailing in India, Emerging Trends in Retailing, Factors Behind the change of Indian Retail Industry. Retail Formats Retail Sales by ownership, On the basis of Merchandise offered, non-store Based retail mix & Non-traditional selling.

#### **Unit II:**

Store Planning, Design & Layout;

Store Planning: Location Planning and its importance, Store design and the retailing image mix, Effective Retail Space Management, Floor Space Management.

#### **Unit III:**

Retail Marketing Advertising & Sales Promotion, Retail Mktg. Strategies, Store Positioning, Retail Marketing. Mix, CRM, Advertising in Retailing, Types of Retail Sales Promotion.

#### **Unit IV:**

Retail Merchandising Buying function, Mark-ups& Markdown in merchandise management, shrinkage in Retail merchandise management. Merchandise Pricing Concept of Merchandise Pricing, Pricing Options, Pricing Strategies, Pricing Objectives, Types of Pricing.

#### **Suggested Readings:-**

1. Cullen & Newman – *Retailing – Environment & Operations*.
2. Berman & Evarv – *Retail Management*.
3. Bajaj, Tuli & Srivastava, *Retail Management*- Oxford University Publications
4. Ogden & Ogden *Integrated Retail Management*, Biztantra Publications
5. Gibson G Vedamani, *Retail Management: Functional principles & practices*, Jaico Publishing House

**SPECIALISATION ELECTIVE COURSE**

**Specialization 2:- Marketing**

**BS3M4: Services Marketing**

**L – 5, C – 5.**

**Objective**

The subject aims to provide the basic insights into the marketing of services and develops the understanding of various types of services and current scenario of service sector in India.

**Unit I:**

Meaning and nature of services marketing, goods and services - a comparative study, significance, marketing mix for services, Classification of services.

**Unit II:**

MIS in Service Marketing, Market Segmentation and positioning, Behaviour of consumer, Service Management.

**Unit III:**

Marketing of Services in India: bank, insurance, tourism, hospital and consultancy.

**Unit IV:**

Promotion mix strategy for services, Relationship marketing, Services under WTO.

**SUGGESTED READINGS:**

1. Helen Woodruffe, *Services Marketing*.
2. Zieeithaml Valarie, Parasuraman A. and Leonard L. Berry, *Delivering Quality Services*.
3. Shetty Y.K. and J.E. Ross, *Quality and its Management in Services*.
4. Lovelock Christopher H., *Service Marketing*.

## SPECIALISATION ELECTIVE COURSE

### Specialization 3:-Finance

#### BS3F1: Financial Markets, Institutions & Services

L – 5, C – 5.

**Objective:** To provide the student a basic knowledge of financial markets and institutions and to familiarize them with major financial services in India.

#### Contents

##### Unit1: Introduction

**Financial System and its Components** – financial markets and institutions; financial intermediation; Flow of funds matrix; financial system and economic development; an overview of Indian financial system

##### Unit 2: Financial Markets

Money market – functions, organization and instruments. Role of central bank in money market; Indian money market – An overview

Capital Markets – functions, organization and instruments. Indian debt market; Indian equity market – primary and secondary markets; Role of stock exchanges in India

##### Unit 3: Financial Institutions

Commercial banking – introduction, its role in project finance and working capital finance; Development Financial institutions (DFIs) – An overview and role in Indian economy; Life and non-life insurance companies in India; Mutual Funds – Introduction and their role in capital market development. Non-banking financial companies (NBFCs).

##### Unit 4: Financial Services

Overview of financial services industry: Merchant banking – pre and post issue management, underwriting. Regulatory framework relating to merchant banking in India

##### Unit 5: Leasing and hire-purchase

Consumer and housing finance; Venture capital finance; Factoring services, bank guarantees and letter of credit; Credit rating; Financial counseling.

#### Suggested Readings:

1. L M Bhole, and Jitendra Mahakud. *Financial Institution and Markets*, McGraw-Hill Education
2. Khan, M.Y. *Indian Financial System*, McGraw-Hill Education.
3. Dhanekar. *Pricing of Securities*. New Delhi: Bharat Publishing House.
4. Prasanna, Chandra. *Financial Management: Theory and Practice*. McGraw-Hill Education.
5. Clifford Gomez, *Financial Markets, Institutions and Financial Services*, PHI Learning
6. MY Khan and PK Jain. *Financial Services*. McGraw Hill Education.
7. Singh, J.K. *Venture Capital Financing in India*. Dhanpat Rai and Company, New Delhi.
8. Annual Reports of Major Financial Institutions in India.

**Note: Latest edition of text books may be used**



## SPECIALISATION ELECTIVE COURSE

### Specialization 3:-Finance

#### BS3F2: Security Analysis & Portfolio Management

L – 4, T- 1, C – 5.

#### Objective:

The objective of this course is to impart knowledge to students regarding the theory and practice of Security Analysis and to give the students an in-depth knowledge of the theory and practice of Portfolio Management.

#### Unit - I:

**Fundamental Analysis** - Economic analysis, Industry Analysis and Company analysis; **Technical Analysis** - Price and volume indicators, indices and moving averages; Interpretation of trends and indices.

#### Unit - II:

**Efficient Market Hypothesis** – Weak, Semi-strong and Strong Markets; Testing of different forms of Market efficiency and their significance; **Valuation of Fixed Income Securities** – Bonds, Debentures, Preference Shares and Convertible Securities; **Valuation of Variable Income Securities** – Equity Shares.

#### Unit - III:

**Portfolio Management** – Meaning, Importance, Objective and Various Issues in Portfolio Construction, Revision of Portfolio and Evaluation; **Portfolio Analysis** - Estimating rate of return and standard deviation of portfolio return; Effects of combining securities; Markowitz risk – return optimization.

#### Unit - IV:

**Single Index Model** – Portfolio total risk, Portfolio market risk and unique risk; Sharpe's optimization solution; **Capital Market Theory** – Capital market line, Security market line; Risk free lending and borrowing.

#### Unit - V:

**Portfolio Construction** - Techniques of Portfolio Construction, Feasible Portfolio, Efficient Frontier; **Portfolio Performance Evaluation** – Measure of return, Risk adjusted measures of performance evaluation, Market timing, Evaluation criteria and procedures

#### Suggested Readings:

1. Fischer, Donald E. and Jordan, Ronald J.: *Security Analysis and Portfolio Management*, PHI, New Delhi
2. Bhall, V. K.: *Investment Management – Security Analysis and Portfolio Management*, S. Chand, New Delhi
3. Alexander, Gordon J. and Sharpe, William F.: *Fundamentals of Investments*: Englewood Cliffs, Prentice Hall Inc., And New Jersey
4. Elton, Edwin J and Gruber, Martin J.: *Modern Portfolio Theory and Investment Analysis*, John Wiley, New York.
5. Amling, Frederic: *Investment*, Englewood Cliffs, Prentice Hall, New Jersey

## **SPECIALISATION ELECTIVE COURSE**

### **Specialization 3:-Finance**

#### **BS3F3: Insurance & Risk Management**

**L – 5, C – 5.**

#### **Objective:-**

It will help the students to learn the basics and fundamentals of insurance principles and practices being practiced in the insurance industry. The knowledge in this field of insurance may help the students to adopt this as a career.

#### **Unit I**

Introduction: History of insurance in general and in India in particular. Basic nature of insurance. Definition of insurance. Comparison of Life Insurance with other forms of insurance. Principles of contract and its applicability to the valid insurance contract.

#### **Unit II**

Principles of Life insurance and its impact on insurability. Morality tables and its kind. Basic elements in computation of premium. Peculiarities of life insurance product and the classification Nature of group insurance and types of group Insurance covers Policy claims and its procedures for settlement of various type of claims. Policy document and its various components including conditions and privileges under the policy.

#### **Unit III**

Study of various proposal and policy forms used in general Insurance Scope of coverage of fire insurance and Marine insurance, Motor insurance Various kinds of miscellaneous insurances Describe classes of insurances requiring specialized knowledge i.e. industrial all risk insurance, aviation insurance, oil and gas insurance Regulatory provisions under Insurance Act 1938, and IRDA Act 1999. Underwriting practice and procedures, types and classification of hazards

#### **Unit IV**

Basic concept of risk, classification of risks, and process of risk management. Identification and evaluation of risk – risk analysis. Risk control – loss prevention and its importance. Risk financing and transfer of risks, Risk retention and its importance/basis of reinsurance

#### **Suggested Readings:**

1. Books published by Insurance Institute of India.
2. “Life Insurance”, - By Kenneth Black (Jr.) and Harold Skipper (Jr.)
3. “*Fundamentals of Risk and Insurance*”, by Emmett J. Vaughan, Therase Vaughan
4. “*Principles of Risk management and Insurance*”, by George E. Rejda

**SPECIALISATION ELECTIVE COURSE**

**Specialization 3:-Finance**

**BS3F4: Banking Principles & Operations**

**L – 5, C – 5.**

**Unit I:**

Indian financial System, Banking System in India, Financial sector reforms in India, RBI – role, functions, monetary policy and credit control, commercial banking in India, Regulatory Environment for commercial bank in Indian core banking.

**Unit II:**

Operational Aspect of commercial banks in India, Relationship between Banker and customers, Types of customer a/c, Cheques, Endorsement, Presentment, Dishonour, Rights and liabilities of Paying and collecting Banker, Time Value of money – calculation of interest on loan & deposits, EMIs, Present Value, future value and loan Amortization.

**Unit III:**

Negotiable Instruments, Bills of Exchange and Promissory notes, Rights and liabilities of parties, Bills discounting and purchasing, ancillary Services of the Bankers.

**Unit IV:**

Employment of funds by Commercial Banks Financial statement analysis, Types of securities, mode of creating charge, Bank guarantees, Asset – liability management in commercial Banks. Basel norms.

**SUGGESTED READINGS**

- 1. K.C. Shekhar and LekshmyShekhar, Banking Theory and Practice (2018), 21<sup>st</sup> edition**
2. JaiswalBimal:*Banking Operations Management*
3. JhinghanM.L.*Banking Theory & Practice*
4. Chabra, T. N., *Elements of Banking Law*, DhanpatRai and Sons
5. Saxena, G. S; *Legal Aspects of Banking Operations*, Sultan Chand and Sons
- 6.Suneja, H R.,*Practical and Law of Banking*, Himalaya Publishing House

# **School of Naturopathy (KSVMCN&YS)**



# Shobhit University, Gangoh

(Established by UP Shobhit University Act No. 3, 2012)

## School Of Naturopathy

### Ordinances, Regulations & Syllabus

For

**Bachelor of Naturopathy & Yogic Sciences (BNYS) 5 ½  
Year Programme Annual Pattern  
(w.e.f. session 2016-17)**

**Revised and adopted (Approved by CCRYN) in the year 2022  
(07<sup>th</sup> Board of Studies)**

## **Programme Educational Objectives (PEOs)**

**PEO1 Knowledge of Naturopathy:** Graduates should have a solid foundation in naturopathic principles, philosophy, and practices. They should possess in-depth knowledge of various natural therapies, such as nutrition, herbal medicine, hydrotherapy, acupuncture, and lifestyle counselling.

**PEO2 Understanding of Human Anatomy and Physiology:** Students should acquire a thorough understanding of human anatomy and physiology, including the structure and functions of different body systems. This knowledge is essential for diagnosing and treating health conditions using naturopathic methods.

**PEO3 Diagnostic Skills:** Graduates should be proficient in assessing patients' health conditions through various diagnostic techniques, including physical examination, laboratory tests, and assessment of health history. They should be able to identify the root causes of illnesses and design personalized treatment plans accordingly.

**PEO4 Therapeutic Skills:** Students should develop practical skills in implementing naturopathic therapies and modalities. These may include prescribing herbal remedies, designing nutritional plans, administering physical therapies, providing lifestyle counselling, and conducting yoga and meditation sessions.

**PEO5 Holistic Approach:** Graduates should understand the importance of treating patients holistically, considering their physical, mental, emotional, and spiritual well-being. They should be able to address health concerns by integrating naturopathy, yoga, and other complementary healing approaches.

**PEO6 Patient Management:** Students should learn effective patient management skills, including effective communication, patient education, and building a strong therapeutic relationship. They should be able to educate patients about their health conditions and motivate them to adopt healthy lifestyle practices.

**PEO7 Ethical and Professional Standards:** Graduates should adhere to high ethical and professional standards in their practice. They should understand the legal and regulatory frameworks governing naturopathic medicine and maintain confidentiality, integrity, and professionalism in their interactions with patients and colleagues.

## **Programme Specific Objectives (PSO's)**

**PSO1** Understanding of naturopathic principles and therapeutic modalities.

**PSO2** Knowledge of yogic sciences and their benefits.

**PSO3.** Proficiency in diagnostic skills, including conventional and naturopathic methods.

**PSO4** Familiarity with various naturopathic treatment modalities.

**PSO5** Ability to design individualized treatment plans and provide natural and modern therapies.

**PSO6** Enrich communication, ethical values team work, professional and leadership skill sets of students.

**PSO7** Focus on health promotion and disease prevention.

## **Programme Outcome (PO's)**

**PO1** Providing knowledge of basic principles of naturopathy through interactive classes.

**PO2** Making the students understand the disease through the perspective of naturopathy and yoga through clinical exposure.

**PO3** Demonstrating the students how to take case study for proper diagnosis of diseases.

**PO4** Working on the personal development and communication skills.

**PO5** Providing proper knowledge of anatomy, physiology, biochemistry of human body.

**PO6** Providing the basic knowledge of modern medicine



Ordinance Governing

# Bachelor of Naturopathy & Yogic Sciences (B.N.Y.S.)

Five and half years' Undergraduate Medical  
Degree in Yoga and Naturopathy  
With effective from 2016

## **CONTENTS**

### Introduction

Section I : Goals of BNYS Course

Section II : Objectives of Medical Graduate Training Programme

Section III : Course of study, Attendance and Scheme of examination including  
Distribution of Marks of Clinical Course

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- i) Anatomy
- ii) Physiology
- iii) Biochemistry
- iv) Philosophy of Naturopathy
- v) Principles of Yoga
- vi) Pathology
- vii) Microbiology
- viii) Community Medicine
- ix) Yoga Philosophy
- x) Basic Pharmacology

- xi) Colour therapy and Magneto biology
- xii) Forensic Medicine and Toxicology
- xiii) Manipulative Therapies
- xiv) Acupuncture and Acupressure
- xv) *Yoga* and its applications
- xvi) Nutrition and Medicinal Herbs
- xvii) Diagnostic Methods (I and II) Naturopathy and Conventional Medicine
- xviii) Psychology and Basic Psychiatry
- xix) Fasting therapy and Dietetics
- xx) Obstetrics and Gynecology
- xxi) *Yoga* therapy
- xxii) Hydrotherapy and Mud therapy
- xxiii) Physical Medicine and Rehabilitation
- xxiv) First Aid and Emergency Medicine
- xxv) Clinical Naturopathy
- xxvi) Research Methodology and Recent Advances

Section V : Teaching of Medical Ethics in BNYS Course

Annexure I : Different Methods Recommended for Internal Assessment

Annexure II : A comprehensive list of skills for a BNYS Graduate

## **INTRODUCTION**

National Institute of Naturopathy (NIN), Pune, revised the BNYS syllabus, with a view of standardizing BNYS syllabi with uniform durations and course contents across the country in 2012. It was implemented by Rajiv Gandhi University of Health Sciences (RGUHS) in the academic year 2013-14. In the view of new regulations, University restructured the BNYS course and issued ordinance year wise of the course in 1996. The present volume is published incorporating the amendments made by the National Institute of Naturopathy, Pune, to the regulations of BNYS course and addition of certain topics to the syllabi, as well as change in duration from 5 years to 5½ years. The ordinance should be read with Revised Ordinance Governing BNYS Degree Course and Curriculum of first year to fourth year – 2013.

First year BNYS is of 1½ year duration, and consists of pre-clinical subjects and subjects describing Yoga and Naturopathy principles, Anatomy, Physiology, Biochemistry, Philosophy of Naturopathy, Principles of Yoga and Sanskrit. Second year BNYS is of 1 year duration, and consists of Para-clinical subjects and subjects describing philosophies of Yoga and Naturopathy clinical subjects, Pathology, Microbiology, Community Medicine, *Yoga* Philosophy, Basic Pharmacology, and Colour therapy and magneto biology. Third year BNYS is of 1 year duration, and consists of Para-clinical subjects and Yoga and Naturopathy clinical subjects, Forensic Medicine and Toxicology, Manipulative Therapies, Acupuncture and Acupressure, *Yoga* and its applications, Nutrition and Medicinal Herbs, Diagnostic Methods (I and II) Naturopathy and Conventional Medicine, Psychology and Basic Psychiatry, and Fasting therapy and Dietetics. Final year BNYS is of 1 year duration, and consists of clinical subjects and Yoga and Naturopathy clinical subjects Obstetrics and Gynecology, *Yoga* therapy, Hydrotherapy and Mud therapy, Physical

Medicine and Rehabilitation, First Aid and Emergency Medicine, Clinical Naturopathy and Research Methodology and Recent Advances.

In Section I, goals of BNYS course are given. Section II gives general objectives. Section III gives duration of the course, recommendations regarding attendance, internal assessment, distribution of marks for various subjects in professional examinations and criteria for pass. Revised course contents, subjects like Pharmacology, Forensic Medicine and Toxicology, Sanskrit, Principles of Yoga, Herbology, Clinical Naturopathy, Psychology and Basic Psychiatry, Clinical Naturopathy, Research Methodology and Recent Advances are added in this publication – are elaborated in Section IV. Section V deals with topics recommended for teaching of medical ethics.

## **SECTION I**

### **1 Goals of BNYS Course**

- 1.1 Recognize the health needs of the community, and carry out professional obligations ethically and in keeping with the objectives of the national health policy;
- 1.2 Develop the skills in most of the competencies, and training that are required to deliver the Naturopathy and Yoga health care system;
- 1.3 Become aware of the contemporary advances and developments in the discipline concerned;
- 1.4 Acquire a spirit of scientific inquiry and is oriented to the principles of research methodology and epidemiology;
- 1.5 Become proficient in their profession by developing scientific temper and improve educational experience;
- 1.6 Identify social, economic, environmental, biological and emotional determinants of health in a given case and take them into account while planning therapeutic, rehabilitative, preventive and promotive measures/strategies;
- 1.7 Plan and devise measures in Naturopathy and yoga for the prevention and rehabilitation of patients suffering from disease and disability ;
- 1.8 Demonstrate skills in documentation of individual case details as well as morbidity data relevant to the assigned situation;
- 1.9 Demonstrate empathy and humane approach towards patients and their families and exhibit interpersonal behavior in accordance with the societal norms and expectations;

- 1.10 Play the assigned role in the implementation of national health programs, effectively and responsibly;
- 1.11 Organize and supervise the chosen/assigned health care services  
Demonstrating adequate managerial skills in the clinic/hospital or the field Situation;
- 1.12 Develop skills as a self-directed learner; recognize continuing educational needs, select and use appropriate learning resources;
- 1.13 Demonstrate competence in basic concepts of research methodology and epidemiology, and be able to critically analyze relevant published research literature;
- 1.14 To implement all National health policies ;
- 1.15 Work towards realization of ‘\_Health for all’, as a national goal through naturopathy and yoga;
- 1.16 To follow the medical ethics and to fulfill the social and professional responsibilities as a Naturopathy and Yoga Physician through drugless therapies;
- 1.17 Be competent in the practice of holistic medicine with expert knowledge and experience in promotive, preventive, curative and rehabilitative aspects of diseases;
- 1.18 Become proficient in their profession by developing scientific temper and improve educational experience;

## 2 Institutional Goals

After the medical undergraduate program, the students must:

- 2.1 Be able to expertly diagnose and manage common diseases and health problems of individuals as well as community, work with the health team as a fully qualified doctor at primary, secondary or tertiary levels, with his/her clinical experience and skills in history, physical examination and relevant investigations;
- 2.2 Be proficient in promotive, preventive, curative and rehabilitative medicine and therapy for common health issues;
- 2.3 Be adept in different therapeutic modalities and their administration;
- 2.4 Develop a humane attitude towards one's clients and understand economic, environmental, social, psychological and cultural factors that influence health;
- 2.5 Enjoy an urge for self-improvement, directed towards advanced expertise or research in any chosen area of health care;
- 2.6 Have enough knowledge about implementation of National Health Programs and the basic factors required for the same, which are as follows;
  - 2.6.3 Family Welfare and Maternal and Child Health (MCH);
  - 2.6.4 Sanitation and Water Supply;
  - 2.6.5 Prevention and Control of communicable and non-communicable diseases;
  - 2.6.6 Immunization;
  - 2.6.7 Health education;
- 2.7 Possess management skills in human resources, materials and resource management in health care delivery;



- 2.8 Be competent in recognizing community health issues and design, institute curative and preventive measures and evaluate the outcome of these measures, thus working towards resolving these issues;
- 2.9 Be able to work successfully in a variety of health care settings;
- 2.10 Develop integrity, responsibility, reliability, dependability and compassion, which are characteristics required for successful professional life;
- 2.11 Develop leadership and communication skills to work as leading investigator or clinician in health care teams;

## **SECTION II**

### **1. Objectives of Medical Graduate Training Programme**

- 1.1. To effectively integrate the conventional basic sciences (e.g. human physiology) with the traditional medical systems and to enhance the understanding of their effects and therapeutic potential;
- 1.2 To provide state of the art learning facilities (e.g. audio visual aids, interactive learning systems) to conceptualize the ancient medical system;
- 1.3 To run advanced laboratories under each department (basic and clinical sciences) for effective experimental training and research;
- 1.4 To explore the possibilities of promoting effective integrated medical practice at conventional medical facilities attached to the institute;
- 1.5 To provide the best possible clinical setting for clinical training and research;
- 1.6 To prepare every Yoga and Naturopathic physician with an in depth understanding of Basic sciences, superior clinical training and with an outlook for research and development;

## **SECTION III**

### **1 Course of Study:**

The duration of the course shall be 5 ½ years (Five and half years). The course shall include a period of regular study of four and a half (4 ½) years, followed by a compulsory rotatory internship of one year.

The period of regular study shall be divided into four phases – first year of one and half (1½) years, and the Second, Third and Final years of one year each of the B.N.Y.S. Medical Degree Course respectively.

### **2 Attendance:**

A candidate shall be considered to have satisfied the requirement of attendance for each Part/Phase if he /she attends not less than 80 per cent of the theory and practical classes actually conducted up to the end of the Phase in that subject.

Such a candidate having shortage of attendance shall be required to attend 80 per cent of the theory and practical classes actually held up to the end of the term by repeating that subject of that Part/Phase during a subsequent term.

### **3 Teaching Hours:**

The allotment of time (in number of hours) to teach Theory and to conduct

Practical/Clinical and Tutorial /Demonstration, Seminar in each subject shall be:

#### **I YEAR B.N.Y.S. (18 months)**

<b>No. of Subjects</b>	<b>No. of Papers</b>	<b>SUBJECTS</b>	<b>TOTAL HOURS</b>
I	01.	Anatomy – I	550hrs
	02.	Anatomy – II	
II	03.	Physiology – I	500hrs
	04	Physiology – II	
III	05.	Biochemistry	300hrs
IV	06.	Philosophy of Naturopathy	325hrs
V	07.	Principles of <i>Yoga</i>	400hrs
		<b>Total Hours</b>	<b>2175hrs</b>

**II YEAR - B.N.Y.S. (12 Months)**

<b>No. of Subject s</b>	<b>No. of papers</b>	<b>SUBJECTS</b>	<b>TOTAL HOURS</b>
I	01.	Pathology	300
II	02.	Microbiology	200
III	03.	Community Medicine	250
IV	04.	<i>Yoga</i> Philosophy	350
V	05.	Basic Pharmacology	100
VI	06.	Colour Therapy and Magneto biology	150
VII	07.	Forensic Medicine & Toxicology	100
		<b>Total Hours</b>	<b>1450</b>

**III YEAR B.N.Y.S. (12 months)**

<b>No. of Subjects</b>	<b>No. of Papers</b>	<b>SUBJECTS</b>	<b>TOTAL HOURS</b>
I	01.	Manipulative Therapies	200
II	02.	Acupuncture & Acupressure	200
III	03.	<i>Yoga</i> & Its Applications	250
IV	04.	Nutrition & Medicinal herbs	250
V	05.	Diagnostic Methods - I (Naturopathy)	200
	06.	Diagnostic Methods -II (Conventional Medicine)	200
VI	07.	Psychology & Basic Psychiatry/An Introduction to Speech Therapy/ Music Therapy	150
		<b>Total Hours</b>	<b>1450</b>

**IV YEAR B.N.Y.S. (12 months)**

<b>No. of Subjects</b>	<b>No. of Papers</b>	<b>SUBJECTS</b>	<b>TOTAL HOURS</b>
I	01.	Fasting Therapy & Dietetics	200
II	02.	Obstetrics & Gynecology	150
III	03.	<i>Yoga</i> Therapy	250
IV	04.	Hydrotherapy & Mud Therapy	250
V	05.	Physical Medicine & Rehabilitation	200
VI	06.	First Aid & Emergency Medicine	100
VII	07.	Clinical Naturopathy	200
VIII	08.	Research Methodology & Recent Advances/ Hospital Management/ Publication Ethics and Database	100
		<b>Total Hours</b>	<b>1450</b>

GRAND TOTAL FOR 4 ½ YEARS IS 6525 hours.

**Internship program:**

A candidate after passing final B.N.Y.S. Medical Degree Examination shall undergo the compulsory rotatory internship of one year duration, which shall consist of work/duty postings in the following sections/departments for the period specified against them.

<b>S.No.</b>	<b>Department</b>	<b>Duration</b>
1.	Philosophy of <i>Yoga</i> and Naturopathy	1 Month
2.	<i>Yoga</i> and Mind-Body Medicine	1 Month
3.	Pathology and Microbiology	1 Month
4.	Community Medicine	1 Month
5.	Energy Medicine	1 Month
6.	Manipulative Therapies, Physical Medicine & Rehabilitation	1 Month
7.	Fasting, Dietetics, Nutrition, & Medicinal Herbs	1 Month
8.	Diagnostic Methods	1 Month
9.	Obstetrics & Gynecology	1 Month
10.	Hydrotherapy & Mud Therapy	1 Month
11.	Naturopathic Medicine	1 Month
12.	Allied Health Sciences	1 Month
	<b>TOTAL</b>	<b>12 Months</b>



#### **4 Scheme of Examination:**

The examination/s shall be held as per the date of Examination notified by the University.

There should be one Internal & One External Examiner for all practical & Viva exams for each subject. A candidate shall register for all the subjects of a term/year, when he/she appears for the first time to the examination of that Part.

##### **4.1 Internal Assessment: Scheme of Examination:**

There shall be an internal assessment which follows broadly the principles enunciated by the University in each subject for which 20 per cent of the marks are set apart and these will be added in the final grade in the University examinations. There shall be a minimum of two assignments and two periodical tests in every subjects of each year to assess the progress of the candidate.

If a candidate fails in an Examination, his/her internal assessment shall be assessed again as if he/she is a regular student for the second attempt only.

#### **Theory**

Minimum of 3 examinations is recommended. The examination preceding the university examination may be similar to the University Examination. Average marks of the better of the two notified internal examinations should be reduced to the marks allotted for internal assessment for each subject and should be sent to the university.

**Practical**

A minimum of one clinical test may be conducted at the end of each ward postings in all the clinical subjects.

Assistant professor and above or lecturer with five years of teaching experience can conduct internal assessment examination. Average of best two examination marks should be taken into consideration while calculating the marks of internal assessment.

The internal assessment marks of both theory and practical obtained by the candidates should be sent to the University at least 15 days prior to the commencement of the theory examination.

## 4.2 Subjects And Credit

### I YEAR BNYS

S.No.	Subject Name	Subject Code	Credit
1	Anatomy I	BNY – 101	3
2	Anatomy II	BNY – 102	3
3	Physiology I	BNY – 103	3
4	Physiology II	BNY – 104	3
5	Biochemistry	BNY – 105	3
6	Philosophy of Naturopathy	BNY – 106	4
7	Principles of Yoga	BNY – 107	3
8	Anatomy	BNY – 151	1
9	Physiology	BNY – 153	1
10	Biochemistry	BNY – 155	1
11	Philosophy of Naturopathy	BNY – 156	1
12	Principles of Yoga	BNY – 157	1

## II YEAR BNYS

S.No.	Subject Name	Subject Code	Credit
1	Pathology	BNY – 201	3
2	Microbiology	BNY – 202	2
3	Community Medicine	BNY – 203	3
4	Yoga Philosophy	BNY – 204	3
5	Color therapy and Magneto biology	BNY – 205	1
6	Basic Pharmacology	BNY – 206	3
7	Forensic Medicine and Toxicology	BNY – 207	2
8	Pathology	BNY – 251	1
9	Microbiology	BNY – 252	1
10	Community Medicine	BNY – 253	1
11	Yoga Philosophy	BNY – 254	1
12	Color therapy and Magneto biology	BNY – 255	1

### III YEAR BNYS

S.No.	Subject Name	Subject Code	Credit
1	Manipulative Therapies	BNY – 301	3
2	Acupuncture & Acupressure	BNY – 302	3
3	<i>Yoga</i> & Its Applications	BNY – 303	3
4	Nutrition & Medicinal herbs	BNY – 304	3
5	Diagnostic Methods - I(Naturopathy)	BNY – 305	3
6	Diagnostic Methods -II (Conventional Medicine)	BNY – 306	3
7	Psychology & Basic Psychiatry/ An Introduction to Speech Therapy/ Music Therapy	BNY – 307/BNY-307 A/BNY-307 B	2
8	Manipulative Therapies	BNY – 351	1
9	Acupuncture & Acupressure	BNY – 352	1
10	<i>Yoga</i> & Its Applications	BNY – 353	1

11	Nutrition & Medicinal herbs	BNY – 354	1
12	Diagnostic Methods - I(Naturopathy)	BNY – 355	1
13	Diagnostic Methods -II (Conventional Medicine)	BNY – 356	1
14	Psychology & Basic Psychiatry	BNY – 357	1

#### IV YEAR BNYS

S.No.	Subject Name	Subject Code	Credit
1	Fasting Therapy & Dietetics	BNY – 401	3
2	Obstetrics & Gynecology	BNY – 402	3
3	<i>Yoga</i> Therapy	BNY – 403	3
4	Hydrotherapy & Mud Therapy	BNY – 404	3
5	First Aid & Emergency Medicine	BNY – 405	2
6	Clinical Naturopathy	BNY – 406	1
7	Physical Medicine & Rehabilitation	BNY – 407	3
8	Research Methodology &Recent Advances /Hospital Management/ Publication Ethics and Database	BNY – 408/BNY-408 A/ 408 B	1
9	Fasting Therapy & Dietetics	BNY – 451	1

10	Obstetrics & Gynecology	BNY – 452	1
11	<i>Yoga</i> Therapy	BNY – 453	1
12	Hydrotherapy & Mud Therapy	BNY – 454	1
13	First Aid & Emergency Medicine	BNY – 455	1
14	Clinical Naturopathy	BNY – 456	1
15	Physical Medicine & Rehabilitation	BNY – 457	1
16	Research Methodology &Recent Advances	BNY – 458	1



#### **4.3 Eligibility for examination:**

A candidate who has passed in all the subjects of First B.N.Y.S. Medical Degree examination shall be eligible to be promoted to Second B.N.Y.S. Medical Degree course.

A candidate is eligible for carry over facility only if he/she has appeared for all the subjects of that particular examination.

First year to Second Year – 3 subjects carry over

Second year to Third year - 3 subjects carry over

Third Year to Final year – 3 subject carry over

Completion of the degree should not go beyond 11 years from the date of admission.

#### **4.4 Criteria for Pass**

To be eligible for promotion to the II, III & IV years, the candidate has to complete and pass in all the subjects of I, II & III years with an exemption of one subject in each year.

The candidate is declared to have been successful provided he/she secures minimum 40% and above in theory, 50% and above in oral/practical/clinical separately each subjects, but should get 50% in aggregate in all.

#### **4.5 Declaration of Class:**

A candidate who passes all the subjects of one examination in the first attempt only be eligible for a class.

No class or rank shall be declared for candidate who does not pass any examination in the first attempt, and such a candidate shall be eligible only for a pass class.

The percentage of marks for declaring pass/Second/First Class and First class with

Distinction shall be as follows:

Distinction	Not less than 75 percent of the Aggregate Marks
First class	Not less than 65 percent of the Aggregate Marks
Second class	Not less than 50 percent of the Aggregate Marks
Pass class	Candidate who passes the examination in more than one attempt

Note: - A candidate who passes in all the subjects of any Examination only in first attempt shall be eligible for First class with Distinction /First/Second Class

## **SECTION IV**

### **SUBJECTS & COURSE CONTENT**

#### **1. ANATOMY**

##### **1.1 Goals and Objectives**

###### **1.1.1 Goal**

It aims at giving inclusive knowledge of the gross and microscopic structure and development of human body to provide a basis for assessing the correlation of organs and structures and anatomical basis for disease presentations.

###### **1.1.2 Objectives**

###### **1.1.2.1 Knowledge:**

After completion of the program, the student must be able to:

- 1.1.2.1.1 Understand normal human anatomy clinically important inter-relationship and functional anatomy of bodily structures;
- 1.1.2.1.2 Comprehend histological structures of various tissues and organs and co- relate structure and function in order to understand diseased states;
- 1.1.2.1.3 Recognize basic structure and connections of the central nervous system, understand the regulation and integration of various organs and systems and be skilled in locating lesion sites according to deficits in diseased states;
- 1.1.2.1.4 Explain developmental basis of variations and abnormalities with respect to sequential development of organs and systems, teratogens, genetic mutations and environmental hazards.

### 1.1.2.2 Skills

After completion of the program, the student must be able to:

- 1.1.2.2.1 Locate and identify body structures including topography of living body;
- 1.1.2.2.2 Histologically, identify tissues and organs;
- 1.1.2.2.3 Identify gross congenital anomalies and be familiar with the principles of karyotyping;
- 1.1.2.2.4 Interpret new imaging techniques such as CT, Sonogram, MRI etc after understanding their basic principles;
- 1.1.2.2.5 Understand clinical basis of some common clinical procedures i.e., intramuscular and intravenous injection, lumbar puncture and kidney biopsy etc..

### 1.1.2.3 Integration

Student shall be capable of understanding the regulation and integration of the functions of the organs and systems in the body and interpret the anatomical basis of disease process using the combined teaching of other basic sciences.

## 1.2 **Human Anatomy – I (Duration: 18 months)**

**Total hours: 500 (Theory: 300 Practical: 200)**

### 1.2.1 Introduction to Anatomy

- 1.2.1.1 Nomenclature
- 1.2.1.2 Anatomical positions
- 1.2.1.3 Axes and planes
- 1.2.1.4 Tissues

- 1.2.1.5 Movements
- 1.2.2 General Histology
  - 1.2.2.1 Detailed structure of cell and its components and their functional mechanisms
- 1.2.3 Osteology (Including ossification)
  - 1.2.3.1 Types of bones
  - 1.2.3.2 Classification of bones
  - 1.2.3.3 Description of various bones
    - 1.2.3.3.1 Upper limb
    - 1.2.3.3.2 Thorax
    - 1.2.3.3.3 Abdomen and pelvis
    - 1.2.3.3.4 Vertebral column
- 1.2.4 Arthrology
  - 1.2.4.1 Classification of joints
  - 1.2.4.2 Construction of joints
  - 1.2.4.3 Description of various joints of:
    - 1.2.4.3.1 Upper limb
    - 1.2.4.3.2 Thorax
    - 1.2.4.3.3 Vertebral column
- 1.2.5 Myology
  - 1.2.5.1 Types of muscles
  - 1.2.5.2 Muscles of upper limb, thorax, abdomen and pelvis
  - 1.2.5.3 Origin, insertion, blood supply, nerve supply, applied anatomy and actions of these muscles
- 1.2.6 Respiratory System

- 1.2.6.1 Upper respiratory tract – Nose, Pharynx, Larynx
- 1.2.6.2 Trachea & Bronchial tree
- 1.2.6.3 Lungs
- 1.2.6.4 Pleura
- 1.2.6.5 Mediastinum
- 1.2.7 Cardiovascular System
  - 1.2.7.1 Heart – Position, Surface anatomy and its description
  - 1.2.7.2 Great vessels – Aorta, Pulmonary trunk, superior vena cava, inferior vena cava and their branches
  - 1.2.7.3 Arteries and Veins – Structure of arteries and veins, important arteries and veins of the body
- 1.2.8 Digestive System
  - 1.2.8.1 Oral cavity
  - 1.2.8.2 Teeth
  - 1.2.8.3 Hard palate
  - 1.2.8.4 Soft palate
  - 1.2.8.5 Esophagus
  - 1.2.8.6 Stomach
  - 1.2.8.7 Small intestine
  - 1.2.8.8 Large intestine
  - 1.2.8.9 Anal canal
  - 1.2.8.10 Liver
  - 1.2.8.11 Gall bladder
  - 1.2.8.12 Bile duct
  - 1.2.8.13 Pancreas

1.2.8.14 Spleen

1.2.8.15 Peritoneum

1.2.9 Mesentery and position of the above organs in the abdominal quadrants.

1.2.9.1 Urinary System

1.2.9.2 Kidney

1.2.9.3 Ureter

1.2.9.4 Urinary bladder

1.2.9.5 Male urethra

1.2.9.6 Female urethra

1.2.10 Lymphatic System

1.2.10.1 Lymph, lymph glands, lymph duct, thoracic duct, cisterna chyli

1.2.10.2 Location of major groups of lymph nodes in the body and their drainage areas

NOTE: The concerned colleges have to make necessary arrangements for providing human cadavers in the anatomy department for teaching.

### **1.3 Human Anatomy – II (Duration: 18 Months)**

#### **1.3.1 Osteology (Including ossification)**

Description of various bones of

1.3.1.1 Lower limb

1.3.1.2 Skull as a whole

1.3.1.3 Individual cranial bones of skull

#### **1.3.2 Arthrology**

Description of various joints of

1.3.2.1 Lower limb

1.3.2.2 Skull as a whole

1.3.2.3 Skull and vertebral column

#### **1.3.3 Myology**

Description of various muscles of

1.3.4 Lower limb

1.3.5 Head

1.3.6 Neck

(Origin, insertion, blood supply, nerve supply, applied anatomy and actions of these muscles)

#### **1.3.7 Reproductive System**

1.3.7.1 Male reproductive organs

Penis, Testes, Vas Deferens, Spermatic Cord, Epididymis, Seminal Vesicles, Ejaculatory Duct Prostate Gland Etc.

1.3.7.2 Female reproductive organs

1.3.7.2.1 External genital organs

Vulva, Clitoris, Vagina



1.3.7.2.2 Inguinal Region perineum

1.3.7.2.3 Internal genital organs

Uterus, Cervix, Fallopian tubes, Ovaries, Ligaments of uterus and ovaries

1.3.7.2.4 Mammary glands

### **1.3.8 Endocrine System**

Description of Pituitary, Pineal, Thyroid, Parathyroid, Thymus, Spleen, Pancreas, Suprarenal, Ovaries and Testes

### **1.3.9 Nervous System**

Division of nervous system, central nervous system, peripheral nervous system, cerebral hemispheres, midbrain, pons, medulla oblongata, cerebellum, spinal cord, autonomic nervous system.

1.3.9.1 Meninges: Dura mater and arachnoid mater

1.3.9.2 CSF

1.3.9.3 Ventricular system

1.3.9.4 Cranial nerves

1.3.10 Spinal nerves

1.3.11 Important plexuses: Cervical, Brachial, Lumbar, Sacral and their nerve descriptions.

1.3.12 Organs and Special Senses

1.3.12.1 Tongue

1.3.12.2 Nose

1.3.12.3 Eye and associated structures

1.3.12.4 Ear

1.3.12.5 Integumentary system

1.3.13 Surface Anatomy

- 1.3.13.1 Projection of the outline of heart, its borders, surface and valves.
- 1.3.13.2 Lungs – borders, fissures, hila, pleura and diaphragm
- 1.3.13.3 Liver
- 1.3.13.4 Kidney
- 1.3.13.5 Abdominal viscera
- 1.3.13.6 Pelvic viscera

## **1.4 Histology**

### **1.4.1 General Histology**

1.4.1.1 Microscope

1.4.1.2 Cell

1.4.1.3 Epithelial Tissue I

1.4.1.4 Epithelial Tissue II

1.4.1.5 Connective Tissue – Bones and Cartilages

1.4.1.6 Muscular Tissues

1.4.1.7 Nerve Tissues (TS & LS of peripheral nerve, sensory and sympathetic ganglion, optic nerve)

1.4.1.8 Epithelial glands (serous, mucous and mixed salivary gland)

1.4.1.9 Circulatory system (large artery, medium sized artery, larger vein)

1.4.1.10 Lymphatic system (lymph nodes, thymus, tonsils, spleen)

1.4.1.11 Skin and appendages

1.4.1.12 Placenta and umbilical cord

### **1.4.2 Systemic Histology**

1.4.2.1 Respiratory system(lungs ,trachea)

1.4.2.2 Esophagus and stomach

1.4.2.3 Liver, gall bladder, pancreas

1.4.2.4 Urinary system I (Kidney)

1.4.2.5 Urinary system II (Ureter, bladder)

1.4.2.6 Small and large intestine

1.4.2.7 Reproductive system – Female

1.4.2.8 Reproductive system – Male

1.4.2.9 Upper GIT (tongue)

1.4.2.10 Hypophysis cerebra, thyroid and suprarenal glands

1.4.2.11 Eye – cornea and retina

## 1.5 Practical

### 1.5.1 Gross Anatomy (Dissection / Demonstration of following):

#### 1.5.1.1 Upper Limb

1.5.1.1.1 Dissection: Pectoral, scapular, shoulder, arm, forearm (5weeks)

1.5.1.1.2 Prosected Parts: Joints, Palm and dorsum of hand

#### 1.5.1.2 Thorax

1.5.1.2.1 Dissection: Chest wall, mediastinum, lungs and heart

#### 1.5.1.3 Abdomen

1.5.1.3.1 Dissection: anterior abdominal wall and inguinal region, viscera and posterior abdominal wall

#### 1.5.1.4 Pelvis

1.5.1.4.1 Dissection: Pelvic viscera and blood vessels and nerve sagittal section (M & F) (2 weeks)

1.5.1.4.2 Prosected Parts: Sole of the foot and joints

#### 1.5.1.5 Head and Neck

1.5.1.5.1 Dissection: Scalp, superficial and deep dissection of face and neck (8 – 10 weeks)

1.5.1.5.2 Prosected Parts: Orbit, eyeball, submandibular region, temporal and infra-temporal fossa, cranial cavity, naso and oropharyngeal regions, larynx and pharynx. Cross sections at C-4, C-6 levels, sagittal section of head and neck

#### 1.5.1.6 Nervous System

Section of brain and prosected specimens and major functional areas; Gross structure of brain and spinal cord and study of gross sections as mentioned earlier (in brief).

## **1.5.2 Demonstrations**

1.5.2.1 Bones as described in the osteology section

1.5.2.2 Brain and Spinal Cord

## **1.5.3 Specific Skills**

1.5.3.1 To localize important pulsations and the structure against which pressure can be applied in case of bleeding and trauma of particular artery.

1.5.3.2 To elicit superficial and deep reflexes.

1.5.3.3 To demonstrate muscle testing and movements at joints.

1.5.3.4 To locate for: lumbar puncture, sterna puncture, pericardial tapping and liver biopsy.

1.5.3.5 To locate veins for venipuncture.

1.5.3.6 To locate the site for emergency such as tracheostomy.

## **1.6 Textbooks:**

1.6.1 Textbook of Anatomy (III volumes) – BD Chaurasia

1.6.2 Textbook of Anatomy – Hamilton

1.6.3 Practical Anatomy – Cunningham

1.6.4 Human Embryology – Inderbir Singh

1.6.5 Bailey's textbook of histology

1.6.6 Medical Embryology – Langman

1.6.7 Textbook of Clinical Anatomy by Neeta V Kulakarni

1.6.8 Histology text book by Latha V

## **1.7 Reference Books**

1.7.1 Textbook of Anatomy – Gray

1.7.2 Atlas of histology – Diforie

- 1.7.3 Atlas of histology – Poddar
- 1.7.4 Textbook of human histology – Veena Bharihoke
- 1.7.5 A color atlas of human anatomy – Mcminn
- 1.7.6 Grant's method of Anatomy – Grant
- 1.7.7 Regional and applied Anatomy – RJ Last

1.8 **Scheme Of Examination**

S.N	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01.	Anatomy – I	80	20	30	130	60	10	70	200
02.	Anatomy – II	80	20	30	130	60	10	70	200

## 2. **PHYSIOLOGY**

### 2.1 **Goals and Objectives**

#### 2.1.1 **Goal**

The goal of teaching Physiology to undergraduate students is aimed at giving the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate comprehension of the physiological basis of health and disease.

#### 2.1.2 **Objectives**

##### 2.1.2.1 **Knowledge**

After completion of the program, the student will be able to:

- 2.1.2.1.1 Explicate the normal functioning of all the organ systems and their interactions for well co-ordinated body function;
- 2.1.2.1.2 Appreciate the relative contribution of each organ system to the homeostasis;
- 2.1.2.1.3 Explain the physiological aspects of normal growth and development;
- 2.1.2.1.4 Illustrate the physiological response and adaptations to environmental stresses;
- 2.1.2.1.5 List physiological principles underlying pathogenesis and disease management.

##### 2.1.2.2 **Skills**

After completion of the program, the student will be able to:

- 2.1.2.2.1 Conduct experiments designed to study physiological phenomena;
- 2.1.2.2.2 Interpret experimental/investigative data;



- 2.1.2.2.3 Differentiate between normal and abnormal data from results of tests, which he/she has done and observed in the laboratory.

**2.1.2.3 Integration**

At the end of the integrated course the student shall acquire an integrated knowledge of organ structure and function and regulatory mechanisms.

**2.2 Physiology – I (Duration: 18 Months)**

**Total hours: 500 (Theory: 300 Practical: 200)**

**2.2.1 General Physiology**

2.2.1.1 Cell structure and function

2.2.1.2 Transport mechanisms across biological membrane

2.2.1.3 Body fluids and homeostasis

2.2.1.4 Thermoregulation

**2.2.2 Blood**

**2.2.2.1 Plasma proteins**

2.2.2.1.1 Normal values

2.2.2.1.2 Origin, Functions and variations in health and disease

**2.2.2.2 Bone marrow**

2.2.2.2.1 Composition and functions

**2.2.2.3 Erythrocytes**

2.2.2.3.1 Morphology and variations in health and disease

2.2.2.3.2 Site and stages of development

2.2.2.3.3 Necessary factors

2.2.2.3.4 Regulation of development of erythrocytes

2.2.2.3.5 Life span and fate of erythrocytes

- 2.2.2.3.6 Erythrocyte sedimentation rate (ESR)
- 2.2.2.3.7 Packed cell volume (PCV)
- 2.2.2.4 Hemoglobin**
  - 2.2.2.4.1 Structure, synthesis, function and metabolism
  - 2.2.2.4.2 Types of hemoglobin
- 2.2.2.5 Anemia** – definition and classification
- 2.2.2.6 Jaundice** – definition and classification
- 2.2.2.7 Spleen-** structure and function
- 2.2.2.8 Leucocytes**
  - 2.2.2.8.1 Classification, morphology, development and functions
  - 2.2.2.8.2 Variation in health and disease
- 2.2.2.9 Thrombocytes**
  - 2.2.2.9.1 Development, morphology and functions
  - 2.2.2.9.2 Variation in health and disease
- 2.2.2.10 Hemostasis**
  - 2.2.2.10.1 Mechanism of hemostasis, coagulation of blood
  - 2.2.2.10.2 Fibrinolysis and bleeding disorders
- 2.2.2.11 Anticoagulants**
  - 2.2.2.11.1 Mechanism of action and clinical applications
- 2.2.2.12 Blood groups**
  - 2.2.2.12.1 Classification
  - 2.2.2.12.2 ABO and RH system
  - 2.2.2.12.3 Blood transfusion, indication and hazards
- 2.2.2.13 Lymph and tissue fluids**
  - 2.2.2.13.1 Formation and functions of lymph

2.2.2.13.2 Physiology of reticular system

**2.2.2.14 Immune system**

Cellular and humoral immunity

**2.2.3 Cardiovascular System**

**2.2.3.1 Heart**

2.2.3.1.1 Structure and properties of cardiac muscle

2.2.3.1.2 Innervations of heart, junctional tissue of heart

2.2.3.1.3 Generation and spread of cardiac impulse

**2.2.3.2 Electrocardiography**

2.2.3.2.1 Einthovan's Law

2.2.3.2.2 ECG leads, normal ECG and its interpretation

**2.2.3.3 Cardiac cycle**

2.2.3.3.1 Pressure and volume changes (mechanical events)

2.2.3.3.2 Principles of echo-cardiograph

2.2.3.3.3 Jugular venous pulse tracing, radial pulse tracing

2.2.3.3.4 Measurement and regulation of cardiac output

**2.2.3.4 Heart sounds**

2.2.3.4.1 Description, Causation and relation to other events in cardiac cycle

2.2.3.4.2 Clinical significance of heart sounds

2.2.3.4.3 Stethoscopy

**2.2.3.5 Blood pressure**

2.2.3.5.1 Definition, regulation and factors influencing BP

2.2.3.5.2 Measurement of blood pressure

2.2.3.5.3 Physiology of hemorrhage and shock

### **2.2.3.6 Circulations**

- 2.2.3.6.1 Blood vessels
- 2.2.3.6.2 Physical principles of blood flow, regulation of blood flow.
- 2.2.3.6.3 Coronary, Splanchnic, cutaneous and capillary, cerebral circulation
- 2.2.3.6.4 Cardiovascular changes in altitude and exercise

## **2.2.4 Respiratory System**

Introduction, internal and external respiration, physiological anatomy of respiratory system

### **2.2.4.1 Mechanism of Respiration**

- 2.2.4.1.1 Inspiration and expiration
- 2.2.4.1.2 Role of respiratory muscles and thoracic cage
- 2.2.4.1.3 Pressure and volume changes during respiration
- 2.2.4.1.4 Work of breathing
- 2.2.4.1.5 lung compliance and its significance in health and disease

### **2.2.4.2 Lung volumes and capacities**

- 2.2.4.2.1 Lung volumes and capacities and their measurements

### **2.2.4.3 Ventilation**

- 2.2.4.3.1 Composition of atmospheric, inspired, alveolar and expired air

### **2.2.4.4 Pulmonary circulation**

- 2.2.4.4.1 Pulmonary circulation, ventilation – perfusion relationship
- 2.2.4.4.2 Diffusion of gases across pulmonary membrane
- 2.2.4.4.3 Oxygen uptake, transport and delivery
- 2.2.4.4.4 Carbon dioxide uptake, transport and delivery

#### **2.2.4.5 Organization of the respiratory centers**

- 2.2.4.5.1 Nervous and chemical regulation of respiration
- 2.2.4.5.2 Classification and characteristics of hypoxia, cyanosis, asphyxia, hypercapnea, hypocapnea dyspnea, apnea and orthopnea and periodic breathing
- 2.2.4.5.3 Respiratory changes in high altitude
- 2.2.4.5.4 Physiology of acclimatization and hyperbarism
- 2.2.4.5.5 Respiratory / pulmonary function tests
- 2.2.4.5.6 Non-respiratory functions of lungs
- 2.2.4.5.7 Artificial respiration
- 2.2.4.5.8 Importance of therapeutic administration of oxygen and carbon dioxide
- 2.2.4.5.9 Respiratory changes during exercise

#### **2.2.5 Digestive System**

##### **2.2.5.1 Introduction, functional anatomy of digestive system**

##### **2.2.5.2 Salivary glands**

- 2.2.5.2.1 Composition, functions of saliva
- 2.2.5.2.2 Regulation of secretion of saliva

##### **2.2.5.3 Stomach**

- 2.2.5.3.1 Functional anatomy of stomach
- 2.2.5.3.2 Functions of stomach
- 2.2.5.3.3 Composition and functions of gastric juice
- 2.2.5.3.4 Regulation of secretion and mechanism of HCL secretion
- 2.2.5.3.5 Methods of study of gastric function and its supplied aspect

#### **2.2.5.4 Pancreas**

2.2.5.4.1 Functional anatomy of pancreas

2.2.5.4.2 Composition and functions of pancreatic juice

2.2.5.4.3 Regulation of pancreatic secretion

2.2.5.4.4 Methods of study of pancreatic secretion

#### **2.2.5.5 Liver and Gall Bladder**

2.2.5.5.1 Functional anatomy of liver and biliary system

2.2.5.5.2 Functions of liver and gall bladder

2.2.5.5.3 Formation, storage and secretion of bile

2.2.5.5.4 Composition, function and regulation of release of bile

2.2.5.5.5 Entero-hepatic circulation

2.2.5.5.6 Tests for liver function

#### **2.2.5.6 Small intestine**

2.2.5.6.1 Functional anatomy and functions of small intestine

2.2.5.6.2 Composition, function and mechanism of secretions of Succus entericus

#### **2.2.5.7 Large intestine**

2.2.5.7.1 Functional anatomy and functions of large intestine

#### **2.2.5.8 Gastro-intestinal hormones**

2.2.5.8.1 Release and functions

#### **2.2.5.9 Gastro-intestinal movements**

2.2.5.9.1 Mastication, deglutition and vomiting

2.2.5.9.2 Movements of stomach, filling and emptying of stomach

2.2.5.9.3 Movements of small intestines

2.2.5.9.4 Movements of large intestine and defecation

2.2.5.9.5 Regulation of movement

**2.2.5.10 Digestion and absorption of carbohydrates, fats, proteins and vitamins, minerals and water**

**2.2.6 Excretory System**

2.2.6.1 General introduction, organs of excretion with special emphasis on evolution of excretory mechanisms

2.2.6.2 Functional anatomy of renal glands and renal circulation

2.2.6.3 Nephron -

2.2.6.3.1 Mechanism of urine formation

2.2.6.3.2 Concentration and acidification of urine

2.2.6.3.3 Renal function tests

2.2.6.4 Non-excretory functions of kidney

2.2.6.4.1 Physiology of micturition and its abnormalities

2.2.6.5 Skin – structure and functions

## 2.3 **Physiology-II (Duration: 18 Months)**

### 2.3.1 **Endocrine System**

2.3.1.1 **Introduction** - evolutionary background and organization of endocrine control systems

### 2.3.1.2 **Hormones**

2.3.1.2.1 Classification of hormones and mechanism of hormone action

2.3.1.2.2 Regulation of hormone secretion and feedback system

2.3.1.3 Hypothalamo-hypophyseal system – hormones released

### 2.3.1.4 **Endocrine glands**

2.3.1.4.1 Pituitary glands –functional anatomy of anterior and posterior pituitary glands. source, chemical nature, actions, regulation and applied aspect of anterior and posterior pituitary hormones

2.3.1.4.2 Thyroid gland – functional anatomy , hormones ,applied aspect

2.3.1.4.3 Parathyroid gland – functional anatomy, hormones, applied aspect

2.3.1.4.4 Adrenal gland – Functional anatomy of adrenal cortex and medulla, hormones and applied physiology of adrenal cortex and medulla

2.3.1.4.5 Islets of langerhans – Functional anatomy, hormones ,applied aspect

2.3.1.4.6 Other hormones – prostaglandins, thromboxanes, acetylcholine ,serotonin, histamine, bradykinin, leptin, prostacyclin, leukotrienes, atrial natriuretic peptide, brain natri uretic peptide,melatonin



## 2.3.2 **Reproductive System**

### 2.3.2.1 **Physiology of reproduction**

- 2.3.2.1.1 Introduction to physiology of reproduction
- 2.3.2.1.2 Sex determination, sex differentiation and chromosomal study

### 2.3.2.2 **Male Reproductive System**

- 2.3.2.2.1 Development and structure of testes
- 2.3.2.2.2 Functions of testes
- 2.3.2.2.3 Gonadotropins and gonadal hormones
- 2.3.2.2.4 Composition of semen and structure of human sperm

### 2.3.2.3 **Female Reproductive System**

- 2.3.2.3.1 Functional anatomy of female reproductive system
- 2.3.2.3.2 Functional anatomy and functions of ovary
- 2.3.2.3.3 Gonadotropins and ovarian hormones
- 2.3.2.3.4 Physiology of menstrual cycle
- 2.3.2.3.5 physiology of ovulation and pregnancy
- 2.3.2.3.6 Physiology of placenta, gestation and parturition
- 2.3.2.3.7 Physiological basis of tests for ovulation and pregnancy
- 2.3.2.3.8 Physiology of lactation

### 2.3.3 **Nerve and Muscle Physiology**

#### 2.3.3.1 **Neuron**

- 2.3.3.1.1 Morphology of neuron and Classification of neuron and nerve fibres
- 2.3.3.1.2 Properties of nerve fibres and measure of excitability
- 2.3.3.1.3 Degeneration and regeneration of nerve fibres

#### 2.3.3.2 **Muscle**

- 2.3.3.2.1 Classification of muscle
- 2.3.3.2.2 Skeletal muscle – structure , properties and functions
- 2.3.3.2.3 Excitation -contraction coupling
- 2.3.3.2.4 Neuromuscular junction
- 2.3.3.2.5 Smooth muscle – structure, types, properties, functions
- 2.3.3.2.6 Cardiac muscle – structure, properties, functions
- 2.3.3.2.7 Myasthenia gravis
- 2.3.3.2.8 Starling's law and its applications

### 2.3.4 **Central Nervous System**

2.3.4.1 Structural and functional organization of central nervous system

2.3.4.2 Neuroglia

#### 2.3.4.3 **Sensory physiology**

2.3.4.3.1 Classification and general properties of receptors

#### 2.3.4.4 **Synapse**

2.3.4.4.1 Types of synapse and their structure

2.3.4.4.2 Functions and properties of synapse

2.3.4.4.3 Classification and actions of neuro -transmitters

#### 2.3.4.5 **Reflexes**

- 2.3.4.5.1 Classification of Reflexes
- 2.3.4.5.2 General properties of reflexes (with examples)
- 2.3.4.5.3 Reciprocal inhibition and reciprocal innervation

#### **2.3.4.6 Spinal cord**

- 2.3.4.6.1 Functional anatomy of spinal cord
- 2.3.4.6.2 Ascending tracts – situation, origin, course, termination and functions
- 2.3.4.6.3 Physiology of pain, different pathways of pain sensation
- 2.3.4.6.4 Physiology of referred pain,
- 2.3.4.6.5 Gate control theory, analgesia system
- 2.3.4.6.6 Descending tracts – situation, origin, course, termination and functions
- 2.3.4.6.7 Extrapyramidal tracts – situation, origin, course, termination and functions
- 2.3.4.6.8 Upper and lower motor neurons and their lesions
- 2.3.4.6.9 Brown Sequard syndrome, Syringomyelias

#### **2.3.4.7 Functional anatomy and functions of brain stem**

#### **2.3.4.8 Thalamus**

- 2.3.4.8.1 Functional anatomy, connections and functions
- 2.3.4.8.2 Effects of lesions

#### **2.3.4.9 Internal capsule – situation, divisions, effect of lesions**

#### **2.3.4.10 Hypothalamus**

- 2.3.4.10.1 Functional anatomy, connections and functions
- 2.3.4.10.2 Effect of lesions

#### **2.3.4.11 Cerebellum**

2.3.4.11.1 Functional anatomy, connections and functions

2.3.4.11.2 Effects of lesions and tests for cerebellar function

#### **2.3.4.12 Basal ganglia**

2.3.4.12.1 Functional anatomy, connections and functions

2.3.4.12.2 Diseases of basal ganglia and its clinical evaluation

#### **2.3.4.13 Cerebral cortex**

2.3.4.13.1 Functional anatomy of cerebral cortex

2.3.4.13.2 Functional areas and its functions of frontal lobe, parietal lobe, temporal lobe, occipital lobe

2.3.4.13.3 Methods of study of cortical connections and functions

#### **2.3.4.14 Limbic System**

2.3.4.14.1 Functional anatomy, connections and functions

#### **2.3.4.15 Reticular formation**

2.3.4.15.1 Functional anatomy, connections and functions of reticular formation

2.3.4.15.2 EEG, physiology of sleep and wakefulness

#### **2.3.4.16 Vestibular apparatus**

2.3.4.16.1 Functional anatomy, connections and functions

2.3.4.16.2 Effects of lesions and their assessment

2.3.4.16.3 Physiology of maintenance and regulation of muscle tone, posture and equilibrium

2.3.4.16.4 Decerebrated rigidity and righting reflexes

#### **2.3.4.17 Higher functions**

2.3.4.17.1 Learning, speech, memory, behavior and emotions

### **2.3.4.18 Cerebro-spinal fluids**

- 2.3.4.18.1 Formation, circulation, functions of CSF
- 2.3.4.18.2 Properties and composition of CSF
- 2.3.4.18.3 Method of collection of CSF and its clinical significance
- 2.3.4.18.4 Blood – brain barrier

### **2.3.4.19 Autonomic Nervous System**

- 2.3.4.19.1 Sympathetic nervous system and its functions
- 2.3.4.19.2 Parasympathetic nervous system and its functions

## **2.3.5 Special Senses**

### **2.3.5.1 Smell**

- 2.3.5.1.1 Structure of olfactory receptors,
- 2.3.5.1.2 Physiology of olfaction and olfactory discrimination
- 2.3.5.1.3 Olfactory pathway and defects of olfaction

### **2.3.5.2 Taste** structure of taste receptor, primary taste sensation and taste pathway and applied aspects

### **2.3.5.3 Vision**

- 2.3.5.3.1 Functional anatomy of eye
- 2.3.5.3.2 Structure of visual receptors
- 2.3.5.3.3 Neural, chemical, electrical basis of visual process
- 2.3.5.3.4 Visual acuity ,field of vision, tests for visual acuity and field of vision
- 2.3.5.3.5 Visual pathways and effects of lesions in visual pathways
- 2.3.5.3.6 Pupillary reflexes
- 2.3.5.3.7 Color vision, color blindness and tests for color blindness
- 2.3.5.3.8 Errors of refraction and its correction,

- 2.3.5.3.9 Physiology of aqueous humor
- 2.3.5.3.10 Dark and light adaptation
- 2.3.5.3.11 Lacrimal glands ,Formation and circulation of tears

#### **2.3.5.4 Hearing**

- 2.3.5.4.1 Functional anatomy and functions of external,middle and internal ear
- 2.3.5.4.2 Impedance matching and tympanic reflex
- 2.3.5.4.3 Auditory pathways and auditory cortex
- 2.3.5.4.4 Mechanism of hearing
- 2.3.5.4.5 Frequency analysis, sound localization,
- 2.3.5.4.6 Defects of hearing
- 2.3.5.4.7 Audiometry, other tests for hearing defects

## 2.4 **Physiology Practical**

### 2.4.1 **Blood**

- 2.4.1.1 Preparation and examination of peripheral blood smear and determination of differential leucocyte count
- 2.4.1.2 Determination of total red blood cell count
- 2.4.1.3 Determination of total leucocyte count
- 2.4.1.4 Determination of platelet count
- 2.4.1.5 Determination of osmotic fragility of erythrocytes
- 2.4.1.6 Determination of erythrocyte sedimentation rate, packed cell volume
- 2.4.1.7 Determination of hemoglobin concentration of blood
- 2.4.1.8 Determination of ABO and Rh blood groups
- 2.4.1.9 Determination of bleeding time, clotting time

### 2.4.2 **Cardiovascular system**

- 2.4.2.1 Determination of the effect of posture on blood pressure
- 2.4.2.2 Clinical examination of the human cardiovascular system (CVS)

### 2.4.3 **Respiration**

- 2.4.3.1 Spirometry (demonstration)
- 2.4.3.2 Examination of human respiratory system

### 2.4.4 **Neurophysiology**

- 2.4.4.1 Examination of motor and sensory system
- 2.4.4.2 Examination of cranial nerves

### 2.4.5 **Special senses**

- 2.4.5.1 Determination of visual acuity
- 2.4.5.2 Clinical assessment of color vision (Demonstration)
- 2.4.5.3 Perimetry: Mapping of visual field

## 2.5 Textbooks

- 2.5.1 Textbook of Medical Physiology – AC Guyton and Hall
- 2.5.2 Review of Medical Physiology – WF Ganong’s
- 2.5.3 Concise Textbook of Medical Physiology – SK Chaudhury
- 2.5.4 Understanding Medical Physiology – RL Bijlani
- 2.5.5 Essentials of Medical Physiology – K Sembulingam

## 2.6 Reference Books

- 2.6.1 Best and Taylor’s Physiological basis of medical practice
- 2.6.2 Berne and Levy Physiology
- 2.6.3 Practical Physiology – C L Ghai
- 2.6.4 Practical Physiology – Dr. V. G.Ranade

## 2.7 Scheme Of Examination

S.No	Subject	Theo-ry	Intern-al Assmt	Viva-Voce	Total	Practi-cals	Inter-nal Assmt	Total Marks	Grand Total Marks
03.	Physiology - I	80	20	30	130	60	10	70	200
04.	Physiology – II	80	20	30	130	60	10	70	200



### **3. BIOCHEMISTRY**

#### **3.1 Goals and Objectives**

##### **3.1.1 Goals:**

The goals of introducing biochemistry to the undergraduate students is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the application of the knowledge in solving clinical problems.

##### **3.1.2 Objectives**

###### **3.1.2.1 Knowledge**

After completion of the course, the student shall be able to:

- 3.1.2.1.1 Elucidate the molecular and functional organization of a cell and list its sub cellular components;
- 3.1.2.1.2 Outline structure, function and inter-relationships of bio molecules and consequences of deviation from normal;
- 3.1.2.1.3 Review the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered;
- 3.1.2.1.4 Illustrate digestion and assimilation of nutrients and consequences of malnutrition;
- 3.1.2.1.5 Integrate the various aspects of metabolism and their regulatory pathways;
- 3.1.2.1.6 Explain biochemical basis of inherited disorders with their associated sequelae;
- 3.1.2.1.7 Describe mechanisms involved in maintenance of body fluid and pH homeostasis;

- 3.1.2.1.8 Delineate the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application in medicine;
- 3.1.2.1.9 Summarize the molecular concept of body defenses and their application in medicine;
- 3.1.2.1.10 Outline the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;
- 3.1.2.1.11 Familiarize with principles of various conventional and specialized laboratory investigations and instrumentation analysis and interpretation of a given data;
- 3.1.2.1.12 Suggest experiments to support theoretical concepts and clinical diagnosis;

### **3.1.2.2 Skills**

At the end of the course, the student will be able to:

- 3.1.2.2.1 Perform conventional techniques/instruments to perform biochemical analysis relevant to clinical screening and diagnosis;
- 3.1.2.2.2 Analyse and interpret investigative data;
- 3.1.2.2.3 Demonstrate the skills of solving scientific and clinical problems and decision making

### **3.1.2.3 Integration**

The integrated knowledge of biochemistry will help the students to integrate molecular events with the structure and function of the human body in health and disease.

### **3.2 Theory (Duration: 18 months: Hours: 200+100)**

3.2.1 Biomolecules & biochemical perspective of a cell

3.2.2 Cell structure

3.2.3 Subcellular organelles

3.2.4 Cell membrane

3.2.5 Transport mechanisms

3.2.6 Chemistry of Carbohydrates

3.2.6.1 Definition, classification and biological importance of carbohydrates

3.2.6.2 Monosaccharides; Classification, Isomerism and properties of monosaccharides, modified monosaccharides

3.2.6.3 Disaccharides

3.2.6.4 Polysaccharides

3.2.7 Chemistry of Lipids

3.2.7.1 Definition, classification and biological importance of Lipids

3.2.7.2 Simple lipids: Composition of Triacyl glycerol & Waxes.

3.2.7.3 Compound lipids: Composition & functions of Phospholipids, glycolipids & lipoproteins

3.2.7.4 Derived lipids: Fatty acids - Classification & Properties fatty acids, Steroids & sterols

3.2.7.5 Micelle, Liposomes

### 3.2.8 Chemistry of Proteins

3.2.8.1 Definition, classification & properties of amino acids

3.2.8.2 Definition, classification & properties of proteins

3.2.8.3 Structural organization of proteins

3.2.8.4 Biological significance of amino acids & proteins

3.2.8.5 Plasma proteins, their functions and clinical significance

### 3.2.9 Enzymes

3.2.9.1 Definition, classification,

3.2.9.2 Kinetics, mechanism of enzymatic catalysis.

3.2.9.3 Factors influencing enzymatic catalyses, enzyme activators and inhibitors.

3.2.9.4 Regulation of enzyme activity,

3.2.9.5 Iso-enzymes & clinical enzymology

### 3.2.10 Vitamins

3.2.10.1 Definition and classification of vitamins

3.2.10.2 Brief account of chemistry, source, RDA, biochemical functions, deficiency diseases, Vitamin antagonists and hypervitaminosis of each vitamin

### 3.2.11 Mineral metabolism

3.2.11.1 Classification of minerals

3.2.11.2 Brief account of chemistry, source, RDA, biochemical functions, deficiency diseases of each mineral

### 3.2.12 Digestion and absorption

3.2.12.1 Digestion and absorption of carbohydrates

3.2.12.2 Digestion and absorption of lipids

3.2.12.3 Digestion and absorption of proteins.

### 3.2.13 Carbohydrate Metabolism

3.2.13.1 Major metabolic pathways: Glycolysis, pyruvate oxidation, Citric acid cycle, Gluconeogenesis, HMP Shunt pathway & glycogen metabolism

3.2.13.2 Minor metabolic pathways: Metabolism of Fructose and Galactose,

3.2.13.3 Regulation of blood sugar, glucose tolerance test, Diabetes mellitus & other disorders of carbohydrate metabolism.

### 3.2.14 Biologic Oxidation

3.2.14.1 Redox potential

3.2.14.2 High energy compounds

3.2.14.3 Oxidative Phosphorylation

3.2.14.4 Electron transport chain

### 3.2.15 Lipid metabolism

3.2.15.1 Biosynthesis and degradation of fatty acids

3.2.15.2 Metabolism of cholesterol

3.2.15.3 Ketone bodies: their synthesis, utilization and conditions leading to ketoacidosis

3.2.15.4 Chemistry and metabolism of lipoproteins, hyper lipoproteinemias

3.2.15.5 Prostaglandins

3.2.15.6 Fatty liver, Obesity & other lipid storage disease.

### 3.2.16 Protein metabolism

3.2.16.1 Overview of protein metabolism

3.2.16.2 Nitrogen balance

3.2.16.3 Formation and disposal of ammonia

3.2.16.4 General metabolism of amino acids

3.2.16.5 Inborn errors of amino acid metabolism

3.2.17 Molecular biology

3.2.17.1 Chemistry of Nucleic acids: Definition, classification, composition of nucleic acids; Structure and function of DNA ; Types, structure & functions of RNA

3.2.17.2 Metabolism of Nucleic acids : Synthesis and breakdown of purines; Synthesis and breakdown of pyrimidine

3.2.17.3 DNA Replication, Inhibitors of DNA replication

3.2.17.4 DNA Transcription & Post-transcriptional processing.

3.2.17.5 Genetic code

3.2.17.6 Protein synthesis, inhibitors of protein synthesis & Post-translational processing

3.2.18 Integration of metabolism

3.2.18.1 Metabolic effects of insulin & glucagon

3.2.18.2 The feed/fast cycle

3.2.18.3 Biochemistry of starvation

3.2.19 Biochemistry of blood

3.2.19.1 Porphyrins, Synthesis and degradation of heme; Porphyria; Jaundice

3.2.19.2 Structure & functions of hemoglobin

3.2.19.3 Abnormal hemoglobins & hemoglobinopathies

3.2.19.4 Plasma Proteins

3.2.19.5 Immunoglobulins

3.2.19.6 Blood pH & its regulation

3.2.19.7 Role of kidney and lungs in maintaining pH of blood

3.2.19.8 Acidosis and Alkalosis

3.2.20 Energy metabolism and Nutrition

3.2.20.1 Calorific value of foods

3.2.20.2 Basal metabolic rate and its importance

3.2.20.3 Specific dynamic action

3.2.20.4 Energy requirements for physical activity

3.2.20.5 Balanced diet; Role of carbohydrates, proteins & lipids

3.2.20.6 Nutritive value of proteins, protein-energy malnutrition (PEM)

3.2.21 Clinical biochemistry

3.2.21.1 Tools of biochemistry

3.2.21.2 Liver function tests

3.2.21.3 Renal function tests

3.2.22 Environmental biochemistry

3.2.22.1 Environmental pollutants

3.2.22.2 Xenobiotics, interaction with biomolecules, effects & metabolism

3.2.22.3 Biochemical characteristics of cancer and carcinogenesis

### 3.3 **Practicals**

3.3.1 **Qualitative Experiments**

3.3.1.1 General reactions Carbohydrates

3.3.1.1.1 Reactions of monosaccharides - glucose and fructose

3.3.1.1.2 Reactions of disaccharides - lactose, maltose and sucrose

3.3.1.1.3 Reactions of polysaccharides - starch and dextrin

**3.3.1.2** General reactions of proteins (albumin, casein and gelatin)

3.3.1.2.1 Colour reactions of proteins

3.3.1.2.2 Precipitation & coagulation reactions of proteins

**3.3.1.3** General reactions of non-protein-nitrogen compounds (N P N) - Urea, Uric acid and creatinine

**3.3.1.4** Analysis of Urine.

3.3.1.4.1 Analysis of normal urine.

3.3.1.4.2 Analysis of abnormal urine.

**3.3.2 Quantitative Experiments**

3.3.2.1 Blood Sugar estimation by Glucose Oxidase method

**3.3.3 Demonstrative Experiments**

**3.3.3.1** Colorimetry and colorimeter

3.3.3.1.1 Estimation of concentration of serum Cholesterol

3.3.3.1.2 Estimation of concentration of serum Urea

3.3.3.1.3 Estimation of concentration of serum Uric acid

3.3.3.1.4 Estimation of concentration of serum triglycerides

3.3.3.1.5 Estimation of concentration of serum calcium

**3.3.3.2** Paper chromatography

**3.3.3.3** Electrophoresis

**3.3.3.4** Glucose tolerance test (GTT)



### 3.4 **Text Books**

#### 3.4.1 **Recommended text books for Biochemistry**

- 3.4.1.1 Text book of Biochemistry - by U. Sathyanarayana, U Chakrapani
- 3.4.1.2 Text book of Biochemistry – by DM Vasudevan, Sreekumari S
- 3.4.1.3 Lippincott’s Illustrated Reviews- Biochemistry by Pamela C Champe,  
Richard A Harvey
- 3.4.1.4 Textbook of Medical Laboratory Technology by Praful B Godkar, Darshan  
P Godkar
- 3.4.1.5 Essentials of Biochemistry by PankajNaik

#### 3.4.2 **Reference Books for Biochemistry**

- 3.4.2.1 Harper’s Illustrated Biochemistry, Robert K. Murray, Daryl K. Granner,  
and Victor W. Rodwell.
- 3.4.2.2 Biochemistry. Lubert Stryer. W.H. Freeman and Company, New York.
- 3.4.2.3 Principles of Biochemistry. Ed. Lehinger, Nelson and Cox. CBS  
Publishers and distributors.
- 3.4.2.4 Textbook of Biochemistry with Clinical Correlations. Ed. Thomas M.  
Devlin, Wiley-Liss Publishers.
- 3.4.2.5 Tietz Textbook of Clinical Chemistry. Ed. Burtis and Ashwood. W.B.  
Saunders Company.
- 3.4.2.6 Biochemistry. Ed. Donald Voet and Judith G. Voet. John Wiley & Sons,  
Inc
- 3.4.2.7 Text book of Biochemistry - by West and Todd.
- 3.4.2.8 Laboratory Manual of Biochemistry by Pattabhirama and Acharya.

### 3.5 Scheme Of Examination

S.N	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01.	Biochemistry	80	20	30	130	60	10	70	200

## 4. PHILOSOPHY OF NATUROPATHY

### 4.1 Goals and Objectives

#### 4.1.1 **Goals:**

The goals of introducing philosophy of Naturopathy to the undergraduate students is to make them understand philosophical basis of the system of Naturopathy, including concepts of health, causes and pathogenesis of disease and brief introduction to the various therapeutic modalities used in Naturopathy.

#### 4.1.2 **Objectives**

##### 4.1.2.1 **Knowledge**

After completion of the course, the student shall be able to:

- 4.1.2.1.1 Elucidate the history of Naturopathy including major contributors to the field and their work;
- 4.1.2.1.2 Understand the evolution and composition of the human body according to different schools of medicine such as Naturopathy, *Yoga, Ayurveda*, Homeopathy, Modern Medicine, etc.
- 4.1.2.1.3 Firmly establish his/her diagnostic and therapeutic thought processes in the fundamental principles of Naturopathy:
- 4.1.2.1.4 Laws of nature according to Henry Lindlahr
- 4.1.2.1.5 Concepts of health and disease according to Naturopathy
- 4.1.2.1.6 Ten basic principles of Naturopathy
- 4.1.2.1.7 Concept of *Panchamahabhuthas* and Naturopathy
- 4.1.2.1.8 Foreign matter, toxin accumulation, theory of Toxemia, Unity of disease and Unity of Cure
- 4.1.2.1.9 Concept of vitality

- 4.1.2.1.10 *Panchatantras, Shareera Dharmas*
- 4.1.2.1.11 Holistic approach of Naturopathy
- 4.1.2.1.12 Modern perspectives of Naturopathy
- 4.1.2.1.13 Natural rejuvenation
- 4.1.2.1.14 Understand naturopathic viewpoints of concepts like hygiene, vaccination, family planning, personal life and prevention of diseases, geriatrics, etc, and implement them in his/her practice
- 4.1.2.1.15 Understand Principles behind using the diagnostic procedures of Naturopathy, like spinal diagnosis, facial diagnosis, iris diagnosis, and chromo diagnosis.
- 4.1.2.1.16 Demonstrate knowledge of recent advances and research in Naturopathy principles/theories.

#### **4.1.2.2 Skills**

At the end of the course, the student will be able to:

- 4.1.2.2.1 Demonstrate basic knowledge of the various therapeutic modalities utilised in Naturopathy;
- 4.1.2.2.2 Describe the various principles of Naturopathy with respect to the body, health, disease and therapy.

#### **4.1.2.3 Integration**

The integrated knowledge of philosophy of Naturopathy will help the students to integrate concepts of human body in health and disease with respect to Naturopathy in terms of diagnosis and management.

## 4.2 **Theory (Duration: 18 months)**

**Total hours: 500 (Theory: 300 Practical: 200)**

- 4.2.1 The Medical Profession & Medical Evolution- an Introduction
- 4.2.2 Concept of Health & Disease through the ages
- 4.2.3 The Human Body
  - 4.2.3.1 The evolution of human body
  - 4.2.3.2 Philosophy of the body, mind, soul, life, spirit and spiritual body with reference to various cultures, philosophies, Vedas and Modern view
  - 4.2.3.3 Composition of the human body, according to *Ayurveda*, Naturopathy, *Yoga*, Modern Medicine, Homeopathy
- 4.2.4 An Introduction to Nature Cure or Naturopathy- Definitions, concepts & theories of various pioneers in the field
- 4.2.5 History of Naturopathy & Philosophy of Naturopaths
  - 4.2.5.1 Chronological highlights of Naturopathy
  - 4.2.5.2 Philosophy of Indian Naturopaths.
    - 4.2.5.2.1 Vegiraju Krishnamaraju
    - 4.2.5.2.2 Vinoba Bhave
    - 4.2.5.2.3 Mahatma Gandhi.
    - 4.2.5.2.4 Dr. S. J. Singh
    - 4.2.5.2.5 Dr. J. M. Jussawala
  - 4.2.5.3 Philosophy of Foreign Naturopaths.
    - 4.2.5.3.1 Aesculapius
    - 4.2.5.3.2 Hippocrates
    - 4.2.5.3.3 The School of Salerno
    - 4.2.5.3.4 Paracelsus.

- 4.2.5.3.5 Vincent Priessnitz
- 4.2.5.3.6 Sebastian Kneipp
- 4.2.5.3.7 Arnold Rickli
- 4.2.5.3.8 Louis Kuhne
- 4.2.5.3.9 Adolf Just
- 4.2.5.3.10 John H Tilden
- 4.2.5.3.11 Sigmund Freud
- 4.2.5.3.12 Henry Lindlahr

#### **4.2.6 Fundamental principles, concepts & theories of Naturopathy.**

- 4.2.6.1** Laws of Nature according to Henry Lindlahr
- 4.2.6.2** Catechism of Nature Cure according to Henry Lindlahr
- 4.2.6.3** Concepts of Health according to Naturopathy
- 4.2.6.4** Concepts of Disease according to Naturopathy
- 4.2.6.5** The 10 basic principles of Naturopathy
- 4.2.6.6** Principles of Natural Medicine in the West
  - 4.2.6.6.1 The Healing Power of Nature (*Vis Medicatrix Naturae*)
  - 4.2.6.6.2 Identify and Treat the Causes (*Tolle Causam*)
  - 4.2.6.6.3 First Do No Harm (*Primum Non Nocere*)
  - 4.2.6.6.4 Doctor as Teacher (*Docere*)
  - 4.2.6.6.5 Treat the Whole Person
  - 4.2.6.6.6 Prevention
  - 4.2.6.6.7 Herring's law of cure
- 4.2.6.7** Concept of *Panchamahabhootas* & Naturopathy
- 4.2.6.8** Foreign matter and toxins accumulation in the body and its importance in elimination through different ways or channels.

- 4.2.6.9 Unity of disease, Unity of cure and way of treatment.
  - 4.2.6.10 Theory of Toxemia- Toxins and anti-toxins, their generation, mitigation in nature cure way
  - 4.2.6.11 Concept of Vitality & Vital economy
  - 4.2.6.12 How Nature Cures- The Natural healing mechanisms
  - 4.2.6.13 *Arogya Rakshak Panchatantras* and their importance in maintenance of good health prevention of diseases and treatment of diseases through lifestyle modification.
  - 4.2.6.14 *Shareera Dharmas – Ahara, Nidra Bhaya, Maithuna*
  - 4.2.6.15 Natural Immunity & how to acquire natural immunity in diseases.
  - 4.2.6.16 Inflammation- Naturopathic perspective.
  - 4.2.6.17 Naturopathy: a blend of Drugless Therapies
  - 4.2.6.18 Holistic approach of Naturopathy
  - 4.2.6.19 Modern perspectives of Naturopathic Medicine
    - 4.2.6.19.1 Understanding Homeostasis
    - 4.2.6.19.2 Metabolism of Xenobiotics
    - 4.2.6.19.3 Aging, Free Radicals and Antioxidants
  - 4.2.6.20 Hygiene & importance of physical and mental hygiene in health and disease
  - 4.2.6.21 Vaccinations and inoculation – The Naturopathic view.
  - 4.2.6.22 Family planning by Natural therapeutics.
- 4.2.7 Introduction to The Diagnostic procedures in Naturopathy
    - 4.2.7.1 Spinal Analysis
    - 4.2.7.2 Facial Diagnosis
    - 4.2.7.3 Iris Diagnosis

- 4.2.7.4 Chromo Diagnosis
- 4.2.8 Natural rejuvenation
- 4.2.9 Personal life and prevention of diseases
- 4.2.10 Geriatrics and Naturopathy
- 4.2.11 Introduction to various systems of Medicine
  - 4.2.11.1 Modern Medicine
  - 4.2.11.2 *Ayurveda*
    - 4.2.11.2.1 Introduction
    - 4.2.11.2.2 Definition of *Prakriti* and its categories.
    - 4.2.11.2.3 *Swastha Vrittam*
      - 4.2.11.2.3.1 *Dinacharya*
      - 4.2.11.2.3.2 *Ratricharya*
      - 4.2.11.2.3.3 *Ritucharya*
      - 4.2.11.2.3.4 *Vegadharanam*
  - 4.2.11.3 Homeopathy
  - 4.2.11.4 *Unani*
  - 4.2.11.5 *Siddha*
- 4.2.12 Comparative study of Naturopathy with other systems of Medicine
- 4.2.13 Basic essentials of a Naturopathy practitioner - an introduction to qualities of a Naturopathy & *Yoga* Practitioner, Approach to the Patient with a Naturopathy view, Ethical considerations, Understanding the Scope & Limitations
- 4.2.14 Recent Advances in Naturopathy & *Yoga*
  - 4.2.14.1 Introduction to Psychosomatic Diseases & Psychoneuroimmunology
  - 4.2.14.2 Introduction to Mind-Body Medicine
  - 4.2.14.3 Lifestyle & psychosocial behavior



#### 4.2.14.4 Introduction to Integrative Medicine

#### 4.2.15 An introduction to Research & its importance in Naturopathy

### 4.3 **Practical**

Students should be introduced to various treatment procedures used in Naturopathy. Brief outlines of the following therapies in naturopathy including understanding the basic classification & procedure through observation and demonstration:

#### 4.3.1 Fasting

#### 4.3.2 Exercises

#### 4.3.3 Rest and relaxation

#### 4.3.4 Regular habits like sun bath, barefoot walking on grass

#### 4.3.5 Hydrotherapy

##### 4.3.5.1 Baths

##### 4.3.5.1.1 Hip-bath

##### 4.3.5.1.2 Spinal bath

##### 4.3.5.1.3 Steam bath

##### 4.3.5.1.4 Foot bath

##### 4.3.5.1.5 Full Immersion bath

##### 4.3.5.2 Packs

##### 4.3.5.2.1 Chest pack

##### 4.3.5.2.2 Abdominal pack

##### 4.3.5.2.3 Gastro-Hepatic pack

##### 4.3.5.2.4 Kidney Pack

##### 4.3.5.2.5 Full wet-sheet pack

#### 4.3.6 Internal Application of Water

##### 4.3.6.1 Enema

- 4.3.6.2 Colon Hydrotherapy
- 4.3.6.3 Water Drinking
- 4.3.7 Mud Therapy
- 4.3.8 Balneotherapy
- 4.3.9 Heliotherapy & Chromo therapy
- 4.3.10 Massage Therapy
- 4.3.11 Magneto therapy
- 4.3.12 Chiropractic
- 4.3.13 Osteopathy
- 4.3.14 Physiotherapy
- 4.3.15 Nutrition & Dietetics with special emphasis on Natural Diet
- 4.3.16 Acupuncture, Acupressure & Reflexology
- 4.3.17 Aromatherapy
- 4.3.18 Bio feed back

#### **Detoxification Techniques**

- Demonstration of enemas and colon cleansing methods.
- Nasal cleansing (Jal Neti, Sutra Neti).
- Body scrubs and dry brushing for lymphatic drainage

#### **Nature Cure Treatments**

- Sunbathing and heliotherapy techniques.
- Training in earthing or grounding practices.
- Air therapy (Pranayama outdoors, oxygen therapy).

#### **Counselling and Lifestyle Management**

- Case studies on holistic health counseling.
- Teaching stress management techniques.
- Promoting positive mental health practices.

#### **Case Studies and Clinical Practice**

- Conducting patient consultations and assessments.
- Designing personalized treatment plans.
- Documenting progress and follow-ups.

A Practical Record book should be maintained to document the above observations.

#### 4.4 Text Books

4.4.1	Philosophy of Nature Cure	Henry Lindlahr
4.4.2	Practice of Nature Cure	Henry Lindlahr
4.4.3	Human Culture and Cure	Dr. E.D. Babbitt
4.4.4	Practical Nature Cure	K. Laxman Sharma
4.4.5	History and Philosophy of Nature Cure	S.J. Singh
4.4.6	My Nature Cure	M.K. Gandhi
4.4.7	Natural Health Care – A to Z	Belinda Gran
4.4.8	Introduction to Natural Hygiene	Herbert.M.Shelton
4.4.9	Text book of Natural Medicine	Joseph E. Pizzorno & Michael T. Murray
4.4.10	Nature Cure treatments	Jindal
4.4.11	Complete handbook of Nature cure	H. K. Bakhru
4.4.12	Toxemia	J. H. Tilden
4.4.13	Return to Nature	Adolf Just

#### 4.5 Reference Books

4.5.1	My Nature Cure or Practical Naturopathy	S.J. Singh
4.5.2	The Science of Facial Expression	Louis Kuhne
4.5.3	The Story of My Experiments With Truth	M.K Gandhi
4.5.4	<i>Ayurveda</i> for health and long life	Dr.R.K.Garde
4.5.5	Fundamentals of <i>Ayurveda</i>	K. N. Udupa
4.5.6	Siddha Medicine	Ram Murthy
4.5.7	Homeopathic Philosophy	Kent

4.5.8	Everybody's Guide to Nature Cure	Harry Benjamin
4.5.9	Prayer	M.K.Gandhi
4.5.10	Diet and Diet Reforms	M.K.Gandhi
4.5.11	Panchatantra	Venkat Rao
4.5.12	Nature Cure	J.N. Jussawalla
4.5.13	The Encyclopedia of Natural Medicine	Joseph E. Pizzorno & Michael T. Murray

#### 4.6 **Scheme Of Examination**

S.N O	Subject	Theo -ry	Intern -al Assm t	Viva- Voce	Total	Practi -cals	Inter- nal Assm t	Total Mark s	Gran d Total Mark s
01.	Philosophy of Naturopathy	80	20	30	130	60	10	70	200

## 5. **PRINCIPLES OF YOGA**

### 5.1 Goals and Objectives

#### 5.1.1 **Goal:**

The goal of teaching *Yoga* to undergraduate students is to familiarize them with basic principles of *Yoga* with respect to history, definitions, philosophy and practices of *Yoga*, with emphasis of *AshtangaYoga*.

#### 5.1.2 **Objectives:**

##### 5.1.2.1 **Knowledge:**

After the completion of the course, the student shall be able to:

- 5.1.2.1.1 Explain the various definitions of *Yoga*, history of *Yoga* and branches of *Yoga* ;
- 5.1.2.1.2 Describe kinds of *Yogasanas*, its importance, methods, rules, regulations and limitations;
- 5.1.2.1.3 Illustrate the various limbs of *Ashtanga Yoga*;
- 5.1.2.1.4 Demonstrate knowledge of *pranayamas*, *prana* and lifestyle, breathing and lifespan.

##### 5.1.2.2 **Skills:**

After the completion of the course, the student shall be able to:

- 5.1.2.2.1 Demonstrate various types of *Yogasanas* in their correct method of performance;
- 5.1.2.2.2 Demonstrate different *pranayamas*.
- 5.1.2.2.3 Explain about the definitions, origin, branches of *Yoga*.

##### 5.1.2.3 **Integration**

At the completion of training, the student should be able to comprehend the basic principles of *Yoga*.

## 5.2 **Theory (Duration: 12 months)**

**Total hours: 450 (Theory: 250 Practical: 200)**

- 5.2.1 What is *Yoga* and various definitions of *Yoga*.
- 5.2.2 History of *Yoga* (Relative chronology, *Yoga* before the time of *Patanjali*, Indus Valley Civilization).
- 5.2.3 Outlines on branches of *Yoga* – *Raja*, *Hatha*, *Jnana*, *Karma*, *Bhakti*, *Mantra*, *Kundalini* and *Laya*.
- 5.2.4 Introduction to *Yogasanas*
  - 5.2.4.1 Definition of *Yogasanas*
  - 5.2.4.2 *Yogasanas* and *Prana*
  - 5.2.4.3 *Yogasanas* and *Kundalini*
  - 5.2.4.4 *Yogasanas* and the mind-body connection
  - 5.2.4.5 *Yogasanas* and Exercises
- 5.2.5 Classifications of *Yogasanas* – Beginners group, Intermediate group, Advanced group, dynamic and static *Yogasanas*.
- 5.2.6 Introduction to *Pranayama*
  - 5.2.6.1 Definition
  - 5.2.6.2 *Prana* and lifestyle
  - 5.2.6.3 Breath, health and *Pranayama*
  - 5.2.6.4 Breathing and Lifespan
  - 5.2.6.5 *Pranayama* and spiritual aspiration
- 5.2.7 Introduction to *AshtangaYoga*
  - 5.2.7.1 *Yama*
  - 5.2.7.2 *Niyama*
  - 5.2.7.3 *Asana*

5.2.7.4 *Pranayama*

5.2.7.5 *Pratyahara*

5.2.7.6 *Dharana*

5.2.7.7 *Dhyana*

5.2.7.8 *Samadhi*

(Concept only – as orientation/introduction)

5.2.8 *Asanas* – their importance, methods, rules, regulations and limitations.

5.2.9 Meditative postures

5.2.9.1 *Padmasana*

5.2.9.2 *Siddhasana*

5.2.9.3 *Vajrasana*

5.2.9.4 *Sukhasana*

5.2.10 Cultural postures

5.2.10.1 *Halasana*

5.2.10.2 *Dhanurasana*

5.2.10.3 *Sarvangasana*

5.2.10.4 *Paschimottanasana*

5.2.10.5 *Trikonasana*

5.2.11 Relaxation postures

5.2.11.1 *Shavasana*

5.2.11.2 *Makarasana*

5.2.11.3 *Sitali Dandasana*

5.2.11.4 *Sitali Tadasana*

5.2.12 *Suryanamaskara*

### 5.3 **Practical**

5.3.1 Joint movements

5.3.2 Loosening exercises

5.3.3 *Sukshma Vyayama*

5.3.4 Stretchings

5.3.5 Breathing exercises

5.3.6 *Suryanamaskara*

5.3.7 *Asanas*

#### 5.3.7.1 Standing

5.3.7.1.1 *Tadasana*

5.3.7.1.2 *Ardha Kati Chakrasana*

5.3.7.1.3 *Kati Chakrasana*

5.3.7.1.4 *Trikonasana*

5.3.7.1.5 *Vrikshasana*

5.3.7.1.6 *Utthita Trikonasana*

5.3.7.1.7 *Veerabhadrasana*

5.3.7.1.8 *Parsvottanasana*

5.3.7.1.9 *Parighasana*

#### 5.3.7.2 Supine

5.3.7.2.1 *Shavasana*

5.3.7.2.2 *Matsyasana*

5.3.7.2.3 *Sarvangasana*

5.3.7.2.4 *Halasana*

5.3.7.2.5 *Chakrasana*

5.3.7.2.6 *Pawanamuktasana*



- 5.3.7.2.7 *Setubandhasana*
- 5.3.7.2.8 *Parvottanasana*
- 5.3.7.2.9 *Vipareetakarani*
- 5.3.7.2.10 *Karnapedasana*
- 5.3.7.2.11 *Suptakonasana*

### **5.3.7.3 Prone**

- 5.3.7.3.1 *Makarasana*
- 5.3.7.3.2 *Bhujangasana – 1 and 2*
- 5.3.7.3.3 *Ardha Shalabhasana*
- 5.3.7.3.4 *Shalabhasana – 1*
- 5.3.7.3.5 *Dhanurasana*
- 5.3.7.3.6 *Adho mukha svanasana*

### **5.3.7.4 Sitting**

- 5.3.7.4.1 *Vakrasana*
- 5.3.7.4.2 *Ardhamatsyendrasana*
- 5.3.7.4.3 *Paschimottanasana*
- 5.3.7.4.4 *Ushtrasana*
- 5.3.7.4.5 *Vajrasana*
- 5.3.7.4.6 *Padmasana*
- 5.3.7.4.7 *Baddha Padmasana*
- 5.3.7.4.8 *Supta Vajrasana*
- 5.3.7.4.9 *Ardha Navasana*
- 5.3.7.4.10 *Gomukhasana*
- 5.3.7.4.11 *Veerasana*
- 5.3.7.4.12 *Baddha Konasana*

5.3.7.4.13 *Janusirshasana*

5.3.7.4.14 *Upavista Konasana*

5.3.7.4.15 *Shashankasana*

### 5.3.8 *Pranayama*

5.3.8.1 *Bhastrika*

5.3.8.2 *Sheetkari*

5.3.8.3 *Sheetali*

5.3.8.4 *Anuloma Viloma*

5.3.8.5 *Ujjayi*

5.3.8.6 *Bhramari*

### 5.3.9 *Kriya*

5.3.9.1 *Jala neti*

5.3.9.2 *Sutra neti*

5.3.9.3 *Vamana dhauti*

#### 5.4 **Textbooks**

5.4.1 Basis and definitions of *Yoga* – Vivekananda Kendra

5.4.2 *Asanas* – Swami Kuvalyananda

5.4.3 The gospel of Buddha – Parul Caruso

5.4.4 The Gospel of Shri Ramakrishna – Mahendranatha Gupta

5.4.5 Complete works of Shri Aurobindo

5.4.6 *Asanas, Pranayama, Bandhas, Mudras* – Swami Satyananda Saraswati

5.4.7 *Hatha YogaPradipika* – Swami Svatmarama

5.4.8 *Raja, Hatha, Jnana, BhaktiYoga* – Swami Vivekananda

#### 5.5 **Scheme Of Examination**

S.N	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01.	Principles of <i>Yoga</i>	80	20	30	130	60	10	70	200

## **2. PATHOLOGY**

### **2.1 Goals and Objectives**

#### **2.1.1 Goal:**

The goal of teaching pathology to undergraduate students is to provide a comprehensive knowledge of the mechanisms and causes of disease, so that he/she is able to comprehend fully the natural history and clinical manifestations of disease.

#### **2.1.2 Objectives:**

##### **2.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 2.1.2.1.1 Explain the structure and ultra-structure of a sick cell, mechanism of cell degeneration, cell death and repair and be able to correlate structural and functional alterations.
- 2.1.2.1.2 Describe the pathophysiological processes which govern the maintenance of homeostasis, mechanisms of their disturbance and the morphological and clinical manifestations associated with it;
- 2.1.2.1.3 Delineate the mechanisms and patterns of tissue response to injury such that he/she can appreciate the pathophysiology of disease processes and their clinical manifestations;
- 2.1.2.1.4 Correlate normal and altered morphology (gross and microscopic) of different organ systems in common diseases to the extent needed for understanding of disease processes and their clinical significance.

### **2.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 2.1.2.2.1 Elaborate on principles, procedures and interpretation of results of diagnostic laboratory tests;
- 2.1.2.2.2 Perform with proper procedure simple bed side tests on biological fluid samples like blood, urine etc.
- 2.1.2.2.3 Prepare investigation flow-charts for diagnosing and managing common diseases;
- 2.1.2.2.4 Identify biochemical and physiological disturbances in diseases;

### **2.1.2.3 Integration**

At the completion of training, the student must be capable of integrating relationships between etiological factors such as social, economic and environmental in the natural history of common diseases in India.

## **2.2 Pathology – I (Duration: 12 months)**

**Total hours: 350 (Theory: 250 Practical: 100)**

2.2.1 History and Scope

2.2.2 Definition and various branches

2.2.3 Scientific study of disease and methodology

2.2.4 The cell and the reaction of cell, tissue and organ to injury

2.2.4.1 Structure and functions of cell

2.2.4.2 Causes and nature of cell injury

- 2.2.4.3 Toxic substances, physical agents and lack of nutrients
- 2.2.4.4 Infectious agents and parasites
- 2.2.4.5 Immune mechanisms and genetic defects
- 2.2.5 Reaction of cell to injurious agents**
  - 2.2.5.1 Lethal injury – necrosis and gangrene
  - 2.2.5.2 Sub lethal injury
    - 2.2.5.2.1 Cloudy swelling
    - 2.2.5.2.2 Fatty changes in liver, heart and kidney
    - 2.2.5.2.3 Glycogen infiltration and hyaline degeneration
    - 2.2.5.2.4 Lipid degeneration Gaucher's disease
    - 2.2.5.2.5 Muroid degeneration
  - 2.2.5.3 Excessive or abnormal accumulations – i) amyloid
  - 2.2.5.4 Pathological calcification
- 2.2.6 Inflammation and Repair**
  - 2.2.6.1 Definition, classification and nomenclature
  - 2.2.6.2 Acute inflammation
  - 2.2.6.3 Vascular and cellular phenomenon, cells of exudates chemical mediators and tissue changes in acute inflammation, cardinal signs of acute inflammation
  - 2.2.6.4 Fate, types and systemic effects of acute inflammation
- 2.2.7 Chronic Inflammation**
  - 2.2.7.1 Difference between acute and chronic inflammation
  - 2.2.7.2 Definition of Granuloma
- 2.2.8 Wound healing**

- 2.2.8.1 Restitution, regeneration and repair
- 2.2.8.2 Repair of epithelial and mesenchymal tissue
- 2.2.8.3 Primary union and secondary union
- 2.2.8.4 Mechanism involved and factors modifying repair process
- 2.2.9 Granulomas**
  - 2.2.9.1 Classification
  - 2.2.9.2 Tuberculosis, genesis and fate of tubercle, primary and secondary tuberculosis
  - 2.2.9.3 Definition, classification and pathology of leprosy
  - 2.2.9.4 Acquired primary, secondary and tertiary stages syphilis
  - 2.2.9.5 CNS syphilis, CVS syphilis and tertiary stages syphilis
  - 2.2.9.6 Actinomycosis, maduramycosis, rhinosporidiosis
- 2.2.10 Fluid and Hemodynamic Changes (circulatory disturbances)**
  - 2.2.10.1 Hyperemia, congestion and hemorrhage
  - 2.2.10.2 Thrombosis, embolism, DIC
  - 2.2.10.3 Ischemia, infarction and shock
- 2.2.11 Immunopathology**
  - 2.2.11.1 Basic pathological mechanism in autoimmune disorders
  - 2.2.11.2 Concept of immunodeficiency disorders
  - 2.2.11.3 Pathology of AIDS
  - 2.2.11.4 Growth disorders and definitions
- 2.2.12 Growth disorders**
  - 2.2.12.1 Definition of agenesis, aplasia, atrophy, hyperplasia, hypertrophy, hypoplasia, metaplasia

2.2.12.2 Concept of dysplasia, anaplasia and carcinoma in-situ

**2.2.13 Neoplasia**

2.2.13.1 Definition, classification and nomenclature

2.2.13.2 Characteristic features of benign and malignant tumors

2.2.13.3 Route of spread of malignant tumors

2.2.13.4 Grading and staging of cancers and pre-cancerous conditions

2.2.13.5 Carcinogenesis and carcinogens

2.2.13.6 Effect of tumor on host, and effect of host on tumors

2.2.13.7 Laboratory diagnosis of cancer – Biopsy, exfoliative cytology, prognostic prediction in cancer

2.2.13.8 Description of common tumors like – Fibroma, Lymphoma, Lipoma, Angioma, Leiomyoma, Fibrosarcoma, Lymphosarcoma, Liposarcoma, Angiosarcoma, and Leiomyosarcoma

2.2.13.9 Embryonal tumors like teratoma and retinoblastoma

**2.2.14 Mineral and Pigment Metabolism**

2.2.14.1 Pathology of melanin pigment

2.2.14.2 Pathology of hemoglobin and its derivatives

2.2.14.3 Hemosiderosis and hemochromatosis

**2.2.15 Genetic disorders**

2.2.15.1 Klinefelter's Syndrome, Turner's Syndrome, Down's Syndrome



## **2.3 Pathology – II (Duration: 12 months)**

### **2.3.1 Disorders of RBC**

- 2.3.1.1 Definition, morphologic and etio-pathologic classification of anemia
- 2.3.1.2 Iron deficiency anemia, B12 and folate deficiency anemia, sideroblastic anemia, post-hemorrhagic anemia
- 2.3.1.3 Concept and classification of hemolytic anemia
- 2.3.1.4 Acquired hemolytic anemia and aplastic anemia
- 2.3.1.5 Polycythemia
- 2.3.1.6 Laboratory investigations in anemia

### **2.3.2 Disorders of WBC**

- 2.3.2.1 Leukopenia, Leukocytosis
- 2.3.2.2 Leukemia, Agranulocytosis and Tropical eosinophilia

### **2.3.3 Coagulation and bleeding disorders**

- 2.3.3.1 Structure, function and pathology of platelets
- 2.3.3.2 Definition and classification of blood dyscrasias
- 2.3.3.3 Laboratory investigations in bleeding disorders

### **2.3.4 Diseases of cardiovascular system**

- 2.3.4.1 Arteriosclerosis and atherosclerosis
- 2.3.4.2 Aneurysm
- 2.3.4.3 Vasculitis and thromboangitis obliterans
- 2.3.4.4 Rheumatic heart disease, endocarditis, myocardial infarction
- 2.3.4.5 Congenital heart diseases, pericarditis
- 2.3.4.6 Congestive cardiac failure

### **2.3.5 Diseases of Respiratory system**

2.3.5.1 Lobar pneumonia, bronchopneumonia, pulmonary tuberculosis

2.3.5.2 Atelectasis, bronchiectasis and pneumoconiosis

2.3.5.3 Chronic Obstructive Pulmonary Diseases (COPD)

2.3.5.4 Bronchial asthma, chronic bronchitis

2.3.5.5 Acute respiratory distress syndrome (ARDS)

2.3.5.6 Tumors of lung and pleura

### **2.3.6 Diseases of gastrointestinal system**

2.3.6.1 Pleomorphic adenoma of salivary gland

2.3.6.2 Barrett's esophagus

2.3.6.3 Gastritis and peptic ulcer and tumors of stomach

2.3.6.4 Inflammatory bowel diseases – Crohn's disease, ulcerative colitis, typhoid  
ulcer, tumors of small intestine

2.3.6.5 Megacolon and tumors of colon

2.3.6.6 Malabsorption syndrome, tropical sprue and celiac tuberculosis

### **2.3.7 Diseases of liver, biliary tract and pancreas**

2.3.7.1 Liver function test and hepatic failure, viral hepatitis

2.3.7.2 Cirrhosis of liver, tumors of liver

2.3.7.3 Cholecystitis, gall stones

2.3.7.4 Acute pancreatitis, diabetes mellitus

2.3.7.5 Cystic fibrosis (mucoviscidosis)

2.3.7.6 Liver abscess and alcoholic liver disease

2.3.7.7 Indian childhood cirrhosis

### **2.3.8 Diseases of Kidney**

2.3.8.1 Renal function tests, renal failure, polycystic kidney

2.3.8.2 Acute glomerulonephritis, crescentic glomerulonephritis, membranous glomerulonephritis, nephritic syndrome

2.3.8.3 Chronic glomerulonephritis, acute tubular necrosis

2.3.8.4 Pyelonephritis, kidney in hypertension

2.3.8.5 Urolithiasis, tumors of kidney and pelvis

### **2.3.9 Diseases of Male Genital System**

2.3.9.1 Orchitis and testicular tumors

2.3.9.2 Nodular hyperplasia of prostate, carcinoma of prostate

2.3.9.3 Carcinoma of penis and lesions of penis

### **2.3.10 Diseases of Female Genital System**

2.3.10.1 Endometrial hyperplasia, adenomyosis and endometriosis

2.3.10.2 Carcinoma of cervix, tumors of ovary

2.3.10.3 Pelvic inflammatory diseases

2.3.10.4 Carcinoma and other diseases of vulva

### **2.3.11 Diseases of Breast**

2.3.11.1 Fibrocystic disease and tumors of breast

2.3.11.2 Gynecomastia

### **2.3.12 Endocrine pathology**

2.3.12.1 Pituitary, acromegaly, hypothyroidism and Grave's disease

2.3.12.2 Thyroiditis, tumors of thyroid and thyroid function tests

2.3.12.3 Hypoparathyroidism and hyperparathyroidism

- 2.3.12.4 Hyperplasia and adenoma of parathyroid
- 2.3.12.5 Adrenal gland, Addison's disease, Cushing's syndrome
- 2.3.12.6 Pheochromocytoma, neuroblastoma
- 2.3.13 Musculoskeletal pathology**
  - 2.3.13.1 Osteomyelitis and osteoporosis
  - 2.3.13.2 Rickets and osteomalacia
  - 2.3.13.3 Osteitis fibrosa cystic and Paget's disease, fibrous dysplasia
  - 2.3.13.4 Tumors of bone
  - 2.3.13.5 Rheumatoid arthritis, Gout
  - 2.3.13.6 Myasthenia gravis and progressive muscular dystrophy
- 2.3.14 Diseases of Nervous System**
  - 2.3.14.1 Meningitis, tumors of CNS
  - 2.3.14.2 Tumors of peripheral nerves
  - 2.3.14.3 Encephalitis
- 2.3.15 Diseases of Lymph nodes and Spleen**
  - 2.3.15.1 Lymphadenopathy
  - 2.3.15.2 Malignant lymphomas and splenomegaly
- 2.3.16 Pathology of skin**
  - 2.3.16.1 Squamous cell carcinoma, basal cell carcinoma
  - 2.3.16.2 Malignant melanoma
  - 2.3.16.3 Warts, molluscum contagiosum
  - 2.3.16.4 Superficial and deep fungal diseases

## 2.4 **Practical**

### 2.4.1 Hematology

- 2.4.1.1 Blood groups (A B O system)
- 2.4.1.2 Estimation of hemoglobin
- 2.4.1.3 Enumeration of RBCs (RBC count)
- 2.4.1.4 Total leucocyte count (Total count)
- 2.4.1.5 Differential leucocyte count (DC)
- 2.4.1.6 Peripheral smear staining and reporting
- 2.4.1.7 Absolute eosinophil count
- 2.4.1.8 Demonstration of
  - 2.4.1.8.1 Hemograms in anemia
    - 2.4.1.8.1.1 Iron deficiency anemia
    - 2.4.1.8.1.2 Macrocytic anemia
    - 2.4.1.8.1.3 Microcytic anemia
    - 2.4.1.8.1.4 Hemolytic anemia
  - 2.4.1.8.2 Hemograms in leukemias
    - 2.4.1.8.2.1 Acute types
    - 2.4.1.8.2.2 Chronic types
- 2.4.1.9 Slide study of
  - 2.4.1.9.1 Acute myeloid leukemia
  - 2.4.1.9.2 Chronic myeloid leukemia
  - 2.4.1.9.3 Chronic lymphatic leukemia

## 2.4.2 Clinical pathology

2.4.2.1 Urine analysis

2.4.2.2 Semen analysis

2.4.2.3 Pregnancy tests

2.4.2.4 Liver function tests

2.4.2.5 Fractional test meal

2.4.2.6 Glucose tolerance test

2.4.2.7 CSF analysis

## 2.5 **Textbooks**

2.5.1 Pathological basis of disease – Robbins, Cotran and Kumar

2.5.2 Textbook of Pathology – NC. Dey

## 2.6 **Reference Books**

2.6.1 Textbook of Pathology – Anderson

2.6.2 Systemic Pathology – Symmers

2.6.3 Medical Laboratory Technology – Ramnik Sood

## 2.7 **Scheme Of Examination**

S.No	Subject	Theo-ry	Intern-al Assmt	Viva-Voce	Total	Practi-cals	Inter-nal Assmt	Total Marks	Grand Total Marks
01.	Pathology	80	20	30	130	60	10	70	200

### **3. MICROBIOLOGY**

#### **2.1 Goals and Objectives**

##### **2.1.1 Goal:**

The goal of teaching microbiology to undergraduate students is to provide a comprehensive knowledge of the natural history, mechanisms and causes of infectious disease, including etiology, pathogenesis, laboratory diagnosis, treatment and control of diseases in the community.

##### **2.1.2 Objectives:**

###### **2.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 2.1.2.1.1 Remember and recall all the infectious micro-organisms of the human body and host-parasite relationship
- 2.1.2.1.2 Describe parasitic micro-organisms (viruses, fungi, bacteria, parasites) with the pathogenesis of the diseases they cause;
- 2.1.2.1.3 Enumerate and illustrate sources and modes of transmission, including insect vectors, of pathogenic and opportunistic organisms;
- 2.1.2.1.4 Describe the pathways and mechanisms of immunity to infection
- 2.1.2.1.5 Acquire knowledge about different vaccines that are available for the prevention of communicable diseases;

2.1.2.1.6 Effectively use sterilization and disinfection to control and prevent nosocomial and community acquired infections;

2.1.2.1.7 Order laboratory investigations for bacteriological examination of food, water and air.

#### **2.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

2.1.2.2.1 Prescribe and interpret laboratory investigations for diagnosis of communicable diseases and identify infectious agents by clinical manifestations;

2.1.2.2.2 Perform common bed-side tests to detect and identify pathogenic agents, such as blood film for malaria, filaria, gram stain and Acid Fast Bacilli (AFB) staining and stool sample for ova cyst, etc.

#### **2.1.2.3 Integration**

3.1 At the completion of training, the student must be knowledgeable about clinical, therapeutic and preventive aspects of diseases most prevalent in India.

#### **3.2 Theory (Duration: 12 months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

3.2.1 Infection and a brief description of Nosocomial infection

3.2.2 Immunology



- 3.2.2.1 Reticuloendothelial system, components and functions of the innate and adaptive immunity
- 3.2.2.2 Role of T and B lymphocytes
- 3.2.2.3 Induction of immune response
- 3.2.2.4 Cell-mediated immune response
- 3.2.2.5 Immunoglobulin structure and functions
- 3.2.2.6 Humoral immune response
- 3.2.2.7 Fate of antigen antibody complex
- 3.2.2.8 Complement system
- 3.2.2.9 Generation of antibody diversity
- 3.2.2.10 Hypersensitivities
- 3.2.2.11 Immunoregulation, autoimmunity, tolerance
- 3.2.2.12 HLA, disease association and transplantation
- 3.2.2.13 Serological and Immunological techniques, application in medicine (vaccines, immunotherapy, immunoassays and immune diagnosis)
- 3.2.2.14 Antibacterial Susceptibility testing
- 3.2.3 Cell as structural unit of life
- 3.2.4 Classification of living organisms
- 3.2.5 Classification of microorganisms
- 3.2.6 Distinctive characteristics of major groups of microorganisms
  - 3.2.6.1 Protozoa
  - 3.2.6.2 Algae
  - 3.2.6.3 Fungi

- 3.2.6.4 Bacteria
- 3.2.6.5 Viruses
- 3.2.7 General bacteriology
  - 3.2.7.1 Bergey's manual of systemic bacteriology
    - 3.2.7.1.1 Gram positive eubacteria: Cocci, endospore forming bacteria, regular shaped rods, irregular shaped rods, mycobacteria, actinomycetes, mycoplasmas
    - 3.2.7.1.2 Gram negative eubacteria: Spirochetes, microaerophilia curved bacteria, aerobic rods and Cocci, facultative rods, anaerobes, rickettsias and Chlamydias
  - 3.2.7.2 Morphology, structure and staining
  - 3.2.7.3 Growth and nutrition of bacteria
  - 3.2.7.4 Sterilization and disinfections
  - 3.2.7.5 Culture media and methods
  - 3.2.7.6 Identification of bacteria
    - 3.2.7.6.1 Phenotypic characteristics – morphology, resistance, metabolism, biochemical test, antigenic structure, typing of bacterial strain, pathogenicity of tests, serological tests, molecular diagnostics
    - 3.2.7.6.2 Bacterial genetics – plasmids, genetic variation
    - 3.2.7.6.3 Mechanism of bacterial pathogenesis
    - 3.2.7.6.4 Bacteriophage
    - 3.2.7.6.5 Systemic bacteriology - Streptococcus, Staphylococcus, Pneumococcus, Gonococci, Meningococcus, Coryne

bacterium, Clostridium, Hemophilus, Mycobacterium, Spirochetes,  
Bordetella, Chlamydia

3.2.7.6.6 Virology- General properties of viruses and their diagnosis.

Study of Herpes, Adenovirus, Picornavirus, Hepatitis virus, Pox virus,  
Rabies, HIV, Poliovirus

3.2.7.6.7 Parasites- Protozoa- Entamoeba and Plasmodium

Helminthology---Ancylostoma, Ascaris, Taenia, Wuchereria

3.2.7.6.8 Mycology—General characteristics and methods used for study  
and diagnosis of fungal infections

Superficial mycoses, Opportunistic mycoses

Systemic mycoses

3.2.7.7 Bacteriology of water

### 3.3 **Practical**

3.3.1 Demonstration of culture media, demonstration of sterilization techniques

3.3.2 Systemic – identification of the pathogen from the given clinical material based  
on staining, property, cultural characters, biochemical and serological tests

3.3.3 Immunology – interpretation of given immunological test

3.3.4 Agglutination – slide, tube and passive agglutination precipitation – VDRL, Elisa

3.3.5 Parasitology – stool examination

3.3.6 Blood smear for malarial parasite and others for identification and interpretation

### 3.4 **Textbooks**

3.4.1 Textbook of microbiology – R Ananthanarayana and CK Jayakumar

3.4.2 Parasitology – Jayaram Panicker

3.4.3 Bacteriology – Dey

3.4.4 Textbook of microbiology – Chakravarthy

3.4.5 Immunology and microbiology – Gupta

### 3.5 **Reference Books**

3.5.1 Parasitology – Chaterjee

3.5.2 Practical microbiology – R Cruick Shank

3.5.3 Clinical microbiology – Bailey & Scott

3.5.4 Medical Laboratory – Manual for tropical countries – Monica Cheesbrough

### 3.6 **Scheme Of Examination**

S.No	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01.	Microbiology	80	20	30	130	60	10	70	200

## **4. COMMUNITY MEDICINE**

### **4.1 Goals and Objectives**

#### **4.1.1 Goal:**

The goal of teaching Community Medicine to undergraduate students is to prepare them to function as community and first level physicians in accordance with the institutional goals.

#### **4.1.2 Objectives:**

##### **4.1.2.1 Knowledge:**

After completion of the course, the student shall be able to:

- 4.1.2.1.1 Describe the health care delivery system including rehabilitation of the disabled in the country;
- 4.1.2.1.2 Describe the National Health Programmes with particular emphasis on maternal and child health programmes, family welfare planning and population control;
- 4.1.2.1.3 List epidemiological methods and describe their applications to communicable and non-communicable diseases in the community or hospital situation;
- 4.1.2.1.4 Apply bio-statistical methods and techniques;
- 4.1.2.1.5 Delineate the demographic pattern of the country and appreciate the roles of the individual family, community and socio-cultural environment in health and disease;
- 4.1.2.1.6 Explain the health information systems;

4.1.2.1.7 Enunciate the principles and components of primary health care and national policies to achieve the goal of 'Health administration, Health education in relation to community'.

4.1.2.1.8 Able to plan a Health Program and able to evaluate a Programme.

4.1.2.1.9 Able to describe principles of organization.

4.1.2.2 **Skills:**

After the end of the course, the student should be able to:

4.1.2.2.1 Use epidemiology as a scientific tool for making national decisions relevant to community and individual patient intervention;

4.1.2.2.2 Collect, Analyse, interpret and present simple community and hospital based data;

4.1.2.2.3 Diagnose and manage common health issues and emergencies at the individual family and community levels with existing healthcare resources, respecting socio-cultural beliefs.

4.1.2.2.4 Diagnose and manage maternal and child health problems and conduct family planning counseling and community programs keeping in mind national priorities;

4.1.2.2.5 Diagnose and manage common nutritional problem at individual and community level;

4.1.2.2.6 Design, implement and evaluate health education program using simple audio-visual aids

4.1.2.2.7 Participate with team members in organising and implementing health care programs;

4.1.2.2.8 Conduct group meetings, give talks on medical issues.

**4.1.2.3 Integration:**

Develop capabilities to form a synthesis between cause of illness in the environment or community and individual health and respond with leadership qualities to institute remedy for the same.

**4.2 Theory (Duration: 12 months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

4.2.1 Man and Medicine: Towards Health for All

4.2.2 Concepts of Health

4.2.2.1 Concept

4.2.2.2 Definitions

4.2.2.3 Dimensions

4.2.2.4 Determinants

4.2.2.5 Positive health

4.2.2.6 Concept of wellbeing

4.2.2.7 Responsibility towards health

4.2.2.8 Health development and its indicators

4.2.2.9 Health science philosophies

4.2.3 Concept of Disease

4.2.3.1 Concepts of causation

4.2.3.2 Natural history of disease

- 4.2.4 Concepts of control and prevention
- 4.2.5 Modes of intervention
- 4.2.6 Population medicine
- 4.2.7 International classification of diseases
- 4.2.8 Principles of epidemiology and epidemiologic methods
  - 4.2.8.1 Definition, basic measurements in epidemiology
  - 4.2.8.2 Epidemiological methods – descriptive, analytical and experimental epidemiology
  - 4.2.8.3 Uses of epidemiology
  - 4.2.8.4 Dynamics of disease transmission
  - 4.2.8.5 Disease prevention and control
  - 4.2.8.6 Investigation of an Epidemic
- 4.2.9 Screening of diseases: Concepts, Uses, Criteria for screening, sensitivity & specificity
- 4.2.10 Epidemiology of communicable diseases
  - 4.2.10.1 Respiratory infections – small pox, varicella, measles, rubella, mumps, influenza, diphtheria, pertussis, tuberculosis, acute respiratory tract infection(ARTI)
  - 4.2.10.2 Intestinal infections – polio, viral hepatitis, cholera, acute diarrheal diseases, typhoid, food poisoning, amoebiasis, ascariasis, ancylostomiasis, taeniasis
  - 4.2.10.3 Arthropod – borne infections – yellow fever, Japanese encephalitis, malaria, filarial
  - 4.2.10.4 Surface infections – rabies, trachoma, tetanus, leprosy, STD, AIDS



- 4.2.11** Epidemiology of non-communicable diseases – cancer, cardiovascular diseases, obesity, blindness, accidents, hypertension, stroke, rheumatic heart disease
- 4.2.12** Demography and Family Planning – Demographic cycle, population trends, fertility related statistics, health aspects of family planning, contraceptive methods and delivery system, National family welfare program.
- 4.2.13** Preventive medicine in Obstetrics, Pediatrics and Geriatrics – Antenatal, Intra natal, Postnatal care, Low birth weight, infant feeding, growth and development, growth chart, under-fives clinic, national health policy, indicators of MCH care, school health services, behavioral problems, geriatrics, Anganwadi ICDS programs.
- 4.2.14** Environmental health and occupational health: Purification of water and water quality standards, air, ventilation, lighting, noise, radiation, air temperature and humidity, housing, solid wastes disposal and control, excretory disposal, water carriage system, modern sewage treatment, entomology-mosquito, housefly, lice, itch mite, Cyclopes, rat flea, rodents, insecticides-hazards, diseases, pre- placement examination, measures for general health, protection of workers, prevention of occupational hazards
- 4.2.15** Basic Medical Statistics: Census, Vital events, legislation, SRS, notification of diseases, measures of dispersion and centering, sampling, tests of significance, correlation and regression
- 4.2.16** Health education and communication: Objectives, principles, aids, practice of Health education, planning and evaluation

- 4.2.17 Health planning – Management – International health organizations: Planning cycle, management methods and techniques, national health policy, health planning in India, five year plans, health systems in India, five year plans, health systems in India – at centre, state and district levels, panchayat raj, rural development schemes
- 4.2.18 Healthcare of community – Health System and National Programs: Levels of healthcare, Health for All, primary healthcare, healthcare delivery, health problems, healthcare services and systems, voluntary health agencies, national health programs
- 4.2.19 Nutrition and Health: Classification of food, vitamin, mineral, carbohydrate, protein, fat, energy balance, balanced diet, nutritional problems in public health, low birth N+PEM, xerophthalmia, nutritional anemia, IDPs, endemic fluorosis, lathyrism, assessment of nutritional status, nutritional surveillance, social aspects of nutritional food hygiene, food-borne disease.
- 4.2.20 International health agencies: WHO, UNICEF, RED CROSS
- 4.2.21 Voluntary health agencies.

### 4.3 **Practical**

- 4.3.1 Posting at any PHC, CHC, RHC or district hospital for National Immunization Program
- 4.3.2 Nutritional Assessment Surveys
- 4.3.3 1 day workshop or awareness program on AIDS with NACO
- 4.3.4 Posting at Blood donation camp
- 4.3.5 Field visits

- 4.3.5.1 Anganwadis
- 4.3.5.2 PHC / CHC / RHC / District hospital and understanding description of existing healthcare services
- 4.3.6 A study on health related problem in the community
- 4.3.7 Family Health Advisory Service
  - 4.3.7.1 To study the family structure & health status of individual members with reference to
    - 4.3.7.1.1 General health status
    - 4.3.7.1.2 Socio-economic status
    - 4.3.7.1.3 Nutritional status
    - 4.3.7.1.4 Environmental
    - 4.3.7.1.5 Immunization status
    - 4.3.7.1.6 Family welfare planning status
- 4.3.8 Health Practices in 4 conditions
  - 4.3.8.1 Pulmonary Tuberculosis
    - 4.3.8.1.1 Index case: occupation, literacy, social status etc
    - 4.3.8.1.2 Preventive measures for other family members
    - 4.3.8.1.3 Health education
  - 4.3.8.2 Antenatal Care
    - 4.3.8.2.1 Literacy of the family and woman
    - 4.3.8.2.2 Customs – social / religious during pregnancy, delivery, lactation
    - 4.3.8.2.3 Dietary habits: knowledge, aptitude and practices

- 4.3.8.3 Antenatal high risk care
  - 4.3.8.3.1 Health education, family planning advice
- 4.3.8.4 Protein energy malnutrition
  - 4.3.8.4.1 Socio-economic status of family
  - 4.3.8.4.2 Infant feeding and weaning practices
  - 4.3.8.4.3 Social customs regarding diet for children
- 4.3.9 Insecticides - 10+ models
- 4.3.10 Universal Immunization Program - 10+ models
- 4.3.11 Communicable diseases - 10+ models
- 4.3.12 Insect-borne diseases - 10+ models
- 4.3.13 Microscope slides - 10+ models
- 4.3.14 Environment and Sanitation - 10+ models
- 4.3.15 Statistical charts
- 4.3.16 Field visits
  - 4.3.16.1 Rural health Centers
  - 4.3.16.2 Sewage Disposal Plant
  - 4.3.16.3 Water Filtration Plant
  - 4.3.16.4 Nature Cure Hospitals
  - 4.3.16.5 *Yoga* Institutes
  - 4.3.16.6 Nutritional Assessment surveys
  - 4.3.16.7 Sanatoriums
  - 4.3.16.8 NACO programs etc

Community medicine, when integrated with naturopathy, focuses on promoting health and preventing diseases by using natural and holistic methods tailored to community needs. Practical applications in community medicine relate to naturopathy:

## Health Education and Promotion

- **Naturopathy Focus:** Emphasize the importance of lifestyle changes such as balanced diets, exercise, yoga, and stress management for disease prevention.
- **Practical Approach:**
  - Organize community workshops on the benefits of natural therapies like hydrotherapy, mud therapy, and fasting.
  - Distribute educational materials on how natural methods can address common health issues like diabetes, hypertension, or obesity.

## Disease Prevention

- **Naturopathy Focus:** Strengthening the body's natural defenses through non-invasive techniques.
- **Practical Approach:**
  - Conduct screenings for lifestyle diseases and offer naturopathic interventions, such as detoxification programs.
  - Teach yoga and meditation in community centers to reduce the risk of chronic diseases.

## Management of Lifestyle Diseases

- **Naturopathy Focus:** Treating conditions like diabetes, hypertension, and obesity using natural diets, yoga, and other therapies.
- **Practical Approach:**
  - Establish naturopathy clinics in communities to offer personalized diet plans, herbal remedies, and therapies.
  - Use community gardens to promote organic food cultivation and healthy eating habits.

## Sanitation and Hygiene

- **Naturopathy Focus:** Highlighting the role of clean environments in health.
- **Practical Approach:**
  - Educate communities about natural cleaning agents and eco-friendly waste management practices.
  - Implement natural mosquito repellents and solutions for vector-borne diseases.

## School Health Programs

- **Naturopathy Focus:** Introducing healthy habits early.
- **Practical Approach:**
  - Train students in yoga and pranayama to improve mental and physical health.
  - Provide nutrition awareness sessions highlighting natural foods.

## Rehabilitation

- **Naturopathy Focus:** Helping individuals regain health through nature-based methods.
- **Practical Approach:**
  - Use naturopathy for addiction recovery programs (e.g., counseling combined with detox therapies and meditation).
  - Establish post-disease recovery camps utilizing hydrotherapy, massage, and other natural methods.

## Community-Based Research

- **Naturopathy Focus:** Studying the efficacy of natural therapies in public health.
- **Practical Approach:**
  - Conduct research projects on the impact of yoga or naturopathic diets on community health indicators.
  - Collaborate with local health authorities to integrate naturopathy in public health schemes.

#### 4.4 **Textbooks**

4.4.1 Textbook of Preventive and Social Medicine – JE Park & K Park

4.4.2 Textbook of Preventive and Social Medicine – BK Mahajan& MC Gupta

#### 4.5 **Reference Books**

4.5.1 Preventive medicine – Ghosh

4.5.2 Preventive medicine – Yeshpal

#### 4.6 **Reference Papers**

4.6.1 WHO Program papers

4.6.2 National Health Program Papers

4.6.3 Voluntary health Program Papers

4.6.4 Red Cross Program papers

4.6.5 UNICEF Program Papers

#### 4.7 **Scheme Of Examination**

S.N o	Subject	Theo -ry	Intern -al Assm t	Viva- Voce	Total	Practi -cals	Inter- nal Assm t	Total Mark s	Grand Total Mark s
01.	Community Medicine	80	20	30	130	60	10	70	200

## 5. YOGA PHILOSOPHY

### 5.1 Goals and Objectives

#### 5.1.1 **Goal:**

The goal of teaching *Yoga* philosophy to undergraduate students is to understand the intricacies of *Yoga* as a philosophy, its relation to ancient texts, other religious thoughts like Buddhism, with reference to *nyaya*, *vasistha*, *samkhya*, *mimamsa*, *Vedanta* and *PatanjaliYogasutras*.

#### 5.1.2 **Objectives:**

##### 5.1.2.1 **Knowledge:**

After the completion of the course, the student shall be able to:

- 5.1.2.1.1 Explain the basic understanding of *Yoga* as a philosophy
- 5.1.2.1.2 Describe the various schools of philosophy which had an influence on *Yogic text* like buddhism, *samkhya*, *mimamsa* etc.
- 5.1.2.1.3 Comprehend the concept of *brahman* according to *vedanta*

##### 5.1.2.2 **Skills:**

After the completion of the course, the student shall be able to:

- 5.1.2.2.1 Perform and demonstrate various *asanas*, *pranayamas*, *kriyas* and meditations;
- 5.1.2.2.2 Describe various philosophies of *Yoga* and apply them therapeutically, relating to a patient's life situation or personality.

##### 5.1.2.3 **Integration**

5.1 At the completion of training, the student should be able to comprehend the basic principles of *Yoga* and therapeutically apply them in his/her professional practice.

**5.2 Theory (Duration: 12 months)**

**Total hours: 350 (Theory: 150 Practical: 200)**

- 5.2.1 *Yoga*, its definition, its basis, its relation to philosophy and its application.
- 5.2.2 Ancient roots of *Yoga* – literature review on reference to *Yoga* in *Upanishads*, *Vedas*, *Smritis* and *Puranas*.
- 5.2.3 Buddhism – 4 main schools of Buddhist philosophy.
- 5.2.4 *Nyaya* – Nature of physical world, individual soul, liberation and concept of supreme soul in Indian philosophy, theory of Body, Mind, Life and Soul and its philosophical background.
- 5.2.5 *Vaisheshika* – Category of substance – *Nava dravyas*, category of quality – 24 gunas.
- 5.2.6 *Sankhya* – theory of cause and effect; *Prakriti*, *Purusa*; Process of evolution of universe; concept of liberation; Practical teachings of *Sankhya*.
- 5.2.7 *Mimamsa* – Major teachings of *Mimamsa* system; selfless action, nonattachment, self-control, self-discipline, daily schedule for psychophysical wellbeing, social awareness, sense of equality, unity with diversity, selectiveness.
- 5.2.8 *Vedanta* – Concept of *Atman*, *Brahma*, *Maya*, Universe, God; the self and human life; liberation and the means of attaining it.
- 5.2.9 *PatanjaliYogaSutras* – Samadhi Pada, SadhanaPada.
- 5.2.10 *AshtangaYoga* (8 limbs of *Yoga* - *Patanjali*).



5.2.11 Spiritual values of *pranayama* and *kriyas*, their methods, importance, rules and regulations, difference between breathing exercises and *Pranayama*.

5.2.12 **Practical**

5.2.13 Entire first year syllabus.

5.2.14 *Asanas*

5.2.14.1 Sitting

5.2.14.1.1 *Siddhasana*

5.2.14.1.2 *Bhadrasana*

5.2.14.1.3 *Samasana*

5.2.14.1.4 *Swastikasana*

5.2.14.1.5 *Simhasana*

5.2.14.1.6 *Ardha Matsyendrasana*

5.2.14.1.7 *Kurmasana*

5.2.14.1.8 *Mayurasana*

5.2.14.1.9 *Sirshasana*

5.2.14.1.10 *Akarna Dhanurasana*

5.2.14.1.11 *Parivarta Janusirshasana*

5.2.14.1.12 *Garbhasana*

5.2.14.1.13 *Tolangulasana*

5.2.14.1.14 *Badhakonasana*

5.2.14.1.15 *Upavistakonasana*

*5.2.14.2 Prone*

*5.2.14.2.1 Shalabhasana – 2 and 3*

*5.2.14.3 Supine*

*5.2.14.3.1 Yoganidrasana*

*5.2.14.3.2 Karnapeedasana*

*5.2.14.3.3 Naukasana*

*5.2.14.4 Standing*

*5.2.14.4.1 Ardha Katichakrasana*

*5.2.14.4.2 Parshvakonasana*

*5.2.14.4.3 Suptakonasana*

*5.2.14.4.4 Padangushtasana*

*5.2.14.4.5 Garudasana*

*5.2.14.4.6 Padahastasana (Advanced)*

*5.2.15 Pranayama*

*5.2.15.1 Surya anulomaviloma*

*5.2.15.2 Ujjayi*

*5.2.15.3 Bhramari*

*5.2.16 Kriya*

*5.2.16.1 VastraDhauti*

*5.2.16.2 Trataka – Jyoti&Bindu*

*5.2.16.3 Kapalabhati*

### 5.3 **Textbooks**

- 5.3.1 Basis and definitions of *Yoga* – Vivekananda Kendra
- 5.3.2 *Asanas* – Swami Kuvalyananda
- 5.3.3 The gospel of Buddha – Parul Caruso
- 5.3.4 The Gospel of Shri Ramakrishna – Mahendranath Gupta
- 5.3.5 Complete works of Shri Aurobindo
- 5.3.6 *Asanas, Pranayama, Bandhas, Mudras* – Swami Satyananda Saraswati
- 5.3.7 *Hatha YogaPradipika* – Swami Svamarama
- 5.3.8 Raja, Hatha, Jnana, Bhakti *Yoga* – Swami Vivekananda

### 5.4 **Scheme Of Examination**

S.N	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01.	Yoga Philosophy	80	20	30	130	60	10	70	200

## **6. BASIC PHARMACOLOGY**

### **6.1 Goals and Objectives**

#### **6.1.1 Goal:**

6.1.1.1 The goal of teaching Pharmacology to undergraduate students is to provide a comprehensive knowledge of scientific, evidence based treatment of diseases through drug administration.

#### **6.1.2 Objectives:**

##### **6.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

6.1.2.1.1 Illustrate pharmacokinetics and pharmacodynamics of essential and common drugs

##### **6.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

6.1.2.2.1 Be proficient in describing pharmacokinetics and pharmacodynamics of essential and common drugs

6.1.2.2.2 Observe medical ethics in his professional practice

##### **6.1.2.3 Integration**

At the completion of training, the student must be trained in medico legal responsibilities of physicians at all levels of health care as well as scientifically based clinical toxicology, being skilled in allied disciplines like Pathology, Radiology, Forensic Sciences, Hospital Administration, Medicine, Pharmacology, etc.

## 6.2 **Theory (Duration: 12 months)**

**Total hours: 100**

### 6.2.1 General Pharmacology

6.2.1.1 Nature and sources of drugs

6.2.1.2 Routes of administration

6.2.1.3 Absorption and bioavailability of a drug – factors affecting drug absorption and its bioavailability

6.2.1.4 Distribution of a drug in the body

6.2.1.4.1 Plasma concentration

6.2.1.4.2 Drug storage

6.2.1.4.3 Placental transfer

6.2.1.5 Fate of the drug

6.2.1.6 Drug excretion

6.2.1.7 Drug receptors

6.2.1.8 Mechanism of action of a drug – types of drug action

6.2.1.9 Adverse reaction to drug

6.2.1.10 Drug toxicity in man –

6.2.1.10.1 drug intolerance

6.2.1.10.2 hemopoietic toxicity

6.2.1.10.3 hepatotoxicity

6.2.1.10.4 nephrotoxicity

6.2.1.10.5 abnormalities of taste and smell

6.2.1.10.6 behavioral toxicity

- 6.2.1.10.7 production of a disease
- 6.2.1.10.8 electrolyte disturbances
- 6.2.1.10.9 endocrine disturbances
- 6.2.1.10.10 skin toxicity
- 6.2.1.10.11 carcinogenesis
- 6.2.1.10.12 teratogenicity
- 6.2.1.10.13 drug dependence

6.2.1.11 Factors modifying the effects of a drug

6.2.1.12 Role of a placebo

## **6.2.2** Brief description of the following drugs

(Their mode of action, dosage, adverse reaction, the method of tapering their dosage, including the adverse effects with the abrupt stoppage of their use)

## **6.2.3** Drugs acting on the CNS

6.2.3.1 General sedatives

6.2.3.2 Anticonvulsant drugs

6.2.3.3 Opioid and Non-Opioid analgesics

6.2.3.4 Analgesics, antipyretics and non-steroidal anti-inflammatory drugs (NSAID)

6.2.3.5 CNS stimulants – Xanthine alkaloids

6.2.3.6 Psychopharmacology

6.2.3.6.1 Anti-anxiety drugs – Meprobamate, Benzodiazepines,  
Chlormethiazole

- 6.2.3.6.2 Anti-depressant drugs – Classification, actions, adverse reaction  
(monoamine oxidase inhibitors, *tricyclic* compounds,  
carbamazepine, lithium)
- 6.2.3.6.3 Psychotogenic drugs – LSD, Mescaline, Cannabis
- 6.2.3.7 Local Anesthetics – adverse reactions
- 6.2.3.8 Drug action on ANS
  - 6.2.3.8.1 Skeletal muscle relaxants – Diazepam, Baclofen, Dantrolene
  - 6.2.3.8.2 Anti-Parkinsonian drugs – Levodopa, Amantadine
- 6.2.3.9 Biogenic Amines and Polypeptides
  - 6.2.3.9.1 Histamine and Antihistamine drugs
  - 6.2.3.9.2 Angiotensin, Kinins, Leukotrienes, Cytokines & PGs
- 6.2.3.10 Drugs used in Respiratory Disorders
  - 6.2.3.10.1 Expectorants, Central cough suppressants, antitussives, mucolytic  
agents
  - 6.2.3.10.2 Pharmacotherapy of bronchial asthma and rhinitis
    - 6.2.3.10.2.1 Drug therapy during an acute attack
      - 6.2.3.10.2.2 Prevention of acute attacks
      - 6.2.3.10.2.3 Treatment of acute severe asthma
      - 6.2.3.10.2.4 Treatment of acute respiratory failure
      - 6.2.3.10.2.5 Treatment of chronic persistent asthma
      - 6.2.3.10.2.6 Drug therapy of rhinitis

### 6.2.3.11 Cardiovascular drugs

6.2.3.11.1 Digitalis

6.2.3.11.2 Pharmacotherapy of cardiac arrhythmias – Sodium channel blockers, beta blockers, potassium channel blockers, calcium channel blockers

6.2.3.11.3 Pharmacotherapy of Hypertension – Clonidine, alpha methyldopa, Guanethidine, Reserpine, Phentolamine etc.

### 6.2.3.12 Drugs acting on Blood and blood forming organs

6.2.3.12.1 Drugs effective in iron deficiency anemia

6.2.3.12.2 Treatment of acute iron poisoning

### 6.2.3.13 Water, Electrolytes and drugs affecting Renal functions

6.2.3.13.1 Nutritional supplementation therapy

6.2.3.13.2 Diuretic and Anti-diuretic drugs

### 6.2.3.14 Drugs used in GIT disorders

6.2.3.14.1 Appetizers, Digestants, Carminatives, Appetite suppressants and agents lowering serum lipid

6.2.3.14.2 Emetics, drug therapy of vomiting and diarrhea

6.2.3.14.3 Pharmacotherapy of constipation

6.2.3.14.4 Pharmacotherapy of peptic ulcer

### 6.2.3.15 Chemotherapy

6.2.3.15.1 Sulfonamides, Cotrimaxazole, Nitrofurans

6.2.3.15.2 Penicillin, antibiotics effective against gram positive and negative organisms



6.2.3.15.3 Tetracyclines, chloramphenicol and antifungal agents

6.2.3.15.4 Chemotherapy of UTI, STD, Tuberculosis, Leprosy, Malaria,  
Amoebiasis, Viral infections, Helminthiasis, Malignancy

6.2.3.15.5 Antiseptics and Disinfectants

6.2.3.16 Drugs used in Endocrine disorders

6.2.3.16.1 Thyroid and antithyroidal drugs

6.2.3.16.2 Insulin and oral antidiabetic drugs

6.2.3.16.3 Adrenal cortical steroids

6.2.3.16.4 Gonadotropins, estrogens, progestins

6.2.3.16.5 Antifertility agents and ovulation including drugs

6.2.3.16.6 Drug therapy in lipidemia

6.2.3.16.7 Drug therapy in obesity

6.2.3.17 Therapeutic gases – oxygen carbon dioxide

6.2.3.18 Vitamins

6.2.3.19 Immunotherapy, immuno-suppressants and immune-stimulants

**NOTE: All the drugs mentioned in the syllabus are strictly for understanding drug reactions and NOT to be prescriptive in nature. Students, after graduation are not expected to prescribe any of the above-mentioned medication.**

### **6.3 Textbooks**

6.3.1 Pharmacology and Pharmacotherapeutics – RS Satoskar, SD Bhandarkar, SS

Ainapure

6.3.2 Essentials of Medical Pharmacology – KD Tripathi

6.3.3 Pharmacology – Rang and Dale

**6.4 Scheme Of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Basic Pharmacology	80	20	50	150	----- ---	----- ---	----- ---	----- ---

## **7. Colour Therapy and Magneto biology**

### **7.1 Goals and Objectives**

#### **7.1.1 Goal:**

The goal of teaching Colour therapy and Magneto biology to undergraduate students is to provide them with comprehensive understanding of philosophy, science and modes of applications of colours and magnets in preventive, curative and rehabilitative therapy.

#### **7.1.2 Objectives:**

##### **7.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 7.1.2.1.1 Demonstrate basic understanding of principles along which colours and magnets can be used as therapeutic agents, along with history of therapeutic uses of colours and magnets;
- 7.1.2.1.2 Understand bio-magnetism, electro-magnetism, properties of magnets, mechanisms of action of magnets on the human body, magnetic overload, charging, modes of application, etc. and apply this knowledge to therapeutically use magnets;
- 7.1.2.1.3 Be aware of the contraindications and harmful effects of colours and magnets;
- 7.1.2.1.4 Illustrate classification of colours, physics of light, electromagnetic spectrum, pathway of vision, human aura, chakras, heliotherapy, colour breathing, chromo charging, and latest research, applying the same to disease management;

### **7.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 7.1.2.2.1 Diagnose various diseases and disorders of the body and mind using the principles of colour diagnosis;
- 7.1.2.2.2 Outline and implement a plan of treatment using colours and magnets as therapeutic tools
- 7.1.2.2.3 Evaluate the therapeutic values of colours and magnets in treatment of various diseases
- 7.1.2.2.4 Utilise latest research finding in improving his/her professional practice

### **7.1.2.3 Integration**

At the completion of training, the student should be able to comprehend the basic principles of Colour therapy and Megneto biology and therapeutically apply them in his/her professional practice.

## **7.2 Theory (Duration: 12 months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **7.2.1 Magnetobiology**

- 7.2.1.1 Definitions of magneto therapy
- 7.2.1.2 Historical highlights
- 7.2.1.3 Vedic references related to magneto therapy

#### 7.2.1.4 Biomagnetism

7.2.1.4.1 Effects on plants , birds and animals.

7.2.1.4.2 Effects on mankind

#### 7.2.1.5 Principles electromagnetism

#### 7.2.1.6 Types of magnets

7.2.1.6.1 Natural

7.2.1.6.2 Artificial

7.2.1.6.2.1 Permanent

7.2.1.6.2.2 Electromagnets

#### 7.2.1.7 Classification of magnets according to

7.2.1.7.1 Power

7.2.1.7.2 Shapes

7.2.1.7.3 Clinical use

#### 7.2.1.8 Physical properties of magnets

7.2.1.8.1 Magnetic permeability

7.2.1.8.2 Ferromagnetic materials

7.2.1.8.3 Antiferromagnetic materials

7.2.1.8.4 Paramagnetic materials

7.2.1.8.5 Diamagnetic materials

#### 7.2.1.9 Measurement of magnetic field

#### 7.2.1.10 Mechanism of action of magnets in the body

#### 7.2.1.11 Properties effects and corresponding features of north & south poles

#### 7.2.1.12 Maintenance of permanent magnets

7.2.1.13 Magnetic field deficiency syndrome

7.2.1.14 Magnetic overload

7.2.1.15 Earth as a huge magnet

7.2.1.16 Effect of biomagnetism in various organ systems

7.2.1.17 Modes of application of magnets

7.2.1.17.1 General

7.2.1.17.2 Local

7.2.1.17.3 Different kinds of magnetic devices used in application of therapy

7.2.1.18 Magnetic charging , mechanism, dosage and its effect and limitations

7.2.1.18.1 Water, oil, milk, honey

7.2.1.19 Magnetic therapy through shad chakras

7.2.1.20 Contraindications, complications, and limitations of magneto therapy.

7.2.1.21 Harmful effects of EMF and measures for minimizing it.

**7.2.1.22 Reference Books:**

7.2.1.22.1 The book of magnetic Healing by Roger Coghill

7.2.1.22.2 Magnet therapy – by Ghanashyamsingh Birla and Colette Hemlin

**7.2.2 Colour Therapy**

7.2.2.1 Definition

7.2.2.2 Historical highlights

7.2.2.2.1 Ghadiyali's principle

7.2.2.2.2 Babbitt postulates

7.2.2.2.3 Modern history of color therapy

- 7.2.2.3 Classification of colors
- 7.2.2.4 How do rainbows form
- 7.2.2.5 Physics of light
- 7.2.2.6 Electromagnetic spectrum
- 7.2.2.7 Pathway of vision and color sensing
- 7.2.2.8 The human aura and colors
- 7.2.2.9 Relation of colors with shad chakras
- 7.2.2.10 Impact of color sense on emotions and psychology
- 7.2.2.11 Therapeutic effect of colors
- 7.2.2.12 Heliotherapy –
  - 7.2.2.12.1 Health benefits
  - 7.2.2.12.2 Physiological and chemical properties of sunlight
  - 7.2.2.12.3 modes of application, plantain leaf sun bath, chromothermoleum
  - 7.2.2.12.4 Procedure, precaution, indication and limitations.
  - 7.2.2.12.5 Dr. Rikli’s method of Sun bath , Dr .Kuhne’s method of sun bath
- 7.2.2.13 Advanced colour therapy
  - 7.2.2.13.1 Photochemotherapy
  - 7.2.2.13.2 Photobiological coloured lighting to produce immunoregulation
- 7.2.2.14 Color breathing
- 7.2.2.15 Chromo charging of water, oil honey and food stuffs. And their effect on health and disease.
- 7.2.2.16 Limitation and contraindications of chromo therapy
- 7.2.2.17 Research updating related to chromo therapy

### **7.2.2.18 Reference Books:**

- 7.2.2.18.1 Color therapy - Jonathan Dee and Lesley Taylor
- 7.2.2.18.2 Healing with color –Theo Gimbel
- 7.2.2.18.3 The power of color – Dr.Marton Walker

### **7.3 Practical**

- 7.3.1 Procedural standards / guidelines for application of magnets
- 7.3.2 General application – lead system of application
- 7.3.3 Local application
  - 7.3.3.1 high power magnets
  - 7.3.3.2 Medium power magnets
  - 7.3.3.3 Low power magnets
  - 7.3.3.4 Specialized magnetic devices

#### **Tools and Equipment**

- 1. Using Therapeutic Magnets:**
  - o Placement techniques for various conditions.
  - o Types of magnetic belts, pads, and bracelets.
- 2. Introduction to Magnetic Field Generators:**
  - o Low-frequency magnetic field devices.
  - o Application in clinical settings.

#### **Safety and Precautions**

1. Contraindications of magneto therapy.
2. Guidelines for sensitive individuals (e.g., pregnant women, pacemaker users).

#### **Case Studies and Practice**

1. Simulated therapy sessions for various health conditions.
2. Assessment and refinement of techniques.
3. Simulated therapy sessions.
4. Designing treatment plans for common ailments.
5. Evaluating results and feedback.



**7.3.4** Case documentation and application of magneto biology and color therapy - at least 20 cases

#### 7.4 Scheme Of Examination

S.No	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01	ColourTherap yand Magneto Biology	80	20	30	130	60	10	70	200

## **8. FORENSIC MEDICINE AND TOXICOLOGY (Duration: 12 Months)**

**Total hours: 100 (Theory: 100)**

### **8.1 Goals and Objectives**

#### **8.1.1 Goal:**

The goal of teaching Forensic Medicine and Toxicology to undergraduate students is to provide a comprehensive knowledge of medico-legal responsibilities in the practice of medicine. He/she learns about law with respect to medical practice, medical negligence and respect for codes of medical ethics.

#### **8.1.2 Objectives:**

##### **8.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 8.1.2.1.1 Outline basic medico-legal aspects of hospitals and general practice;
- 8.1.2.1.2 Define medico-legal responsibilities of a general physician working in a rural primary health center or an urban health center.

##### **8.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 8.1.2.2.1 Observe and infer well, to enquire in criminal and medico-legal matters;
- 8.1.2.2.2 Diagnose and manage acute poisoning and chronic toxicity;

8.1.2.2.3 Be proficient in post mortem examinations including interpretation of findings

8.1.2.2.4 Observe medical ethics in his professional practice

### **8.1.2.3 Integration**

At the completion of training, the student must be trained in medico legal responsibilities of physicians at all levels of health care as well as scientifically based clinical toxicology, being skilled in allied disciplines like Pathology, Radiology, Forensic Sciences, Hospital Administration, Medicine, Pharmacology, etc.

## **8.2 Theory**

### **8.2.1 Forensic Medicine**

8.2.1.1 Definition and scope of forensic medicine

8.2.1.2 Procedure of giving medical evidence with reference to Indian evidence act

8.2.1.3 Methods of identification of living and dead body, race, age, sex etc

8.2.1.4 Death – medico-legal aspects, certification of death, sudden death, causes, medico-legal importance of signs of death, changes due to death and calculating time of death

8.2.1.5 Medico-legal autopsy

8.2.1.6 Medico-legal wounds, their classification and study and Medico-legal aspects

8.2.1.7 Examination of blood stains, hair and seminal stains

8.2.1.8 Miscellaneous causes of death from heat, cold, electricity, starvation etc.

8.2.1.9 Violent asphyxia deaths – hanging, strangulation, suffocation, and drowning

- 8.2.1.10 Sexual offences – impotency and sterility, virginity, legitimacy, unnatural offences, medico-legal aspects
  - 8.2.1.11 Infanticide
  - 8.2.1.12 Medico-legal aspects of insanity
  - 8.2.1.13 Forensic psychiatry
  - 8.2.1.14 Definition, police inquest, difficulties in detection of crime, legal procedure in criminal courts and their powers oath, medical evidence, medical certificate, dying declaration
  - 8.2.1.15 Rules of giving evidence, professional secrecy
  - 8.2.1.16 Postmortem examinations
  - 8.2.1.17 Death – signs of death, cadaveric rigidity and spasm, putrefaction, estimation of time since death
  - 8.2.1.18 Death from asphyxia, differences between hanging and strangulation, suffocation and drowning
  - 8.2.1.19 Death from burns, scalds and lightning
  - 8.2.1.20 Rape and unnatural offences
  - 8.2.1.21 Abortion, pregnancy and delivery, miscarriage
  - 8.2.1.22 Laws in relation to a medical man, medical ethics, duties, professional privilege and responsibilities
- 8.2.2 Toxicology**
- 8.2.2.1 General considerations of poisoning and classification
    - 8.2.2.1.1 Actions of poison, factors, modifying their action
    - 8.2.2.1.2 Diagnosis of poisoning

- 8.2.2.1.3 Treatment of poisoning in general
- 8.2.2.2 Poisons
  - 8.2.2.2.1 Corrosives
  - 8.2.2.2.2 Non-metallic poisons
  - 8.2.2.2.3 Insecticides and weed killers
  - 8.2.2.2.4 Metallic poisons
  - 8.2.2.2.5 Organic irritant poisons
  - 8.2.2.2.6 Somniferous poisons
  - 8.2.2.2.7 Inebriant poisons
  - 8.2.2.2.8 Deliriant poisons
  - 8.2.2.2.9 Drug dependence
  - 8.2.2.2.10 Food poisoning
  - 8.2.2.2.11 Spinal poisons
  - 8.2.2.2.12 Cardiac poisons
  - 8.2.2.2.13 Asphyxiants
  - 8.2.2.2.14 Miscellaneous
- 8.2.2.3 Legal responsibilities – Medical Ethics
- 8.2.2.4 Responsibilities and duties of medical practitioners to the State, professional secrecy and privileged communication
- 8.2.2.5 Unprofessional conduct, malpractice
- 8.2.2.6 The rights and privileges and duties of medical practitioners
- 8.2.2.7 The functions of state medical council and its relationship to IMC
- 8.2.2.8 Medical ethics approved by IMC

### **8.3 Practical**

- 8.3.1 Age estimation
- 8.3.2 Autopsies – 10
- 8.3.3 Skeleton remains
- 8.3.4 Spotters
- 8.3.5 Examination of injured
- 8.3.6 Alcoholic
- 8.3.7 Psychiatric
- 8.3.8 Toxicology

### **8.4 Textbooks**

- 8.4.1 Medical Jurisprudence – Modi
- 8.4.2 A textbook of Forensic Medicine – Narayana Reddy
- 8.4.3 A textbook of Forensic Medicine – MRK Krishna

### **8.5 Reference Books**

- 8.5.1 The essentials of Forensic Medicine – Dr. CJ Polson, DJ Gee and B. Knight
- 8.5.2 Forensic Medicine – Corden and Shapiro
- 8.5.3 Principles and practice of Medical Jurisprudence – Taylor's

**8.6 Scheme Of Examination**

S.N o	Subject	Theo -ry	Intern -al Assm t	Viva- Voce	Total	Practi -cals	Inter- nal Assm t	Total Mark s	Grand Total Mark s
01.	Forensic Medicine & Toxicology	80	20	50	150	----- ---	----- ---	----- ---	----- ---



## **9. MANIPULATIVE THERAPIES**

### **9.2 Goals and Objectives**

#### **9.2.1 Goal:**

The goal of teaching Manipulative Therapies to undergraduate students is to provide them with comprehensive understanding of science and modes of applications of different manipulative modalities like Massage, Chiropractic, Osteopathy, Aromatherapy in preventive, curative and rehabilitative therapy.

#### **9.2.2 Objectives:**

##### **9.2.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 9.2.2.1.1 Understand the principles and historical highlights of massage and manipulative techniques;
- 9.2.2.1.2 Demonstrate basic understanding of principles and procedures of different types of massage, their physiological effects, indications, and contraindications;
- 9.2.2.1.3 Delineate the principles and procedures of various manipulative therapies like chiropractic, osteopathy, reflexology and aromatherapy;
- 9.2.2.1.4 Describe essential oils with respect to the extraction, uses and combinations that are therapeutically used;

### **9.2.2.2 Skills:**

After the completion of the course, the student shall be able to:

9.2.2.2.1 Perform different types of massage and manipulative therapies, such as Osteopathy, Chiropractic, Aromatherapy, Swedish massage, Kellogg's massage, Shiatsu, Geriatric Massage, Pediatric massage, Antenatal massage, Ayurvedic massage, etc;

9.2.2.2.2 Use therapies such as Reflexology and Zone therapy in their professional practice for musculoskeletal disorders, etc.

### **9.2.2.3 Integration**

At the completion of training, the student should be able to comprehend the basic principles of Manipulative Therapies and apply it in clinical practice.

## **9.3 Theory (Duration: 12 Months)**

Total hours: 250 (Theory: 150 Practical: 100)

**9.3.1** Introduction and historical highlights of Massage and Manipulative Techniques

**9.3.2** Classification of (lubricants) massage

**9.3.2.1** Basic Therapeutic massage (Swedish) techniques – procedure, indications, contraindications, physiological action

**9.3.2.2** Joint movements in massage therapy

**9.3.2.3** Massage to local areas

**9.3.3** Professional standards of massage professionals

**9.3.4** Physiological effects, indications, contraindications of massage in various organ systems

- 9.3.5 Kellogg's massage
- 9.3.6 Shiatsu
- 9.3.7 Pediatric massage
- 9.3.8 Geriatric massage
- 9.3.9 Massage for antenatal care
- 9.3.10 Ayurvedic massage – terminology, procedure and manipulations
- 9.3.11 *Panchakarma* in brief
- 9.3.12 Chiropractic
  - 9.3.12.1 History
  - 9.3.12.2 Importance of spine in chiropractic
  - 9.3.12.3 Physiological effect
  - 9.3.12.4 Chiropractic examination
  - 9.3.12.5 Spinal manipulative therapy
  - 9.3.12.6 Treatment for various diseases
- 9.3.13 Osteopathy
  - 9.3.13.1 Definition
  - 9.3.13.2 History
  - 9.3.13.3 Basic principles
  - 9.3.13.4 Relation of osteopathy to musculoskeletal system
- 9.3.14 Basic principles and procedure of different types of massage – Thai, Balanese, Hot-stone massage, dry brush massage, deep tissue massage, powder massage, vibrator massage etc.

### **9.3.15 Aromatherapy**

#### **9.3.15.1 Definition, Origin and History**

#### **9.3.15.2 Essential Oils**

##### 9.3.15.2.1 Types

9.3.15.2.2 Extraction – Distillation, cold pressing or expression, solvent extraction

9.3.15.2.3 Storage of essential oils

9.3.15.2.4 How to recognize an essential oil

9.3.15.2.5 How to select aroma oils

9.3.15.2.6 How essential oils work

9.3.15.2.7 Carrier oils – Almond oil, Apricot kernel oil, Avocado oil, Carrot oil, Corn oil, Primrose oil, Grape seed Oil, Hazelnut oil, Jojoba oil, Olive oil, Peanut oil, Safflower oil, Sesame oil, Soya bean oil, Sunflower oil

**9.3.15.3** Different methods of using essential oils – Inhalation, Diffusers, Vaporizers, Massage, Baths, Foot bath, Potpourri, Compresses, Oral intake, Beauty treatment, Room sprays, Insect repellants etc.

#### **9.3.15.4 Description of different essential oils and their benefits**

9.3.15.4.1 Amrette seed, Aniseed, Angelica, Basil, Bergamot, Black Pepper, Camphor, Cardamom, Chamomile, Clove bud, Cedar wood, Cypress, Clay sage, Eucalyptus, Fennel, Frankincense, Geranium, Ginger, Juniper berry, Lavender, Lemon, Lemongrass, Marjoram, Neroli, Orange, Palma Rosa, Peppermint, Patchouli, Pine, Rose,

Rosemary, Sandalwood, Tarragon, Tea tree, Thyme (white),  
Vetiver, Ylang Ylang

**9.3.15.5** The best essential oils

9.3.15.5.1 5 fragrance categories – green, floral, citrus, woody and spicy

9.3.15.5.2 Mixing of aroma oils, equipment required for mixing oils

**9.3.15.6** Precautions for use of aroma oils – Skin patch test, testing essential oils in its pure state

**9.3.15.7** Ill effects of aroma oils – in eyes, toxic effects, allergic effects etc.

**9.3.15.8** Careful handling of essential oils

**9.3.15.9** Contraindications

9.3.15.9.1 Oils to be avoided – Phototoxic or photosensitive oils, oils to be avoided in pregnancy, oils that cause skin irritation etc.

**9.3.16** Reflexology and Zone therapy

**9.3.16.1** What is Reflexology, history and development

**9.3.16.2** How does it work

**9.3.16.3** Body and its reflex zones

**9.3.16.4** Applications, indications and contra-indications

**9.3.16.5** Preventive effects of reflexology

**9.3.17** Milestones of females and its management through massage

**9.4 Practical**

**9.4.1** 10 full body massages

**9.4.2** 35 partial massages

**9.4.3** 10 Panchakarma demonstration Identification of different oils

#### 9.4.4 Demonstration of different methods of application

9.4.4.1 Inhalation

9.4.4.2 Compress

9.4.4.3 Diffuses

#### 9.4.5 Local baths

#### 9.4.6 Hands-On Techniques

9.4.7 **Joint Mobilization and Manipulation:** Techniques to improve mobility and reduce pain.

9.4.8 **Soft Tissue Techniques:** Includes massage, myofascial release, and trigger point therapy.

9.4.9 **Stretching and Range of Motion Exercises:** Used to restore flexibility and prevent stiffness.

#### 9.4.10 Equipment and Tools

9.4.11 **Adjustable Treatment Tables:** Designed to facilitate proper body mechanics.

9.4.12 **Therapy Tools:** Such as foam rollers, massage balls, and handheld instruments like Graston tools.

9.4.13 **Thermal Packs:** Heat or cold therapy to prepare tissue for manipulation.

#### 9.4.14 Training Resources

9.4.15 **Books and Manuals:** Texts like *Orthopedic Physical Assessment* or *Principles of Manual Therapy*.

9.4.16 **Workshops and Certification Courses:** Hands-on programs focusing on specific techniques like spinal adjustments or craniosacral therapy.

9.4.17 **Online Tutorials and Case Studies:** Videos or simulations to practice assessments and interventions.

#### 9.4.18 Skills Development

9.4.19 **Anatomy Knowledge:** Deep understanding of musculoskeletal and nervous systems.

9.4.20 **Palpation Skills:** Accurate identification of tissues and structures.

9.4.21 **Patient Communication:** To explain procedures and ensure comfort.

#### 9.4.22 Safety and Ethics

9.4.23 **Contraindications Awareness:** Conditions where manipulative therapy should not be used, e.g., severe osteoporosis, fractures, or infections.

9.4.24 **Informed Consent:** Clear communication about treatment risks and benefits.

9.4.25 **Continuing Education:** Staying updated on evidence-based practices.

9.4.26 Are you looking for guidance on a specific technique or type of therapy?

### 9.5 **Textbooks**

9.5.1 Massage – George Downing

9.5.2 Massage Therapy – Dr. JH Kellogg

- 9.5.3 Massage – Constant Young
- 9.5.4 The Complete Book of Massage – Claire Maxwell Hudson
- 9.5.5 Step-by-Step Massage – Carole McGilvery
- 9.5.6 All You Wanted to Know About Aromatherapy – Lalita Sharma
- 9.5.7 Aromatherapy – Julie Sadler
- 9.5.8 *Ayurveda* & Aromatherapy – Dr. Light Miller & Dr. Bryan Miller.

## 9.6 **Reference Books**

- 9.6.1 Massage Therapy – Susan G. Salvo
- 9.6.2 Magic of Massage – Tanushree Podder
- 9.6.3 Art of massage – Dr John Harvey Kellogg

### 9.7 Scheme Of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Manipulative Therapies	80	20	30	130	60	10	70	200



## **10. ACUPUNCTURE AND ACUPRESSURE (Duration:12 Months)**

**Total hours: 200(Theory:100 Practical:100)**

### **10.1 Goals and Objectives**

#### **10.1.1 Goal:**

The goal of teaching acupuncture to undergraduate students is to provide them with a comprehensive understanding of the science and art of Acupuncture, Acupressure and related therapies.

#### **10.1.2 Objectives:**

##### **10.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 10.1.2.1.1 Illustrate the definitions of Acupuncture;
- 10.1.2.1.2 Understand the principles and historical highlights of Acupuncture;
- 10.1.2.1.3 Explain the concepts and theories behind the mechanism in which Acupuncture works, both traditional and modern
- 10.1.2.1.4 Demonstrate basic understanding of procedures of different styles of Acupuncture and related therapeutic modalities, such as Traditional Acupuncture, Scalp Acupuncture, Auriculotherapy, Acupuncture Anaesthesia, Reflexology, Zone Therapy, Acupressure, etc;
- 10.1.2.1.5 Describe basic and advanced tools used in Acupuncture;

10.1.2.1.6 Be aware of the contraindications and dangers of Acupuncture, so as to avoid these in his/her professional practice;

#### **10.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

10.1.2.2.1 Diagnose common diseases and disorders using diagnostic techniques employed in Acupuncture, such as Tongue Diagnosis, Pulse Diagnosis, etc;

10.1.2.2.2 Demonstrate skill in topographically locating meridians and Acupuncture points on the human body;

10.1.2.2.3 Perform Needling and other essential skills in delivering Acupuncture therapy to a patient;

10.1.2.2.4 Plan, implement and evaluate Acupuncture sessions with expertise in his/her professional practice;

#### **10.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively understand traditional and modern approaches to Acupuncture and effectively utilise the same in preventive, promotive, curative and rehabilitative clinical practice as well as research projects.

### **10.2 Theory**

**10.2.1** Definition, concepts of Acupuncture

**10.2.2** Traditional and modern theories of Acupuncture

**10.2.3** Materials and methods of Acupuncture

- 10.2.4** Principles of Acupuncture
- 10.2.5** Rules for the selection of Acupuncture points
- 10.2.6** Contraindications and complications of Acupuncture
- 10.2.7** The concept of Meridians:
  - 10.2.7.1 Lung Meridian (Lu)
  - 10.2.7.2 Large intestine Meridian (LI)
  - 10.2.7.3 Spleen Meridian (Sp)
  - 10.2.7.4 Stomach Meridian (St)
  - 10.2.7.5 Heart Meridian (H)
  - 10.2.7.6 Small intestine meridian (SI)
  - 10.2.7.7 Urinary bladder meridian (UB)
  - 10.2.7.8 Kidney Meridian (K)
  - 10.2.7.9 Triple warmer meridian (TW)
  - 10.2.7.10 Gall bladder meridian (GB)
  - 10.2.7.11 Liver Meridian (Liv)
  - 10.2.7.12 Governing vessel Meridian (GV)
  - 10.2.7.13 Conceptional vessels Meridian (CV)
  - 10.2.7.14 Extra Meridians
- 10.2.8** The extra-ordinary points
- 10.2.9** Examination methods of Traditional Chinese Medicine
- 10.2.10** Auriculotherapy

10.2.11 Scalp acupuncture

10.2.12 Moxibustion

10.2.13 Types of Stimulation in Acupuncture

10.2.13.1 Manual stimulation

10.2.13.2 Electro acupuncture

10.2.14 Acupuncture Therapeutics

10.2.15 Acupuncture Anesthesia

10.2.16 Reflexology & Zone Therapy

10.2.16.1 What is reflexology, history and development

10.2.16.2 How does reflexology work

10.2.16.3 Body & its reflex zones

10.2.16.4 Applications, indications and contra-indications Preventive effects of reflexology

10.2.17 Acupressure

10.2.17.1 What is Acupressure

10.2.17.2 Origin & development

10.2.17.3 Physiological effects

10.2.17.4 Therapeutic uses of Acupressure

### 10.3 **Practicals**

10.3.1 Demonstration of needling techniques and electro-stimulation, Moxibustion.

10.3.2 Each student should give treatment for at least 20 patients during the practical.

#### **10.4 Reference Books :-**

- 10.4.1 Clinical Practice of Acupuncture - A.L. Aggarwal
- 10.4.2 Clinical Acupuncture - Dr. Anton Jayasurya
- 10.4.3 Principles and Practice of Acupuncture - Dr. J.K. Patel
- 10.4.4 Health in Your Hands - DevendraVora
- 10.4.5 Clinical Acupuncture and Moxibustion - Liu Gong Wang
- 10.4.6 Fundamentals of Acupuncture and Moxibustion - Liu Gong Wang/Akira Hyodo.
- 10.4.7 Advanced Acupuncture Therapy - Arjun L Agarwal, Govind N Sharma
- 10.4.8 Classical Acupuncture - The Standard Textbook - Poret. Hemen, the China Academy
- 10.4.9 Reiki
  - 10.4.9.1 Empowerment through Reiki - Paula Horan
  - 10.4.9.2 Reiki - Energy Medicine - Libby Barnett & Maggie Chambers with Susan Davidson
- 10.4.10 Pranic Healing
  - 10.4.10.1 Pranic healing using Breathing with Healing Mantras - Dr. L.R. Chowdhry
  - 10.4.10.2 Advanced Pranic Healing- Choa Kok Sui
  - 10.4.10.3 The Ancient Science and Art of Pranic Crystal Cleaning- Choa Kok Sui.

### 10.5 Scheme Of Examination

S.No	Subject	Theo-ry	Inter-Nal Assmt	Viva-Voce	Total	Practi-cals	Inter-Nal Assmt	Total Marks	Grand Total Marks
01.	Acupuncture & Acupressure	80	20	30	130	60	10	70	200

## **11. YOGA AND ITS APPLICATIONS (Duration: 12 Months)**

**Total hours: 200 (Theory: 100 Practical: 100)**

### **11.1 Goals and Objectives**

#### **11.1.1 Goal:**

The goal of teaching *Yoga* and its applications to undergraduate students is to provide them with comprehensive understanding of *Yoga* with reference to traditional texts like *PatanjaliYogasutras*, *Hatha YogaPradipika*, *Shiva samhita*, *Gheranda samhita* and *Swara Yoga*; various streams of *Yoga*, advanced meditative techniques like *Yoganidra*, *Omkar*, *Cyclic*, *Vipassana* and learn about benefits of *Yoga* as compared to exercise.

#### **11.1.2 Objectives:**

##### **11.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 11.1.2.1.1 Illustrate the knowledge of traditional texts like *Patanjali Yoga Sutras*, *Hatha Yoga*, *Shiva Samhita* and *Gheranda Samhita*;
- 11.1.2.1.2 Understand the principles behind various meditative practices like *Yoganidra*, *Om* meditation, *cyclic* meditation, *Vipassana* and so on;
- 11.1.2.1.3 Explain about *Yoga* in relation to its application in education, sports;
- 11.1.2.1.4 Demonstrate basic understanding of procedures of stretching and exercises;

11.1.2.1.5 Describe basic physiological changes of *asanas*

11.1.2.1.6 Be aware of the effects of shat *kriyas* and their adverse effects.

#### **11.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

11.1.2.2.1 Describe the concept of *Yoga* as explained in the traditional texts;

11.1.2.2.2 Deliver a meditative session using any of the meditative styles;

11.1.2.2.3 Implement various exercises loosening or eye exercises or stretching to complement *Yoga* practice.

#### **11.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively understand traditional approaches to *Yoga* and employ the same for therapeutic purposes.

### **11.2 Theory**

11.2.1 *PatanjaliYogaSutras* – First two chapters (i.e. *Samadhi Pada* and *SadhanaPada*, brief summary of *VibhutiPada* and *Kaivalyapada*)

11.2.2 *Hatha YogaPradipika* – full text with necessary reference to *GherandaSamhita* and *Siva Samhita*

11.2.2.1 Description of practice of *asanas*: Verses – 15, 16, 17, 32, 34, 35, 38, 44, 47, 48, 50, 51, 53, 54, 57, 58, 59, 62, 63, 64, 65, 67



11.2.2.2 Description of practice of *pranayama*: Verses – 2, 3, 5-12, 14, 16-20, 22, 24, 26-32, 34-37, 39, 40, 44-51, 54, 57, 59

11.2.3 Introduction to other streams of *Yoga* - *Kundalini*, *Tantra*, *Swaraand Kriya*

11.2.4 *Yoganidra*- methods, applications, effects and benefits

11.2.5 Meditation – types –*omkar*,*cyclic*,*vipassana*etc. methods of application, benefits, precaution, its influence on health and disease

11.2.6 *Yoga* – in relation to personality and education

11.2.7 *Yoga* – in relation to sports and games, social and political life

11.2.8 Eye exercises – benefits, methods, precautions

11.2.9 Physiological aspects of *asana*

11.2.10 Physiological, neurophysiological aspects of *pranayama*

11.2.11 *Shatkriyas* – comparative study of *shat kriyas*with other systems of medicine

11.2.12 Physiological aspects of exercises

11.2.13 Physical exercises for health and fitness

11.2.13.1 Introduction

11.2.13.2 Who should stretch

11.2.13.3 When to stretch

11.2.13.4 Why to stretch

11.2.13.5 How to stretch

11.2.13.6 Relaxing stretches for back, legs, feet and ankles; hips, hamstrings,

low back

11.2.13.7 Stretching exercises for elderly

11.2.13.8 Stretching exercises for abdominal muscles, arms, chest, ankles,  
legs, knee, thigh, forearm etc

11.2.13.9 Techniques of walking, running, cycling etc

11.2.13.10 Caring for the back

### 11.3 **Practical**

11.3.1 All previous years' asana plus – *veerasana, koormasana, kukkutasana, utthankoormasana, matsyendrasana, padmamayurasana, simhasana, sarvangasana* (all variants), *sirsasana*(all variants)

11.3.2 All loosening (*Sithilikarana Vyayama*) and breathing exercises

11.3.3 All previous years' *Pranayama* plus – *suryabhedana, Chandra bhedana*, cat and tiger breathing, new variants of *pranayama*

11.3.4 All previous years' *Kriyas* plus – *Dandadhouti, agnisara, nauli, bandhas, mudras*

### 11.4 **Textbooks**

11.4.1 Autobiography of a Yogi – ParamahansaYogananda

11.4.2 *Yoga* as Philosophy and Religion – SN Dasgupta

11.4.3 *Yoga* – the Science of Holistic Siving – VK *Yoga*

11.4.4 A Complete Illustrated Book of *Yoga* – Swami Vishnu

11.4.5 Encyclopedia of Indian Physical Culture – DC Mujumdar

11.4.6 Preksha Meditation – Acharya Tulsi

### 11.5 Scheme Of Examination

S.No	Subject	Theo -ry	Inter- Nal Assmt	Viva- Voce	Total	Practi- cals	Inter- Nal Assmt	Total Marks	Grand Total Marks
01.	Yoga & its Applications	80	20	30	130	60	10	70	200

## **12. NUTRITION AND MEDICINAL HERBS**

### **12.1 Goals and Objectives**

#### **12.1.1 Goal:**

The goal of teaching Nutrition and Medicinal Herbs to undergraduate students is to enable them to analyse nutritional profiles of their patients and prescribe diets to them based on nutritional requirements, as well as use herbs in the management of various diseases.

#### **12.1.2 Objectives:**

##### **12.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 12.1.2.1.1 Describe fundamentals of nutrition, with respect to different nutrients and food groups;
- 12.1.2.1.2 Illustrate details of nutritional requirements for different age groups, as well as pregnant and lactating women;
- 12.1.2.1.3 Demonstrate therapeutic application of nutrition for common diseases;
- 12.1.2.1.4 Compare modern nutrition to traditional Naturopathic diets;
- 12.1.2.1.5 Have detailed knowledge of recent advances and studies, such as carcinogens in food, food additives, contaminants, etc;
- 12.1.2.1.6 Illustrate the use of specific herbs in common diseases, with therapeutic values;

### **12.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

12.1.2.2.1 Assess the nutritional status of a patient;

12.1.2.2.2 Plan, implement and evaluate nutritional advice for people of different ages and patients of different diseases, including the use of herbs.

### **12.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively integrate traditional Naturopathic nutrition and modern nutritional along with herbs, and employ the same for therapeutic purposes.

## **12.2 Theory (Duration: 12 Months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

### **12.2.1 Nutrition**

12.2.1.1 Definition of food, nutrition, nutrient and diet

12.2.1.2 What is nutrition healing

12.2.1.3 Defining essential nutrients

12.2.1.4 Proteins and amino acids

12.2.1.5 Carbohydrates

12.2.1.6 Lipids, sterols and their metabolism

12.2.1.7 Energy needs: assessment and requirements in humans

12.2.1.8 Electrolytes, water and acid-base balance

- 12.2.1.9 Minerals – calcium, phosphorous, magnesium, iron zinc, copper, iodine,  
selenium, chromium, ultra trace minerals
- 12.2.1.10 Vitamins – A, retinoid, D, E, K, Thiamine, Riboflavin,  
Niacin, Pantothenic acid, Folic acid, B12, Biotin, C.
- 12.2.1.11 Clinical manifestations of human vitamin and mineral disorders
- 12.2.1.12 Role/significance of nutrition
  - 12.2.1.12.1 Regulation of gene expression
  - 12.2.1.12.2 Membrane and transport
- 12.2.1.13 Control of food intake
- 12.2.1.14 Antioxidants
- 12.2.1.15 Food groups
- 12.2.1.16 Metabolic consequences of starvation
- 12.2.1.17 Fiber and other dietary factors affecting nutrient absorption  
and metabolism
- 12.2.1.18 Hormone, cytokine and nutrient reactions
- 12.2.1.19 Nutrition and immune system
- 12.2.1.20 Oxidative stress and oxidant defense
- 12.2.1.21 Diet in work and exercise performance
- 12.2.1.22 Body composition: influence of nutrition, physical activity, growth  
and aging
- 12.2.1.23 Maternal nutrition
- 12.2.1.24 Nutritional requirements during infancy
- 12.2.1.25 Diet, nutrition and adolescence

- 12.2.1.26 Nutrition in the elderly
- 12.2.1.27 Clinical nutrition assessment of infants and children
- 12.2.1.28 Clinical and functional assessment of adults
- 12.2.1.29 Nutritional assessment of malnutrition by anthropometric methods
- 12.2.1.30 Laboratory tests for assessing nutritional status
- 12.2.1.31 Dietary assessment
- 12.2.1.32 Childhood obesity
- 12.2.1.33 Nutritional management of infants and children with specific  
diseases and/or conditions
- 12.2.1.34 Assessment of mal absorption
- 12.2.1.35 Nutrition in pancreatic disorders
- 12.2.1.36 Nutrition in liver disorders
- 12.2.1.37 Nutrition and diet in the management of hyperlipidemia  
and atherosclerosis
- 12.2.1.38 Nutrition, diet and hypertension
- 12.2.1.39 Diet, nutrition and prevention of cancer
- 12.2.1.40 Carcinogens in foods
- 12.2.1.41 Nutritional support of the cancer patient
- 12.2.1.42 Nutrition and diet in rheumatic diseases
- 12.2.1.43 Nutritional management of diabetes
- 12.2.1.44 Obesity
- 12.2.1.45 Nutritional aspects of hematologic disorders
- 12.2.1.46 Renal disorders and nutrition

- 12.2.1.47 Nutrition, respiratory function and disease
- 12.2.1.48 Diagnosis and management of food allergies
- 12.2.1.49 Nutrition and diet in alcoholism
- 12.2.1.50 The hypercatabolic state
- 12.2.1.51 Nutrition and infection
- 12.2.1.52 Nutritive value of food ingredients commonly used in India
- 12.2.1.53 Enteral feeding (only theory)
- 12.2.1.54 Parenteral nutrition (only theory)
- 12.2.1.55 Nutrition and medical ethics – the interplay of medical decisions, patients' rights, and the judicial system
- 12.2.1.56 RDA – individuals and populations
- 12.2.1.57 Nutritional implications of vegetarian diets
- 12.2.1.58 Social and cultural influences on food consumption and nutritional status
- 12.2.1.59 Food additives, contaminants and natural toxins
- 12.2.1.60 Comparative study of modern nutrition and traditional naturopathy diet

## **12.2.2 MEDICINAL HERBS**

### **12.2.2.1 Introduction to Herbology**

**12.2.2.2 Following herbs are to be studied with respect to their source and therapeutic uses. Botanical details can be avoided**

**12.2.2.2.1 Embelicaofficinalis**

**12.2.2.2.2 Cassia fistula**

**12.2.2.2.3 Ficus glomerata**

**12.2.2.2.4 Vetiveriazizanodies**



12.2.2.2.5 Cinnamomumcamphora  
12.2.2.2.6 Mosardicacharantia  
12.2.2.2.7 Tribulusterrestris  
12.2.2.2.8 Myristicafragrans  
12.2.2.2.9 Cuminumcuminum  
12.2.2.2.10 Sesamumindicum  
12.2.2.2.11 Ocimum sanctum  
12.2.2.2.12 Punicagranatum  
12.2.2.2.13 Coriandrum sativum  
12.2.2.2.14 Azadirachta indica  
12.2.2.2.15 Allium cepa  
12.2.2.2.16 Piper longum  
12.2.2.2.17 Psoralea corylifolia  
12.2.2.2.18 Taxus baccata  
12.2.2.2.19 Aegle marmelos  
12.2.2.2.20 Semecarpus anacardium  
12.2.2.2.21 Phyllanthus niruri  
12.2.2.2.22 Piper nigrum  
12.2.2.2.23 Trigonella foenum – graecum  
12.2.2.2.24 Santalum album  
12.2.2.2.25 Allium sativum  
12.2.2.2.26 Mimosa pudica  
12.2.2.2.27 Acorus calamus

12.2.2.2.28 Asparagus racemosus

12.2.2.2.29 Rauwolfia serpentine

12.2.2.2.30 Curcuma longa

12.2.2.2.31 Terminaliachebula

12.2.2.2.32 Ferula narthex

12.2.2.2.33 Syzygiumaramaticum

12.2.2.2.34 Terminaliabelerica

12.2.2.2.35 Gingiberofficinalis

#### • **Practical**

- Calculation of Body Mass Index (BMI) and Basal Metabolic Rate (BMR).
- Assessment of nutritional status through dietary recall (24-hour recall method) and food frequency questionnaires.
- Identification and classification of macronutrients and micronutrients in common foods.
- Preparation of balanced diet plans for different age groups and lifestyles.

#### **Naturopathic Principles in Nutrition**

- Understanding and demonstration of the importance of natural foods (raw, organic, seasonal).
- Role-playing or case studies on detox diets (e.g., juice fasting, elimination diets).
- Preparation of plant-based meals, highlighting whole foods and minimal processing.

#### **Therapeutic Diets and Meal Planning**

- Designing therapeutic diets for conditions such as obesity, diabetes, hypertension, and gastrointestinal disorders.
- Conducting food preparation workshops focusing on naturopathic cooking (e.g., sprouting, fermenting, steaming).
- Demonstrating the preparation of low-sodium, low-glycemic index, or high-fiber recipes.

#### ***Diet in Relation to Lifestyle Disorders***

- Identifying risk factors and dietary interventions for common lifestyle disorders.
- Monitoring and documenting dietary interventions in case studies.
- Preparing meal plans for stress management, improved immunity, and anti-inflammatory effects.

#### **Food and Herb Synergy in Naturopathy**

- Exploring and preparing herbal teas, decoctions, and tonics.
- Blending foods with functional herbs for specific health benefits (e.g., turmeric for inflammation, ginger for digestion).
- Creating herbal remedies for digestive health (e.g., bitters, teas).

#### **Community Nutrition**

- Conducting nutritional education sessions for different communities.

- Developing low-cost nutritious recipes for underprivileged populations.
- Planning and executing awareness programs on food hygiene and healthy eating.

### ***Research and Innovation in Nutrition***

- Analyzing current nutrition trends and evaluating their relevance to naturopathy.
- Preparing case reports on dietary interventions.
- Designing and testing innovative recipes based on naturopathic principles.

### 12.3 **Textbooks**

- 12.3.1 Davidson and Passamore Human Nutrition – Passamore
- 12.3.2 Clinical Dietetics and Nutrition – FP Antia
- 12.3.3 Normal Therapeutic Nutrition – Corinne Robinson
- 12.3.4 Essentials of Food and Nutrition – Swaminathan
- 12.3.5 Sprouts – JD VaishYogaSamsthan
- 12.3.6 Science and Art of Food and Nutrition – Herbert Shelton
- 12.3.7 Nutritive Values of Indian Foods – NIN (Hyd)
- 12.3.8 Publications of NIN, Hyderabad
- 12.3.9 Herbs that Hheal – HK Bakhru
- 12.3.10 *Charaka and Sushruta Samhita*
- 12.3.11 Fundamentals of *Ayurveda* – Mahadev Shastri

#### 12.4 Scheme Of Examination

S.No	Subject	Theo -ry	Inter- Nal Assmt	Viva- Voce	Total	Practi- cals	Inter- Nal Assmt	Total Marks	Grand Total Marks
01.	Nutrition & Medicinal Herbs	80	20	30	150	60	10	70	200

## **13. DIAGNOSTIC METHODS IN NATUROPATHY – I**

(Duration: 12 months)

Total hours: 200 (Theory: 100 Practical: 100)

### **13.1 Goals and Objectives**

#### **13.1.1 Goal:**

The goal of teaching Diagnostic Methods in Naturopathy to undergraduate students is to provide them with comprehensive knowledge of diagnostic methods employed by traditional Naturopaths that can be used efficiently to diagnose various diseases without the use of sophisticated technology.

#### **13.1.2 Objectives:**

##### **13.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 13.1.2.1.1 Define and be aware of historically significant developments in diagnostic procedures used in Naturopathy
- 13.1.2.1.2 Illustrate the characteristics of a Healthy Body with respect to Naturopathic Principles
- 13.1.2.1.3 Describe philosophical theories of causation of disease according to Naturopathy
- 13.1.2.1.4 Utilise knowledge of theory of encumbrances, their types and interpretation, along with naturopathic ways to therapeutically correct them;

13.1.2.1.5 Describe in detail Iris Diagnosis, with respect to history, techniques, iris signs, interpretations and tools used, and use the same to diagnose diseases;

13.1.2.1.6 Comprehend the techniques and interpretations of stool and urine diagnosis, correlating modern medical knowledge and Ayurvedic *sthoola* and *muthrapariksha*;

13.1.2.1.7 Describe the characteristics of normal and unhealthy skin, in different diseases.

### **13.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

13.1.2.2.1 Use knowledge of different diagnostic procedures in Naturopathy to effectively and accurately diagnose various diseases, such as Iris Diagnosis, Facial Diagnosis, Stool and Urine Diagnosis, etc.

### **13.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively understand the principles and procedures of Diagnostic Methods in Naturopathy and employ the same for diagnostic and prognostic purposes.

## **13.2 Theory**

### **13.2.1 Facial Diagnosis**

#### **13.2.1.1 Introduction**

13.2.1.1.1 Definition

13.2.1.1.2 Historical Highlights

13.2.1.2 Characteristics of Healthy Body

13.2.1.3 Foreign matter theory , toxemia theory, vitality theory

13.2.1.4 Physiological and pathological perspective of foreign matter, toxemia and vitality theory

13.2.1.5 Unity of disease and unity of cure – interpretation with contemporary medicine

13.2.1.6 Encumbrance, its types and its interpretation in health and disease

13.2.1.7 Habits – significance /consequences and its correspondence in encumbrance

13.2.1.8 Significance of naturopathy treatment modalities in correction of encumbrances.

## 13.2.2 Iridiagnosis

13.2.2.1 Definition and Historical Highlights

13.2.2.2 Anatomy of iris in detail

13.2.2.3 Conceptual theories of Iridiagnosis

13.2.2.4 Comparison of the science of iridiagnosis with concepts of *Drishtipraraksha* in *Ayurveda* and ophthalmology in modern medicine.

13.2.2.5 Technique in iris reading

13.2.2.5.1 Normal and abnormal iris

13.2.2.5.2 The vibratory theory and its significance

13.2.2.5.3 Diagnostic chart

13.2.2.6 Iridoscope

13.2.2.7 Zones

13.2.2.8 Sectorial division

13.2.2.9 Interpretation of iris manifestation

13.2.2.9.1 Inherent lesions and weakness

13.2.2.9.2 Cataract

13.2.2.9.3 Toxic settlements

13.2.2.9.4 Nerve rings

13.2.2.9.5 Lymphatic rosary

13.2.2.9.6 Injuries and surgeries

13.2.2.9.7 Psora spot, scurf rim

13.2.2.9.8 Radii Solaris

13.2.2.9.9 Sympathetic nerve wreath

13.2.2.9.10 Closed and open lesions

13.2.2.9.11 Sodium ring

13.2.2.9.12 Circulatory indicators

13.2.2.9.13 Drugs and chemicals' appearance in the iris and their effect on the body

13.2.2.9.13.1 Arsenic, bismuth, bromides, coal tar products, ergot, glycerin, iodine, iron, lead, mercury, opium, phosphorus, quinine, salicylic acid, sodium, strychnine, sculpture, turpentine, vaccines etc.

### **13.2.3 Stool & Urine Diagnosis**

**13.2.3.1 Characteristics of Normal stool & urine**

**13.2.3.2 Abnormal characteristics and its significance**



13.2.3.3 Comparison of Stool and urine diagnosis with mala & moothra pareeksha in

*Ayurveda*

13.2.4 Skin Diagnosis

13.2.4.1 Anatomy of skin

13.2.4.2 Skin types

13.2.4.3 Abnormality and its significance in Health

13.2.4.4 Comparison of skin diagnosis with twakpareeksha in *Ayurveda*

13.2.5 Tongue diagnosis

13.2.6 Pulse diagnosis

13.2.7 Chromo diagnosis

13.2.8 Advanced research updates

### 13.3 **Practical**

13.3.1 Case sheet writing - minimum 25 cases with naturopathic diagnostic methods

13.3.2 Regular hospital visit

13.3.3 Dissertation of at least 20 cases studies with significant and relevant Naturopathic diagnostic modalities

### 13.4 **Reference Books:**

13.4.1 Macfaddans Encyclopedia of Physical Culture - Bernard Macfadden

13.4.2 *Asthangahrityam*

13.4.3 *Charaka samhitha*

13.4.4 *Susrutha samhitha*

13.4.5 The Science of Facial Expression – Louis Kuhne

13.4.6 Iridology - Dr. Bernard Jenson

### 13.5 Scheme Of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Diagnostic Methods - I (Naturopathy)	80	20	30	130	60	10	70	200

## **14. DIAGNOSTIC METHODS IN CONVENTIONAL MEDICINE – II**

**(Duration: 12 Months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

### **14.1 Goals and Objectives**

#### **14.1.1 Goal:**

The goal of teaching Diagnostic Methods in Conventional Medicine to undergraduate students is to provide them with comprehensive knowledge of diagnostic methods employed by conventional doctors that can be used efficiently to diagnose various diseases, for diagnosis as well as prognosis.

#### **14.1.2 Objectives:**

##### **14.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 14.1.2.1.1 Understand the procedures and nuances in approaching a patient and taking a detailed history and writing a case report;
- 14.1.2.1.2 Illustrate examination procedures and techniques generally as well as for specific systems and make provisional diagnoses of common diseases;
- 14.1.2.1.3 Describe laboratory investigations used for supporting the provisional diagnosis made after history taking and examinations;
- 14.1.2.1.4 Prescribe and interpret radiological investigations, biochemical investigations, sonography, EEG, ECG,

EMG, echocardiography, CT, PET, MRI, etc for  
diagnostic and prognostic purposes;

- 14.1.2.1.5 Explain and demonstrate knowledge of invasive tests  
such as paracentesis, thoracocentesis, lumbar puncture,  
laparoscopy, endoscopy, biopsy, etc.

#### **14.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 14.1.2.2.1 Effectively take a case history with examinations and  
prepare a detailed case report;
- 14.1.2.2.2 Prescribe and interpret any further investigations  
required for the provisional diagnosis made.

#### **14.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively understand the principles, procedures and nuances of Diagnostic Methods in Conventional Medicine and employ the same for diagnostic and prognostic purposes.

### **14.2 Theory**

#### **14.2.1 Examination of the Patient**

- 14.2.1.1 Approach to a patient
- 14.2.1.2 History taking and case sheet writing
- 14.2.1.3 Symptomatology
- 14.2.1.4 Examination of vital data

- 14.2.1.5 Importance of height, weight, abdominal girth
- 14.2.1.6 General physical examination
- 14.2.1.7 Examination of skin, nail and hair
- 14.2.1.8 Systemic examination of the patient
  - 14.2.1.8.1 Examination of Abdomen (digestive system)
  - 14.2.1.8.2 Examination of Cardiovascular system
  - 14.2.1.8.3 Examination of Respiratory system
  - 14.2.1.8.4 Examination of Renal and urogenital system
  - 14.2.1.8.5 Examination of Central nervous system
  - 14.2.1.8.6 Examination of Locomotor system
  - 14.2.1.8.7 Examination of ear, nose and throat
  - 14.2.1.8.8 Gynecological examination
  - 14.2.1.8.9 Endocrine system and metabolic disorder
  - 14.2.1.8.10 Examination of eye
- 14.2.1.9 Provisional diagnosis
- 14.2.1.10 Routine and special investigations
  - 14.2.1.10.1 Laboratory investigations: Urine analysis, stool examination, blood examination-peripheral smear, total WBC count, differential WBC count; ESR, Hb estimation ;BT ,CT ,platelet count, red cell indices, bone marrow examination.
  - 14.2.1.10.2 Radiological investigations: Plain X ray chest, K.U.B., lumbar and cervical spine, skull and para nasal sinuses, joints

- 14.2.1.10.3 Contrast Radiology: Barium swallow, barium meal, barium enema; cholecystography, pyelography, angiography, bronchogram, myelogram
- 14.2.1.10.4 Electrocardiography
- 14.2.1.10.5 Echo-cardiograph
- 14.2.1.10.6 Coronary angiography
- 14.2.1.10.7 Electro-encephalography
- 14.2.1.10.8 Biochemical investigations: LFT, creatinine clearance test, Vanillic acid (VMA) excretion test in urine, SGOT and SGPT, LDH, CPK, blood urea, serum creatinine, cholesterol, renal function test, serum uric acid and serum amylase
- 14.2.1.10.9 Diagnostic Paracentesis
- 14.2.1.10.10 Diagnostic Thoracocentesis
- 14.2.1.10.11 Lumbar puncture and CSF analysis
- 14.2.1.10.12 Radioactive iodine uptake studies
- 14.2.1.10.13 Thyroid T3, T4, TSH estimation
- 14.2.1.10.14 Diagnostic skin tests
- 14.2.1.10.15 Endoscopic procedures
- 14.2.1.10.16 Ultra-sonography
- 14.2.1.10.17 CT, PET, MRI, Doppler
- 14.2.1.10.18 Tissue biopsy and FNAC

## 14.2.2 Final Diagnosis

## 14.3 **Practical**

14.3.1 History taking and physical examination of cases

14.3.2 Case sheet writing of different types of cases (25)

14.3.3 Demonstration of equipment and instruments used for investigation in modern diagnostics

14.3.4 Demonstration tour of an ultra-modern super-specialty hospital to view the latest technique of modern diagnosis

### **Functional Diagnostics**

- **Functional Testing:**

- Food sensitivity testing (IgG, IgA).
- Functional nutrient analysis (e.g., vitamin and mineral deficiencies).
- Metabolic health assessments (e.g., blood sugar, insulin response).

- **Biofeedback Devices:**

- Introduction to heart rate variability (HRV).
- Electrodermal screening for energetic imbalances.

### **Traditional Diagnostic Techniques**

- **Naturopathic Diagnostics:**

- Iridology: Eye analysis for systemic health.
- Pulse diagnosis and its variations in naturopathic practices.
- Tongue diagnosis: Shapes, colors, and coatings.

- **Physical Examination Skills:**

- Basic palpation techniques for lymphatic and abdominal assessment.
- Blood pressure and pulse oximetry interpretation.

### **Psychosomatic and Emotional Diagnosis**

- **Techniques to assess mental and emotional health.**
  - Use of questionnaires and behavioral observation.
  - Evaluating stress levels and emotional trauma.

### **Emerging Trends in Naturopathic Diagnostics**

- Genetic testing: Role of genomics in naturopathic care.
- Advances in AI and wearable technologies for health monitoring.
- Personalized medicine in naturopathy.

#### 14.4 **Textbooks**

- 14.4.1 Hutchison's Clinical Methods
- 14.4.2 Manual of clinical Methods – PS Shankar
- 14.4.3 Clinical Diagnosis – JalVakil
- 14.4.4 Clinical Methods – Chamberlin
- 14.4.5 Physical Diagnosis – Golwala
- 14.4.6 Harrison's Principles of Internal Medicine
- 14.4.7 Manipal Manual of Clinical Medicine
- 14.4.8 Macleod's Clinical Examination
- 14.4.9 Davidson's Principles and Practice of Medicine
- 14.4.10 Essentials in Hematology and Clinical Pathology



#### 14.5 Scheme Of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Diagnostic Methods – II (Conventional)	80	20	30	130	60	10	70	200

## **15. PSYCHOLOGY AND BASIC PSYCHIATRY**

**(Duration: 12 months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **15.1 Goals and Objectives**

#### **15.1.1 Goal:**

The goal of teaching Psychology and Basic Psychiatry to undergraduate students is to provide them with comprehensive knowledge of normal and abnormal psychology and assessment of the same for therapeutic purposes.

#### **15.1.2 Objectives:**

##### **15.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 15.1.2.1.1 Describe the evolution of Psychology from speculation to science;
- 15.1.2.1.2 Illustrate mechanisms of sense and perception, states of consciousness and their functions;
- 15.1.2.1.3 Understand basic and complex functions such as learning, memory, thinking, language, motivation, emotion, intelligence, development of psychology across lifespan, personality, stress coping, social psychology, attitudes, etc.
- 15.1.2.1.4 Explain abnormal psychology and describe aetiology and psychopathology along with classification of disorders;

- 15.1.2.1.5 Demonstrate knowledge of therapies aimed at psychological health, such as psychotherapy, *Yoga*, etc;

**15.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 15.1.2.2.1 Utilise knowledge of psychology and psychiatry in diagnosing and managing various psychological disorders, assessing psychological profile;
- 15.1.2.2.2 Demonstrate usage of various therapeutic tools in psychiatry to improve mental health in professional practice.

**15.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of normal and abnormal psychology and psychiatric therapies and efficiently utilise the same for therapeutic purposes.

**15.2 Theory**

**15.2.1 Psychology**

15.2.1.1 Unit 1: The Evolution of Psychology- How psychology developed from speculation to science

15.2.1.1.1 Studying the mind and behaviour

15.2.1.1.2 Early scientific approaches to psychology

15.2.1.1.2.1 Structuralism

15.2.1.1.2.2 Functionalism

15.2.1.1.3 Contemporary approaches to psychology

- 15.2.1.1.3.1 Behavioural approach
- 15.2.1.1.3.2 Psychodynamic approach
- 15.2.1.1.3.3 Cognitive approach
- 15.2.1.1.3.4 Behavioural neuroscience approach
- 15.2.1.1.3.5 Evolutionary psychology approach
- 15.2.1.1.3.6 Sociocultural approach
- 15.2.1.1.4 Positive approach to psychology: Humanistic movement and the positive psychology movement

#### 15.2.1.2 Unit 2: Sensation and Perception

- 15.2.1.2.1 How we sense and perceive the world
  - 15.2.1.2.1.1 The visual system
    - 15.2.1.2.1.2 The auditory system
    - 15.2.1.2.1.3 Other senses
  - 15.2.1.2.2 States of consciousness
    - 15.2.1.2.2.1 Levels of awareness
    - 15.2.1.2.2.2 Sleep and dreams
  - 15.2.1.2.3 Altered states of consciousness
    - 15.2.1.2.3.1 Hypnosis
    - 15.2.1.2.3.2 Meditation
    - 15.2.1.2.3.3 Drug induced states

#### 15.2.1.3 Unit 3: Learning and Memory

- 15.2.1.3.1 Types of learning
  - 15.2.1.3.1.1 Classical conditioning
  - 15.2.1.3.1.2 Operant conditioning
  - 15.2.1.3.1.3 Observational learning

- 15.2.1.3.1.4 Cognitive factors in learning
- 15.2.1.3.2 Memory
  - 15.2.1.3.2.1 Nature of memory
  - 15.2.1.3.2.2 Memory encoding: getting information into memory – the role of attention
  - 15.2.1.3.2.3 Levels of processing
  - 15.2.1.3.2.4 Enriching encoding
  - 15.2.1.3.2.5 Memory storage
    - 15.2.1.3.2.5.1 Sensory memory
    - 15.2.1.3.2.5.2 Short-term memory
    - 15.2.1.3.2.5.3 Long-term memory
  - 15.2.1.3.2.6 Memory retrieval
    - 15.2.1.3.2.6.1 Serial position effect
    - 15.2.1.3.2.6.2 Retrieval cues and the retrieval task
    - 15.2.1.3.2.6.3 Retrieval of autobiographical memories
    - 15.2.1.3.2.6.4 Retrieval of emotional memories
    - 15.2.1.3.2.6.5 Forgetting
  - 15.2.1.3.2.7 Biochemistry of memory
  - 15.2.1.3.2.8 Neural circuitry of memory
  - 15.2.1.3.2.9 Anatomy of memory
  - 15.2.1.3.2.10 Are there multiple memory systems? Implicit versus explicit memory
  - 15.2.1.3.2.11 Declarative versus procedural memory
  - 15.2.1.3.2.12 Semantic versus episodic memory
- 15.2.1.4 Unit 4: Thinking and Language

- 15.2.1.4.1 The cognitive revolution in psychology
- 15.2.1.4.2 Concept formation
- 15.2.1.4.3 Problem solving
- 15.2.1.4.4 Critical thinking
- 15.2.1.4.5 Reasoning and decision making
- 15.2.1.4.6 Language and thought language acquisition and development

15.2.1.5 Unit 5: Motivation and Emotion

- 15.2.1.5.1 Approaches to motivation
  - 15.2.1.5.1.1 Evolutionary approach
  - 15.2.1.5.1.2 Drive reduction theory
  - 15.2.1.5.1.3 Optimum arousal theory
  - 15.2.1.5.1.4 The cognitive approach
- 15.2.1.5.2 Hunger
  - 15.2.1.5.2.1 The biology of hunger and thirst
  - 15.2.1.5.2.2 Environmental factors in the regulation of hunger
  - 15.2.1.5.2.3 Eating and weight
  - 15.2.1.5.2.4 Sexuality - the biology of sex and the human sexual response:  
cognitive and sensory/perceptual factors
  - 15.2.1.5.2.5 Cultural factors
  - 15.2.1.5.2.6 Psychosexual dysfunctions
  - 15.2.1.5.2.7 Sexual behavior and orientation

15.2.1.6 Unit 6: Intelligence

- 15.2.1.6.1 Nature of intelligence
- 15.2.1.6.2 Intelligence testing
- 15.2.1.6.3 Neuroscience and intelligence

- 15.2.1.6.4 Theories of multiple intelligences
- 15.2.1.6.5 The extremes of intelligence and creativity
- 15.2.1.6.6 The influence of heredity and environment

15.2.1.7 Unit 7: Human development across the life span

- 15.2.1.7.1 Exploring human development
- 15.2.1.7.2 Prenatal development
- 15.2.1.7.3 Child development: physical, cognitive and socio emotional development in childhood
- 15.2.1.7.4 Adolescence positive psychology and adolescents
- 15.2.1.7.4.1 Physical, cognitive and socio emotional development in adolescence
- 15.2.1.7.5 Adult development and aging
- 15.2.1.7.6 Physical, cognitive and socio emotional development in adulthood

15.2.1.8 Unit 8: Personality

- 15.2.1.8.1 The nature of personality
- 15.2.1.8.2 Psychodynamic perspectives
- 15.2.1.8.3 Behavioral perspectives
- 15.2.1.8.4 Humanistic perspectives
- 15.2.1.8.5 Biological perspectives and contemporary empirical approaches to personality

15.2.1.9 Unit 9: Stress coping and health

- 15.2.1.9.1 The nature of stress
- 15.2.1.9.2 Major types of stress
- 15.2.1.9.3 Responding to stress

- 15.2.1.9.4 The effects of stress on psychological functioning
- 15.2.1.9.5 The effects of stress on physical health
- 15.2.1.9.6 Factors moderating the impact of stress
- 15.2.1.9.7 Health-impairing lifestyles
- 15.2.1.9.8 Reactions to illness
- 15.2.1.9.9 Improving coping and stress management
- 15.2.1.10 Unit 10: Social Psychology
  - 15.2.1.10.1 Social thinking
    - 15.2.1.10.1.1 Attribution
    - 15.2.1.10.1.2 Social perception
    - 15.2.1.10.1.3 Attitudes
  - 15.2.1.10.2 Social influences
    - 15.2.1.10.2.1 Conformity and obedience
    - 15.2.1.10.2.2 Group influence
    - 15.2.1.10.2.3 Leadership
  - 15.2.1.10.3 Inter group relations
    - 15.2.1.10.3.1 Group identity
    - 15.2.1.10.3.2 Prejudice
    - 15.2.1.10.3.3 Ways to improve interethnic relations
  - 15.2.1.10.4 Social interaction
    - 15.2.1.10.4.1 Aggression
  - 15.2.1.10.5 Relationships
    - 15.2.1.10.5.1 Attraction
    - 15.2.1.10.5.2 Love
    - 15.2.1.10.5.3 Relationships and gender



## 15.2.2 Abnormal psychology: Psychiatry

### 15.2.2.1 Unit 1: Abnormal behavior in historical context- the science of psychopathology

#### 15.2.2.1.1 The historical conceptions of abnormal behavior

##### 15.2.2.1.1.1 The supernatural tradition

##### 15.2.2.1.1.2 The biological tradition

##### 15.2.2.1.1.3 The psychological tradition

#### 15.2.2.1.2 An integrative approach to psychopathology

#### 15.2.2.1.3 One-dimensional and multidimensional models

#### 15.2.2.1.4 Genetic contributions to psychopathology neuroscience and its contributions to psychopathology

#### 15.2.2.1.5 Behavioral and cognitive science

#### 15.2.2.1.6 Cultural, social and interpersonal factors

#### 15.2.2.1.7 Classification of psychological disorders: DSM IV and ICD 10 Classifications

### 15.2.2.2 Unit 2: Anxiety disorders

#### 15.2.2.2.1 Generalized anxiety disorders

#### 15.2.2.2.2 Panic disorders; phobias

#### 15.2.2.2.3 Obsessive-compulsive disorders

### 15.2.2.3 Unit 3: Somatoform and Dissociative disorders

#### 15.2.2.3.1 Hypochondriasis

#### 15.2.2.3.2 Somatization disorder

#### 15.2.2.3.3 Conversion disorder

#### 15.2.2.3.4 Pain disorder

#### 15.2.2.3.5 Dissociative disorders

15.2.2.4 Unit 4: Mood disorders

15.2.2.4.1 Depressive disorders

15.2.2.4.2 Bipolar disorders

15.2.2.4.3 Suicide

15.2.2.5 Unit 5: Substance-related disorders

15.2.2.5.1 Depressants

15.2.2.5.1.1 Alcohol use disorders

15.2.2.5.1.2 Sedative substance use disorders

15.2.2.5.1.3 Hypnotic substance use disorders

15.2.2.5.1.4 Anxiolytic substance use disorders

15.2.2.5.2 Stimulants

15.2.2.5.2.1 Amphetamine use disorders

15.2.2.5.2.2 Cocaine use disorders

15.2.2.5.2.3 Nicotine use disorders

15.2.2.5.2.4 Caffeine use disorders

15.2.2.5.3 Opioids use disorders

15.2.2.5.4 Hallucinogens

15.2.2.5.4.1 Marijuana

15.2.2.5.4.2 LSD

15.2.2.5.4.3 Other Hallucinogens

15.2.2.5.5 Other drugs of abuse

15.2.2.6 Unit 6: Schizophrenia and other psychotic disorders

15.2.2.6.1 Schizophrenia

15.2.2.6.1.1 Clinical description

15.2.2.6.1.2 Causes

- 15.2.2.6.1.3 Types and treatment
- 15.2.2.6.2 Personality disorders – cluster A, B and C
- 15.2.2.6.3 Psychotherapies
  - 15.2.2.6.3.1 Psychodynamic therapies
  - 15.2.2.6.3.2 Behavioural therapies
  - 15.2.2.6.3.3 Humanistic therapies

15.2.2.7 Unit 7: Mental health and Yoga

**15.2.2.8 Psychology Practical Syllabus**

**15.2.2.9 Psychological Assessment:**

15.2.2.10 Administration, scoring, and interpretation of standardized psychological tests:

**15.2.2.11 Intelligence Tests:**

15.2.2.12 Raven's Progressive Matrices

15.2.2.13 Wechsler Adult Intelligence Scale (WAIS)

15.2.2.14 Stanford-Binet Test

**15.2.2.15 Personality Assessments:**

15.2.2.16 Rorschach Inkblot Test

15.2.2.17 Thematic Apperception Test (TAT)

15.2.2.18 Eysenck Personality Questionnaire (EPQ)

15.2.2.19 Big Five Inventory

**15.2.2.20 Cognitive Function Tests:**

15.2.2.21 Stroop Test

15.2.2.22 Digit Span Test

15.2.2.23 Trail Making Test

**15.2.2.24 Aptitude and Interest Tests:**

15.2.2.25 Differential Aptitude Test (DAT)

15.2.2.26 Strong Interest Inventory

**15.2.2.27 Attitude and Values:**

15.2.2.28 Likert Scale

15.2.2.29 Thurstone Scale

**15.2.2.30 Behavioral Experiments:**

15.2.2.31 Classical Conditioning and Operant Conditioning

15.2.2.32 Reaction Time Studies

**15.2.2.33 Memory Experiments:**

15.2.2.34 Serial Position Effect

15.2.2.35 Forgetting Curve

15.2.2.36 Problem-Solving and Decision-Making Tasks

**15.2.2.37 Counseling and Interviewing Skills:**

15.2.2.38 Role-plays and case studies

15.2.2.39 Structured and unstructured interviews

15.2.2.40 Building therapeutic rapport

**15.2.2.41 Observation Techniques:**

15.2.2.42 Use of checklists and rating scales

15.2.2.43 Behavioral observation and recording

**15.2.2.44 Case Studies:**

15.2.2.45 Detailed analysis of psychological disorders (e.g., depression, anxiety)

15.2.2.46 Child and adolescent psychological issues

**15.2.2.47 Field Work:**

15.2.2.48 Visits to schools, NGOs, or rehabilitation centers for practical exposure

- 15.2.2.49 Basic Psychiatry Practical Syllabus**
- 15.2.2.50 Clinical Psychiatry Skills:**
- 15.2.2.51 History-taking:
- 15.2.2.52 Psychiatric history
- 15.2.2.53 Family history
- 15.2.2.54 Substance use history
- 15.2.2.55 Mental Status Examination (MSE):
- 15.2.2.56 Appearance and behavior
- 15.2.2.57 Mood and affect
- 15.2.2.58 Thought content and process
- 15.2.2.59 Perception, insight, and judgment
- 15.2.2.60 Risk assessment for suicide or violence
- 15.2.2.61 Diagnostic Tools and Scales:**
- 15.2.2.62 Hamilton Depression Rating Scale (HAM-D)
- 15.2.2.63 Hamilton Anxiety Rating Scale (HAM-A)
- 15.2.2.64 Mini-Mental State Examination (MMSE)
- 15.2.2.65 Beck Depression Inventory (BDI)
- 15.2.2.66 Yale-Brown Obsessive-Compulsive Scale (Y-BOCS)
- 15.2.2.67 Psychiatric Case Discussions:**
- 15.2.2.68 Mood disorders (e.g., depression, bipolar disorder)
- 15.2.2.69 Psychotic disorders (e.g., schizophrenia)
- 15.2.2.70 Anxiety disorders
- 15.2.2.71 Personality disorders
- 15.2.2.72 Substance-related and addictive disorders
- 15.2.2.73 Therapeutic Approaches:**
- 15.2.2.74 Basics of pharmacological management:
- 15.2.2.75 Antidepressants
- 15.2.2.76 Anxiolytics
- 15.2.2.77 Antipsychotics
- 15.2.2.78 Introduction to psychotherapy:
- 15.2.2.79 Cognitive Behavioral Therapy (CBT)
- 15.2.2.80 Psychodynamic Therapy
- 15.2.2.81 Supportive Therapy
- 15.2.2.82 Electroconvulsive Therapy (ECT) overview
- 15.2.2.83 Observation in Clinical Settings:**
- 15.2.2.84 Attending ward rounds
- 15.2.2.85 Observation of psychiatric interviews and counseling sessions
- 15.2.2.86 Ethics and Legal Aspects in Psychiatry:**
- 15.2.2.87 Consent in psychiatric practice
- 15.2.2.88 Legal aspects of involuntary admission and treatment
- 15.2.2.89 Research and Report Writing:**
- 15.2.2.90 Writing clinical case reports
- 15.2.2.91 Conducting small-scale research projects (if applicable)

### **15.3 References:**

1. Weiten, Wayne (1995) themes and variations 3<sup>rd</sup> edition, New York Brooks/Cole Publishing company
2. Santrock, J.W. (2005) Psychology, 7<sup>th</sup> edition , New York, McGraw Hill publications
3. Barlow , D.H. and Durand, V.M. (2002 ) Abnormal Psychology, 3<sup>rd</sup> edition , United

## BNYS 3<sup>rd</sup> Year Syllabus

### An Introduction to Speech Therapy (BNY-307A)

#### CO: COURSE OBJECTIVES

**CO-1** To understand the social, emotional, and psychological impacts of communication disorders and how speech therapy improves the quality of life for individuals with these challenges.

**CO-2** To introduce the normal processes of speech, language, and communication development, to explore how these processes can be disrupted by various disorders or conditions.

**CO-3** To familiarize students with common speech and language disorders, including articulation, fluency (e.g., stuttering), voice, receptive and expressive language, and cognitive-communication disorders.

**CO-4** To examine the roles and responsibilities of speech-language pathologists, including their work settings, collaboration with other healthcare professionals, and adherence to professional and ethical guidelines.

#### Course Contents

##### Unit I: Introduction to Speech Therapy

- Overview of speech-language pathology as a profession.
- Roles and settings where speech-language pathologists work.
- History and evolution of the field.

##### Unit II: Basics of Communication

- Overview of the communication process.
- Components of speech (articulation, fluency, voice) and language (syntax, semantics, pragmatics).
- Typical developmental milestones in speech and language.

##### Unit III: Articulation and Phonological Disorders

- Introduction to articulation disorders.
- Phonological processes and speech sound disorders.
- Case studies and assessment techniques.

##### Unit IV: Language Disorders in Children

- Receptive and expressive language disorders.
- Developmental language disorder (DLD) and its characteristics.
- Impact of language disorders on academic achievement.

##### Unit V: Fluency Disorders (Stuttering)

- Understanding fluency disorders.
- Etiology and characteristics of stuttering.
- Introduction to stuttering therapy techniques.

#### Suggested Readings:

- *Introduction to Communication Disorders: A Lifespan Evidence-Based Perspective* by Robert Owens, Dale Metz, Kimberly Farinella.
- *Assessment in Speech-Language Pathology: A Resource Manual* by Kenneth G. Shipley and Julie G. McAfee.
- *Journals and articles from the American Speech-Language-Hearing Association (ASHA).*

## **COURSE OUTCOMES-**

**COs-1** Students will demonstrate an understanding of normal speech, language, and communication development across different age groups.

**COs-2** Students will be able to identify and differentiate between various speech and language disorders, such as articulation disorders, fluency disorders, language delays, and voice disorders.

**COs-3** Students will gain foundational knowledge of how speech-language pathologists assess communication disorders using screening tools and comprehensive evaluations.

**COs-4** Students will explore the principles of speech therapy and gain a general understanding of intervention techniques for speech and language disorders.

## **BNYS 3<sup>rd</sup> Year Syllabus Music Therapy (BNY-307 B)**

### **CO: COURSE OBJECTIVES**

**CO-1** Learn about different music therapy approaches, including psychodynamic, humanistic, cognitive-behavioral, and neurological models.

**CO-2** Gain proficiency in various music therapy techniques, such as improvisation, songwriting, receptive music listening, and musical play.

**CO-3** Understand how music impacts the brain and body, including the psychological and physiological effects of rhythm, melody, and harmony, learn about the use of music therapy in managing pain, anxiety, stress, and other mental health conditions.

**CO-4** Provide hands-on clinical training through supervised practicum experiences, apply music therapy skills in real-world settings such as hospitals, schools, rehabilitation centres, and mental health facilities. Receive feedback and reflect on personal and professional growth.

### *Course Contents*

#### **Unit I: Introduction to Music Therapy**

- Course overview and objectives.
- History and evolution of music therapy.
- Overview of different populations served by music therapy.

#### **Unit II: Theoretical Foundations of Music Therapy**

- Psychodynamic, cognitive-behavioral, humanistic, and neurological models.
- Case studies of different therapeutic approaches.

### Unit III: Music Therapy and the Brain

- How music affects the brain and body.
- Neurological foundations of music therapy.

### Unit IV: Assessment in Music Therapy

- Client assessment techniques.
- Developing individualized treatment plans.
- Role of assessment tools.

### Unit V: Music Therapy Methods – Receptive Techniques

- Guided music listening and visualization.
- Music-assisted relaxation and imagery techniques.

### Suggested Readings:

- **Textbook:** *Music Therapy: An Introduction* by W. B. Davis.
  - **Supplementary Readings:** Research articles, case studies, and media provided via course platform.
- Instruments:** Students will need access to basic percussion instruments, guitar, or piano.

## COURSE OUTCOMES

**COs-1** Demonstrate a thorough understanding of the history, philosophy, and theoretical foundations of music therapy. Identify and explain the major approaches and models used in music therapy (e.g., psychodynamic, humanistic, cognitive-behavioural, neurological).

**COs-2** Use various music therapy methods, such as improvisation, songwriting, and guided music listening, to address emotional, cognitive, physical, and social needs. Demonstrate proficiency in using both active (e.g., playing instruments, vocal techniques) and receptive (e.g., listening, imagery) music therapy interventions.

**COs-3** Explain how music affects the brain, body, and emotions. Apply knowledge of the therapeutic benefits of music in addressing physical, emotional, and mental health issues, such as pain management, stress reduction, and mood regulation.

**COs-4** Apply music therapy skills in real-world settings (e.g., hospitals, schools, rehabilitation centers) through supervised clinical practicum. Develop reflective practices by receiving and incorporating feedback from clinical supervisors and peers. Demonstrate the ability to work effectively within multidisciplinary teams of healthcare and educational professionals.

### 15.4 Scheme Of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks

01.	Psychology & Basic Psychiatry/An Introduction to Speech Therapy/ Music Therapy	80	20	30	130	60	10	70	200
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## **16. FASTING THERAPY AND DIETETICS (Duration: 12 months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

### **16.1 Goals and Objectives**

#### **16.1.1 Goal:**

The goal of teaching Fasting Therapy and Dietetics to undergraduate students is to provide them with comprehensive knowledge of diet management and Fasting therapy and utilisation of the same for therapeutic purposes.

#### **16.1.2 Objectives:**

##### **16.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 16.1.2.1.1 Describe definitions and historical highlights of fasting therapy through the centuries, including fasting employed in different religions;
- 16.1.2.1.2 Classify fasting according to duration, purpose, type, etc;
- 16.1.2.1.3 Define rules and regulations of fasting to be followed;
- 16.1.2.1.4 Understand the metabolism of fasting;
- 16.1.2.1.5 Understand contraindications and indications of fasting in order to efficiently use fasting as a therapy;
- 16.1.2.1.6 Understanding Calorie Restriction: Concept, Method, Prevailing basic- Clinical-applied evidence;

- 16.1.2.1.7 Understand the concept of dietetic principles in Naturopathy;
- 16.1.2.1.8 Understand food combinations and health, including dietary requirements for different age groups, including pregnant and lactating women;
- 16.1.2.1.9 Describe importance of various components of diet, such as dietary fiber, vitamins, minerals, etc;
- 16.1.2.1.10 Explain auxiliary concepts of dietetics such as food hygiene, etc.

#### **16.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 16.1.2.2.1 Utilise knowledge of fasting therapy and dietetics in managing various diseases;
- 16.1.2.2.2 Demonstrate usage of therapeutic diets and fasting therapy in promotive, preventive, curative and rehabilitative therapy.

#### **16.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of fasting therapy and dietetics and efficiently utilise the same for therapeutic purposes.

## **16.2 Fasting**

16.2.1 Definition

16.2.2 Historical highlights

- 16.2.2.1 Indian: According to Vedas, *Ayurveda*, Epics and other pioneer Naturopaths
- 16.2.2.2 Western
- 16.2.3 Evidence of fasting in animals and its benefits
- 16.2.4 Fasting in different religions
- 16.2.5 Classification of fasting and its effects, limitations, according to
  - 16.2.5.1 Duration (Short, long, intermittent, weekly)
  - 16.2.5.2 Purpose (Preventive, therapeutic, religious, political)
  - 16.2.5.3 Type (Dry, water, juice, monodiet)
- 16.2.6 Starvation – pathological features in different organ systems
- 16.2.7 Physiological changes of fasting in short, long, intermittent, dry, water, juice (lemon honey, tender coconut, sugarcane juice, alkaline juices, honey water etc.) and monodiet fasting.
- 16.2.8 Difference between hunger and starvation
- 16.2.9 Rules and regulations for administering fasting
- 16.2.10 Rules and regulations for selection of patient for fasting
- 16.2.11 Hygiene and auxiliaries of fasting
- 16.2.12 Sane fasting
- 16.2.13 Do's and don'ts of fasting
- 16.2.14 Metabolism of fasting
- 16.2.15 Preparation of individuals for fasting
  - 16.2.15.1 Psychological effects and barriers for fasting
  - 16.2.15.2 Crises during fasting therapy and its management
  - 16.2.15.3 Significance of enema during fasting and its physiology
  - 16.2.15.4 Significance of fasting in fever

16.2.15.5 Fasting for preservation of health

16.2.15.6 Contraindications and limitations of fasting

**16.2.16** Research updates on fasting

## **16.3 Dietetics**

- 16.3.1** Concept of health in naturopathy
- 16.3.2** Dietetic principles in naturopathy
- 16.3.3** Concept of wholesome diet
- 16.3.4** Medical values of food
- 16.3.5** Natural qualities / properties / characters of foods in naturopathy / *Ayurveda* / modern nutrition
- 16.3.6** Natural food and health
  - 16.3.6.1 Importance of green vegetables, other vegetables, fruits and ingredients
  - 16.3.6.2 Chemical composition of different raw juices and their effects and uses
  - 16.3.6.3 Wheat grass, beetroot, cabbage, cucumber, garlic, papaya, mango, pineapple, pumpkins etc
  - 16.3.6.4 Comparison with raw and cooked food
  - 16.3.6.5 Sprouts, nutrition and method
- 16.3.7** Food combination and health
- 16.3.8** Naturopathic hospital dietetics and classification
- 16.3.9** Disease management for different diseases
- 16.3.10** Food allergies and diet
- 16.3.11** Seasonal changes
- 16.3.12** Dietary requirements for pregnancy, lactation and infancy
- 16.3.13** Food hygiene and health
- 16.3.14** Methods of cooking – nutrient losses and preservation
- 16.3.15** Dietary fiber and its therapeutic effects

16.3.16 Customs and traditions of eating

16.3.17 Emotional states and diet

#### 16.4 **Practical**

16.4.1 Visits to different diet departments of naturopathy and modern medicine hospitals

16.4.2 Menu planning using natural foods and raw diet in general

16.4.3 Demonstration of different sprouts

16.4.4 Preparation of low cost balanced diet for different population groups using natural foods

16.4.5 Canteen duties at different naturopathy hospitals

16.4.6 Visit to different nutrition centers like CFTRI, Mysore, NIN, Hyderabad etc.

16.4.7 Study of 20 fasting cases

16.4.8 Case studies of 10 with records

#### 16.5 **Textbooks**

16.5.1 Fasting for Healthy and Long Life – Carrington

16.5.2 Fasting Cure – Lakshman Sharma

16.5.3 Fasting - The Ultimate Diet - Allan Cott

16.5.4 Mucusless Diet Healing System - Arnold Ehret

16.5.5 The Fasting Cure (Classic Reprint) - Upton Sinclair

16.5.6 Fasting Can Save Your Life - Herbert M. Shelton

16.5.7 Davidson and Passamore Human Nutrition – Passamore

16.5.8 Clinical Dietetics and Nutrition – FP Antia

16.5.9 Normal Therapeutic Nutrition – Corinne Robinson

16.5.10 Essentials of Food and Nutrition – Swaminathan

16.5.11 Sprouts – JD Vaish *Yoga Samsthan*

16.5.12 Science and Art of Food and Nutrition – Herbert Shelton

16.5.13 Nutritive Values of Indian Foods – NIN (Hyd)

16.5.14 Publications of NIN, Hyderabad

### 16.6 **Scheme Of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Fasting Therapy and Dietetics	80	20	30	130	60	10	70	200

## **17. OBSTETRICS AND GYNECOLOGY (Duration: 12 Months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **17.1 Goals and Objectives**

#### **17.1.1 Goal:**

The goal of teaching Obstetrics and Gynecology to undergraduate students is to provide them with the comprehensive knowledge of anatomy, physiology and pathophysiology of the reproductive system and gain the ability to optimally manage common problems.

#### **17.1.2 Objectives:**

##### **17.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 17.1.2.1.1 Delineate the anatomy, physiology and pathophysiology of the reproductive system and the common conditions affecting it;
- 17.1.2.1.2 Detect normal pregnancy, labor, and puerperium;
- 17.1.2.1.3 Elucidate the leading causes of maternal and perinatal morbidity and mortality;
- 17.1.2.1.4 Understand the principles of contraception and various methods employed, methods of medical termination of pregnancy, sterilization and their complications;
- 17.1.2.1.5 Recognize the use, abuse and side effects of drugs in pregnancy, pre-menopausal and post-menopausal periods;



- 17.1.2.1.6 Explain the national programmes of maternal and child health and family welfare and their implementation;
- 17.1.2.1.7 Assess different gynecological diseases and describe principles of their management;
- 17.1.2.1.8 Explain the indications, techniques and complications of procedures like Caesarean section, laparotomy, abdominal and vaginal hysterectomy, and vacuum aspiration for Medical Termination of Pregnancy (MTP).

**17.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 17.1.2.2.1 Examine a pregnant women, recognize high risk pregnancies and make appropriate referrals;
- 17.1.2.2.2 Recognise complications of delivery and provide postnatal care;
- 17.1.2.2.3 Recognize congenital anomalies of newborn;
- 17.1.2.2.4 Advise a couple on the use of various available contraceptive devices;
- 17.1.2.2.5 Perform pelvic examination, diagnose and manage common gynaecological problems including early detection of genital malignancies;
- 17.1.2.2.6 Interpret data of investigations like biochemical, histopathological, radiological, ultrasound etc

### **17.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of Obstetrics and Gynaecology to manage related ailments and educate masses on family planning norms.

## **17.2 Theory**

### **17.2.1 Obstetrics**

#### 17.2.1.1 Basic Anatomy and Physiology

17.2.1.1.1 Anatomy and Physiology of female reproductive organs and pelvis

17.2.1.1.2 Maturation and fertilization of ovum

17.2.1.1.3 Development of placenta

17.2.1.1.4 Embryology of uterus

#### 17.2.1.2 Physiology of pregnancy

17.2.1.2.1 Maternal changes due to pregnancy

17.2.1.2.2 Diagnosis of pregnancy

17.2.1.2.3 Differential diagnosis of pregnancy

17.2.1.2.4 Foetus in normal pregnancy

17.2.1.2.5 Antenatal care

#### 17.2.1.3 Physiology of labor

17.2.1.3.1 Causation and stages of labor

17.2.1.3.2 Mechanism of labor

17.2.1.3.3 Conduct of normal labor

#### 17.2.1.4 Physiology puerperium

17.2.1.4.1 Phenomena of normal puerperium

- 17.2.1.4.2 Care of puerperium
- 17.2.1.4.3 Care of new born child
- 17.2.1.5 Pathology of pregnancy
  - 17.2.1.5.1 Hyperemesis gravidarum
  - 17.2.1.5.2 Venereal diseases
  - 17.2.1.5.3 Anemia in pregnancy
  - 17.2.1.5.4 Diseases of the urinary system
  - 17.2.1.5.5 Diabetes in pregnancy
  - 17.2.1.5.6 Diseases and abnormalities of fetal membranes and placenta
  - 17.2.1.5.7 Abortion
  - 17.2.1.5.8 Ectopic pregnancy
  - 17.2.1.5.9 Ante-partum hemorrhage
  - 17.2.1.5.10 Placenta previa
- 17.2.1.6 Pathology of labor
  - 17.2.1.6.1 Occipito-posterior position
  - 17.2.1.6.2 Breech presentation
  - 17.2.1.6.3 Prolapse of the cord, compound presentation
  - 17.2.1.6.4 Multiple pregnancy
  - 17.2.1.6.5 Contracted pelvis
  - 17.2.1.6.6 Management of labor in contracted pelvis
  - 17.2.1.6.7 Complications of 3<sup>rd</sup> stage of labor
- 17.2.1.7 Affection of new-born
  - 17.2.1.7.1 Asphyxia neonatorum
  - 17.2.1.7.2 Pre-term baby
  - 17.2.1.7.3 Congenital malformations

17.2.1.8 Obstetrical operations

17.2.1.8.1 Forceps

17.2.1.8.2 Caesarean section

17.2.1.8.3 Induction of abortion and labor

17.2.1.9 Pathology of Puerperium – Puerperal infections

17.2.1.10 Miscellaneous:

17.2.1.10.1 Perinatal mortality and maternal mortality

17.2.1.10.2 Post-dated pregnancy

17.2.1.10.3 Placenta insufficiency

17.2.1.10.4 Control of contraception

17.2.1.10.5 Medical termination of pregnancy

17.2.1.10.6 Pre-term labor

17.2.1.10.7 Ultrasonogram in Obstetrics

17.2.1.11 Applied aspects in Obstetrics:

17.2.1.11.1 *Yoga* and Naturopathy for Healthy parenthood

17.2.1.11.2 Antenatal and postnatal care through *Yogic* methods

17.2.1.11.3 Antenatal and postnatal care through Naturopathic modalities

17.2.1.11.4 Antenatal and postnatal care through general exercises

17.2.1.11.5 Antenatal and postnatal care through Hydrotherapy

17.2.1.11.6 Natural diet during pregnancy and lactation

## **17.2.2 Gynecology**

### 17.2.2.1 Anatomy of the female pelvic organs

17.2.2.1.1 External genitalia

17.2.2.1.2 Internal genitalia

17.2.2.1.3 Female urethra

17.2.2.1.4 Urinary bladder

17.2.2.1.5 Pelvic ureter

17.2.2.1.6 Rectum and Anal canal

17.2.2.1.7 Pelvic muscles

17.2.2.1.8 Pelvic fascia and cellular tissue

### 17.2.2.2 Blood vessels, lymphatic drainage and innervations of pelvic organs

17.2.2.2.1 Pelvic blood vessels

17.2.2.2.2 Pelvic lymphatics

17.2.2.2.3 Pelvic nerves

### 17.2.2.3 Puberty and Menopause

### 17.2.2.4 Neuroendocrinology in relation to reproduction

### 17.2.2.5 Menstruation

### 17.2.2.6 Examination of a gynecological patient and the diagnostic aids

17.2.2.6.1 History

17.2.2.6.2 Examination

17.2.2.6.3 Ancillary aids

17.2.2.6.4 Cytology

17.2.2.6.5 Colonoscopy

17.2.2.7 Pelvic infection

17.2.2.7.1 Defense of the genital tract

17.2.2.7.2 Acute pelvic infection

17.2.2.7.3 Chronic pelvic infection

17.2.2.7.4 Genital tuberculosis

17.2.2.8 Sexually transmitted diseases

17.2.2.9 Infections of the individual pelvic organs

17.2.2.9.1 Vulva

17.2.2.9.2 Bartholin's gland

17.2.2.9.3 Vagina

17.2.2.9.4 Cervix

17.2.2.9.5 Endometrium

17.2.2.9.6 Fallopian tube

17.2.2.9.7 Ovary

17.2.2.9.8 Parametrium

17.2.2.10 Dysmenorrhea and other disorders of menstrual cycles

17.2.2.10.1 Dysmenorrhea

17.2.2.10.2 Dysfunctional uterine bleeding

17.2.2.11 Displacement of the uterus

17.2.2.11.1 Retroversion

17.2.2.11.2 Prolapse

17.2.2.11.3 Chronic inversion

17.2.2.12 Infertility

17.2.2.12.1 Causes

17.2.2.12.2 Investigations

- 17.2.2.12.3 Treatment
- 17.2.2.12.4 Assisted reproductive techniques
- 17.2.2.12.5 Counseling techniques
- 17.2.2.13 Benign lesions of the vulva and vagina
  - 17.2.2.13.1 Vulval epithelial disorders
  - 17.2.2.13.2 Vulval ulcers
  - 17.2.2.13.3 Vulval and vaginal cysts
- 17.2.2.14 Benign lesions of the cervix
- 17.2.2.15 Benign lesions of the uterus
  - 17.2.2.15.1 Fibroid
  - 17.2.2.15.2 Polyps
- 17.2.2.16 Benign lesions of the ovary
- 17.2.2.17 Ovarian neoplasm
- 17.2.2.18 Endometriosis and adenomyosis
- 17.2.2.19 Premalignant lesions
  - 17.2.2.19.1 Vulva
  - 17.2.2.19.2 Vagina
  - 17.2.2.19.3 Cervix
  - 17.2.2.19.4 Endometrium

- 17.2.2.20 Genital malignancy
  - 17.2.2.20.1 Cervical
  - 17.2.2.20.2 Endometrial
  - 17.2.2.20.3 Gestational trophoblastic neoplasia
  - 17.2.2.20.4 Ovarian
- 17.2.2.21 Urinary problems in gynecology
  - 17.2.2.21.1 Anatomy of the urethra-vesical unit
  - 17.2.2.21.2 Genuine stress incontinence
  - 17.2.2.21.3 Overflow incontinence
  - 17.2.2.21.4 Retention of urine
  - 17.2.2.21.5 Urinary tract infections
- 17.2.2.22 Genital fistulae
  - 17.2.2.22.1 Genito-urinary
  - 17.2.2.22.2 Recto-vaginal
- 17.2.2.23 Amenorrhea
  - 17.2.2.23.1 Physiological
  - 17.2.2.23.2 Primary
  - 17.2.2.23.3 Secondary
- 17.2.2.24 Contraception
  - 17.2.2.24.1 Barrier methods
  - 17.2.2.24.2 Natural
  - 17.2.2.24.3 IUCD
  - 17.2.2.24.4 Steroidal
  - 17.2.2.24.5 Emergency
  - 17.2.2.24.6 Sterilization



- 17.2.2.25 Special problems
  - 17.2.2.25.1 Abnormal vaginal discharge
  - 17.2.2.25.2 Pruritis vulvae
  - 17.2.2.25.3 Pelvic pain
  - 17.2.2.25.4 Postmenopausal bleeding
  - 17.2.2.25.5 Low backache
  - 17.2.2.25.6 Breast in gynecology
  - 17.2.2.25.7 Vaginismus
  - 17.2.2.25.8 Dyspareunia
  - 17.2.2.25.9 Hirsutism
  - 17.2.2.25.10 Galactorrhoea
- 17.2.2.26 Operative gynecology
  - 17.2.2.26.1 Postoperative care
  - 17.2.2.26.2 Dilation of cervix
  - 17.2.2.26.3 Dilation and curettage
  - 17.2.2.26.4 Dilation of and insufflation
  - 17.2.2.26.5 Hysterosalpingography
  - 17.2.2.26.6 Cervical biopsy
  - 17.2.2.26.7 Cryosurgery
  - 17.2.2.26.8 Perineoplasty
  - 17.2.2.26.9 Amputation of cervix
  - 17.2.2.26.10 Abdominal hysterectomy
  - 17.2.2.26.11 Vaginal hysterectomy
- 17.2.2.27 Endoscopic surgery in gynecology
  - 17.2.2.27.1 Laparoscopy

17.2.2.27.2 Hysteroscopy

17.2.2.28 Applied aspects in Gynecology:

17.2.2.28.1 Role of Naturopathy and *Yoga* in Gynecology

17.2.2.28.2 Water treatments for gynecological disorders.

17.3 **Practical**

17.3.1 History taking of antenatal and gynecological cases

17.3.2 Demonstration of physical examination of antenatal and postnatal gynecological cases

17.3.3 Demonstration of conductive labor, normal delivery and use of minor instruments during delivery.

17.3.4 Demonstrations of instruments like Sim's speculum, Cusco's bivalve self training vaginal speculum, Cervical dilators, Anterior vaginal wall retractor, Uterine curette

17.3.5 Specimens

17.3.6 X ray, US, and CT plates

17.3.7 Case-history writing of antenatal and gynecological cases

17.3.8 Demonstration of underwater delivery and painless delivery using acupuncture desired.

17.4 **Textbooks**

17.4.1 Clinical Obstetrics – Mudaliar and Menon

17.4.2 Textbook of Obstetrics and Gynecology – CS Dawn

17.4.3 Shaw's Gynecology

17.4.4 Textbook of Obstetrics and Gynecology - Dutta

### 17.5 **Scheme Of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Obstetrics and Gynaecology	80	20	30	130	60	10	70	200

## **18. YOGA THERAPY (Duration: 12 Months)**

**Total hours: 225 (Theory: 125 Practical: 100)**

### **18.1 Goals and Objectives**

#### **18.1.1 Goal**

The goal of teaching *Yoga* Therapy to undergraduate students is to provide them with comprehensive knowledge of *Yoga* and the physiological effects of various *yogic* practices and utilisation of the same for therapeutic purposes.

#### **18.1.2 Objectives:**

##### **18.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 18.1.2.1.1 Describe the physiological effects of various *yogic* practices like *kriyas*, *asanas*, *pranayamas*, *mudras*, *bandhas*, *drishtis*, Guided relaxation and Meditation;
- 18.1.2.1.2 Define rules and regulations of *Yoga* to be followed;
- 18.1.2.1.3 Understand the therapeutic aspects of *Yoga* as applied to different disease conditions;
- 18.1.2.1.4 Understand contraindications and indications of *yogic* practices in order to efficiently use *Yoga* as a therapy;
- 18.1.2.1.5 Understand the concept of health and disease in *yogic* lore and role of stress in disease causation and management of the same with *Yoga* ;
- 18.1.2.1.6 Understand importance of food according to *Yoga*;
- 18.1.2.1.7 Delineate the importance of *Yoga* and mental health;

### **18.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 18.1.2.2.1 Utilise knowledge of *Yoga* therapy in managing various diseases;
- 18.1.2.2.2 Demonstrate usage of therapeutic aspect of *Yoga* in promotive, preventive, curative and rehabilitative therapy.
- 18.1.2.2.3 Institute remedial measures in *Yoga* for various disease conditions.

### **18.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of *Yoga* and efficiently utilize the same for therapeutic purposes.

## **18.2 Theory**

- 18.2.1 Introduction to *Yogic* Therapy / Basis of *yogic* Therapy
- 18.2.2 Role of *Asanas* in curing various diseases
- 18.2.3 Specific importance of *Pranayama* in curing various diseases
- 18.2.4 Vital role of *Bandhas*, *Mudras*, *Drishtis*, in curing various diseases
- 18.2.5 Role of *Shat kriyas* in curing various diseases
- 18.2.6 Role of general exercises in health and diseases
- 18.2.7 *Sudarshan Kriya* and other modern variants
- 18.2.8 The effects of various *Yogic* practices on different systems (skeletal system, endocrine system, nervous system, digestive system, respiratory system, excretory system, cardiovascular system, muscular system, reproductive system)

**18.2.9** Research methods in *yogic* therapy, statistical analysis etc.

**18.2.10** *Yoga* therapy for

- 18.2.10.1 Cardiovascular diseases
- 18.2.10.2 Psychiatric disorders
- 18.2.10.3 Musculoskeletal disorders
- 18.2.10.4 Nervous system disorders
- 18.2.10.5 Gastrointestinal disorders
- 18.2.10.6 Hormonal diseases
- 18.2.10.7 Respiratory diseases
- 18.2.10.8 Metabolic diseases
- 18.2.10.9 Ophthalmologic disorders
- 18.2.10.10 Pediatric disorders
- 18.2.10.11 ENT Disorders
- 18.2.10.12 OBG disorders

**18.2.11** Meditation and its applications on psychosomatic disorders

**18.2.12** *Yoga* and relaxation techniques

- 18.2.12.1 QRT – Quick Relaxation Technique
- 18.2.12.2 IRT – Instant Relaxation Technique
- 18.2.12.3 DRT – Deep Relaxation Technique

**18.2.13** Teaching methods of *Yoga* to public, students and patients. Model lesson planning and adoption of *Yoga* in education system, limitations, *vidhi* and *nishedha* (right and wrong)

**18.2.14** Advanced techniques of *Yoga* therapy (CM, PET, MSRT, MIRT, MEMT, VISAK, ANAMS, and SMET etc.)

**18.2.15** Subtle Energy Medicine

**18.2.16** *Yoga* and Mental Health: Total integration of personality, correct mental behavior and attitude, hormonal relationship of body and mind, self-content tranquilizing effect, psychology of spiritual growth and spiritual values, reasoning and judgment, pure consciousness, mode of living and disciplined life.

**18.2.17** *Drishtis*

**18.2.18** Stress management through *Yoga*

**18.2.19** Applied Psychology

18.2.19.1 Historical perspective, identifying disorders

18.2.19.1.1 Anxiety disorders

18.2.19.1.2 Dissociative disorders

18.2.19.1.3 Somatoform disorders

18.2.19.1.4 Sexual disorders

18.2.19.1.5 Mood disorders

18.2.19.1.6 Personality disorders

18.2.19.1.7 Schizophrenia

18.2.19.2 Therapy for psychological disorders: psychotherapy, therapy of interpersonal relations, behavior therapy

**18.2.20** Lesson planning and teaching methods in *Yoga*

### **18.3 Practical**

First three years' portions and:

**18.3.1** LSP

**18.3.2** QRT

**18.3.3** IRT

**18.3.4** DRT

- 18.3.5 TM
- 18.3.6 CM
- 18.3.7 SKY
- 18.3.8 SMET
- 18.3.9 PET
- 18.3.10 MSRT
- 18.3.11 MIRT
- 18.3.12 MEMT
- 18.3.13 VISAK
- 18.3.14 ANAMS.

#### 18.4 **Reference Books**

- 18.4.1 *Yogic Therapy* – Vinekar
- 18.4.2 *Yogic Therapy* – Garde
- 18.4.3 *Treatment of Common Diseases through Yoga* – Swami Satyananda Saraswati
- 18.4.4 *Seminar on Yoga, Science and Man* – CCRYN, Delhi
- 18.4.5 *Yoga for Healing* – PS Venkateswaran
- 18.4.6 *Handbook of Behavior Modification and Therapy* – Plenum Press
- 18.4.7 *Stress Management Research Papers* – VK *Yoga*, Bangalore
- 18.4.8 All Bihar School of *Yoga* publications



### 18.5 **Scheme Of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Yoga Therapy	80	20	30	130	60	10	70	200

## **19. HYDROTHERAPY AND MUD THERAPY**

**Total hours: 275 (Theory: 175 Practical: 100)**

### **19.1 Goals and Objectives**

#### **19.1.1 Goal:**

The goal of teaching Hydrotherapy and Mud Therapy to undergraduate students is to provide them with comprehensive knowledge of treating diseases using water and mud, and the physiological effects of various kinds of such applications, and utilisation of the same for therapeutic purposes.

#### **19.1.2 Objectives:**

##### **19.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 19.1.2.1.1 Describe the properties and chemical composition of water and mud used for therapeutic purposes, physiology of the skin, production of heat and body temperature regulation, which are essential as a foundation for hydrotherapy.
- 19.1.2.1.2 Illustrate physiological effects of hot and cold water upon the different systems of the body and applications to reflex areas ;
- 19.1.2.1.3 Explain action and reaction mechanisms and physiology, with their effects and uses
- 19.1.2.1.4 Demonstrate use of water in preservation, acute diseases, chronic diseases;
- 19.1.2.1.5 Show in-depth knowledge of general principles of hydrotherapy, therapeutic applications of water, along with therapeutic actions, indications and contra-indications; and classification of mud,

storing of mud, modes of mud treatment, cosmetic uses of mud and research updates in hydrotherapy and mud therapy;

19.1.2.1.6 Demonstrate techniques and procedures of various types of hydriatic applications;

**19.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

19.1.2.2.1 Utilise knowledge of hydrotherapy and mud therapy in managing various diseases;

19.1.2.2.2 Demonstrate usage of therapeutic aspect of hydrotherapy and mud therapy treatments in promotive, preventive, curative and rehabilitative therapy.

19.1.2.2.3 Institute and evaluate remedial measures in hydrotherapy for various disease conditions in clinical as well as research settings.

**19.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of hydrotherapy in various diseases and efficiently utilise the same for therapeutic purposes.

**19.2 Hydrotherapy And Mud Therapy (Duration: 12 Months)**

**19.2.1** Introduction and History

**19.2.2** Physical properties and chemical composition of water

**19.2.3** Physiological basis of Hydrotherapy: The skin and its anatomical construction, functions of skin, temperature sense

- 19.2.4 Production of heat and its distribution in the body, regulation of the body temperature, conditions that increase and decrease heat production in the body, body heat and body temperature
- 19.2.5 Importance of water to human body
- 19.2.6 Physiological effects of water on different systems of the body
  - 19.2.6.1 General and physiological aspects of heat upon: Skin, Respiration, Circulation, Nervous system, Heat and its production-dissipation etc, Tactile and temperature sense
  - 19.2.6.2 General and physiological effects of cold upon: Skin, Respiration, Circulation, Nervous system, GIT, body temperature and its maintenance, circulatory system
- 19.2.7 Reflex areas of the body, results of application of hot and cold over reflex areas
- 19.2.8 Actions and reaction, incomplete reaction, conditions that encourage reaction, internal reaction, thermic reaction, modified thermic reaction
- 19.2.9 Place of water in preservation
- 19.2.10 Place of water in acute diseases
- 19.2.11 Place of water in chronic diseases
- 19.2.12 Magnesium sulphate – use in Hydrotherapy
- 19.2.13 General principles of Hydrotherapy
  - 19.2.13.1 General rules of hydrotherapy
  - 19.2.13.2 Therapeutic significance of reaction
  - 19.2.13.3 Adaptation of individual cases
  - 19.2.13.4 Exaggeration of symptoms under treatment, the untoward effects and how to avoid them

19.2.13.5 General indications and contra-indications

**19.2.14 Therapeutic actions and use of Hydrotherapy**

19.2.14.1 Classification of Hydratic effects, general principles – excitation and depression

19.2.14.2 Primary excitant effects – when to apply and when not to

apply 19.2.14.2.1 Local hemostatic effects – hydratic heart tonics

19.2.14.2.2 Cardiac effects – Hydratic heart tonics

19.2.14.2.3 Uterine excitations, emanagogic effects

19.2.14.2.4 Vesical excitations

19.2.14.2.5 Intestinal excitation, peristaltic effects

19.2.14.3 Secondary excitant effects

19.2.14.3.1 Restorative effects

19.2.14.3.2 Tonic effects of cold water, physiological effects of cold water, cold water vs. medical tonics, application in the following: anemia, neurasthenia, rheumatism, diabetes mellitus, valvular heart diseases

19.2.14.3.3 Calorific effects

19.2.14.3.4 Diaphoretic effects

19.2.14.3.5 Importance of attention to the skin in chronic diseases – alternative and qualitative effect – hot baths in Bright's diseases, sweating baths in Dropsy and Obesity. Depurative or Eliminative effects, Toxemia in Rheumatism

19.2.14.3.6 Expectorant effects

19.2.14.3.7 Diuretic effects – Bright's Disease, Uremia - eclampsia

19.2.14.3.8 Atomic dyspepsia, hyperacidity

19.2.14.3.9 Revulsive and derivative effects, fluxion, revulsive methods for combating superficial anemia and for relief of deep congestion method adopted to anemia of deep rooted organs revulsion on analgesic method

19.2.14.4 Resolvent effects

19.2.14.4.1 Sedative effects – general sedatives – local sedatives:

19.2.14.4.1.1 Sedatives of circulatory system – antiphlogistic effects, inflammation, pneumonia, pleurisy, other acute disorders

19.2.14.4.1.2 Nerve sedatives, hypnotic, calmative, analgesic, anesthetic, antispasmodic, insomnia, chorea, spastic paralysis, exophthalmia, goiter, mania, epilepsy and various painful conditions

19.2.14.4.1.3 Antithermic and antipyretic effects, relation to heat production and heat elimination to antipyretic methods, principles that govern the application of hydriatic measures for the reduction of temperature in fevers, methods that may be efficiently employed in various morbid conditions accompanied by rise in temperature – suggestions, effects, indications and contraindications

19.2.14.4.1.4 Secretory and sedative effects prophylactic uses - Cold bathing in infancy and early childhood, cold bathing for adults, cold baths for women, cold baths in old age - precautions

**19.2.15** The techniques of Hydrotherapy

19.2.15.1 Water Baths

19.2.15.1.1 Plain water bath

- 19.2.15.1.2 Cold hip bath
- 19.2.15.1.3 Kellogg's and Kuhne's sitz bath
- 19.2.15.1.4 Shallow bath – for males and females
- 19.2.15.1.5 Arm and foot bath
- 19.2.15.1.6 Graduated bath
- 19.2.15.1.7 Natural bath
- 19.2.15.1.8 Non-revulsive bath
- 19.2.15.1.9 Immersion bath
- 19.2.15.1.10 Cold plunge
- 19.2.15.1.11 Whirlpool bath
- 19.2.15.1.12 Aeration bath
- 19.2.15.1.13 Vichy spray massage
- 19.2.15.1.14 Rapid bath
- 19.2.15.1.15 Brand bath
- 19.2.15.1.16 Fever bath
- 19.2.15.1.17 River bathing
- 19.2.15.1.18 Sea bathing
- 19.2.15.2 Various baths and air baths
  - 19.2.15.2.1 Russian bath
  - 19.2.15.2.2 Turkish bath
  - 19.2.15.2.3 Steam bath
  - 19.2.15.2.4 Local steam bath
  - 19.2.15.2.5 Steam inhalation
  - 19.2.15.2.6 Hot air bath
  - 19.2.15.2.7 Local hot air bath

- 19.2.15.2.8 Super-hot air bath
- 19.2.15.2.9 Cold air bath
- 19.2.15.2.10 Indoor and outdoor bath

### 19.2.15.3 Pool therapy

#### 19.2.15.3.1 Introduction

#### 19.2.15.3.2 Principles of treatment part I and part II

#### 19.2.15.3.3 Physiological and therapeutic effects of exercise in warm water

#### 19.2.15.3.4 Indications and contraindications

#### 19.2.15.3.5 Dangers and precautions

### 19.2.15.4 Douches

- 19.2.15.4.1 Cold Douche
- 19.2.15.4.2 Hot Douche
- 19.2.15.4.3 Neutral Douche
- 19.2.15.4.4 Alternative Douche
- 19.2.15.4.5 Underwater Douche
- 19.2.15.4.6 Contrast Douche
- 19.2.15.4.7 Horizontal Jet
- 19.2.15.4.8 Cephalic Douche
- 19.2.15.4.9 Lumbar Douche
- 19.2.15.4.10 Fan Douche
- 19.2.15.4.11 Rain Douche or Shower Douche
- 19.2.15.4.12 Hepatic Douche
- 19.2.15.4.13 Circular Douche and semi-circular Douche
- 19.2.15.4.14 Cerebrospinal Douche
- 19.2.15.4.15 Plantar Douche



19.2.15.4.16 Percussion Douche

19.2.15.4.17 Scotch Douche

19.2.15.5 Packs and compresses

19.2.15.6 Procedures that increase oxidation

19.2.15.7 Measures that encourage general and local metabolic activity

19.2.15.8 Procedures that increase general blood movement and local  
blood supply

19.2.15.9 Measures that increase heat production

19.2.15.10 Measures that increase the elimination of heat

19.2.15.11 Measures that combat bacterial development of blood

19.2.15.12 Measures that increase/lessen heat elimination

19.2.15.13 Hydratic incompatibility

19.2.15.14 Adoption of hydratic prescription of individual disease

19.2.15.15 Hydrotherapy as a means of rehabilitation and health promotion

19.2.15.16 Emergency treatments in Hydrotherapy

## **19.2.16 Mud Therapy**

19.2.16.1 Introduction to Mud therapy

19.2.16.2 Classification of Mud for therapeutic use

19.2.16.3 Precautions for storing mud

19.2.16.4 Methods of treatment of mud

19.2.16.4.1 Applications

19.2.16.4.2 Packing

19.2.16.4.3 Hot poultices

19.2.16.5 Effect of Mud on different systems of body

19.2.16.6 Types of mud therapy applications

19.2.16.6.1 Natural mud bath

- 19.2.16.6.2 Full and partial mud packs
- 19.2.16.6.3 Mud plaster
- 19.2.16.6.4 Thermal bath
- 19.2.16.6.5 Dry pack
- 19.2.16.6.6 Sand pack and sand baths
- 19.2.16.7 Cosmetic uses of mud
- 19.2.16.8 Research updates

### 19.3 **Practical**

- 19.3.1 Demonstration of various therapeutic effects, procedure and treatments in Hydrotherapy during clinical classes at the Hospital
- 19.3.2 At the end of the Final BNYS course, candidate should be in a position to give treatments independently
- 19.3.3 5 case documentation of all hydriatic applications
- 19.3.4 Clinical dissertation on case studies with minimum sample size of 20 patients on one general and two local applications

### 19.4 **Textbooks**

- 19.4.1 Baths – SJ Singh
- 19.4.2 My Water Cure – Sebastian Kneipp
- 19.4.3 Rational Hydrotherapy – JH Kellogg
- 19.4.4 Healing Clay –Michael Abserra
- 19.4.5 Our Earth Our Cure – Raymond Dextroit

### 19.5 **References**

- 19.5.1 Handbook of Hydrotherapy – Shew Joel

19.5.2 Hydrotherapy in Practice – Davis BC & Harrison RA

19.5.3 Medical Hydrology – Sidney Licht

19.6 **Scheme Of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Hydrotherapy and Mud Therapy	80	20	30	130	60	10	70	200

## **20. PHYSICAL MEDICINE & REHABILITATION (Duration: 12 Months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

### **20.1 Goals and Objectives**

#### **20.1.1 Goal:**

The goal of teaching Physical Medicine and Rehabilitation to undergraduate students is to provide them with the knowledge and skills needed for utilisation of Physical medicine for therapeutic, rehabilitative purposes.

#### **20.1.2 Objectives:**

##### **20.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 1.1.1.1.1 Define principles of basic physics that act as a foundation for physical medicine
- 1.1.1.1.2 Describe exercise therapy in detail, including starting positions, movements and their types, muscle strength, joint movement, relaxation, posture, co-ordination, gait, walking aids, neuromuscular facilitation, suspension therapy and their therapeutic applications, including allied modalities like heat treatments and cryotherapy;
- 1.1.1.1.3 Understand electrotherapy in terms of fundamentals, principles, laws of electricity and magnetism, practical and theoretical aspects of electrotherapeutic applications, such as faradic and galvanic currents, high frequency currents, laser, ultrasound, radiation therapy (IR &UV), TENS and IFT.

### **1.1.1.2 Skills:**

After the completion of the course, the student shall be able to:

- 1.1.1.1.1 Demonstrate usage of therapeutic applications of physical medicine in promotive, preventive, curative and rehabilitative therapy, focusing on rehabilitation.
- 1.1.1.1.2 Institute remedial measures in *Yoga* for various disease conditions.

### **1.1.1.2 Integration**

At the completion of training, the student should be able to integrate knowledge of various treatments used in Physical Medicine and efficiently utilise the same for rehabilitative and therapeutic purposes.

## **20.2 Theory**

### **20.2.1 Exercise therapy**

#### 20.2.1.1 Basic Physics in Exercise Therapy

- 20.2.1.1.1 Mechanics: Force, gravity, line of gravity, center of gravity in human body, base, equilibrium, axes and planes
- 20.2.1.1.2 Mechanical Principles: lever, order of lever, examples in human body, pendulum, spring

#### 20.2.1.2 Introduction to exercise therapy

20.2.1.3 Starting positions: Fundamental starting positions, derived positions, muscle work for all the fundamental starting positions

#### 20.2.1.4 Classification of movements in detail

- 20.2.1.4.1 Voluntary movements

- 20.2.1.4.2 Involuntary movements
- 20.2.1.5 Active movements
- 20.2.1.6 Passive movements
- 20.2.1.7 Muscle strength: Anatomy and physiology of muscle tissue, causes of muscle weakness/paralysis, types of muscle work and contractions, range of muscle work, muscle assessment, Principles of muscle strengthening/reeducation, early reeducation of paralyzed muscles
- 20.2.1.8 Joint movement: Classification of joint movements causes for restriction of joint movement, prevention of restriction of joints range of movement, principles of mobilization of joint in increasing the range of motion. Technique of mobilization of stiff joint.
- 20.2.1.9 Relaxation: Techniques of relaxation, Principles of obtaining relaxation in various positions
- 20.2.1.10 Posture: types, factors responsible for good posture, factors for poor development of posture
- 20.2.1.11 Coordination exercises: Definition of coordinated movements, in coordinated movements, Principles of coordinated movements, technique of coordination exercise
- 20.2.1.12 Gait: Analysis of normal gait with muscles work, various pathological gaits
- 20.2.1.13 Crutch gait: introduction, crutch measurement, various types of crutch gait in detail
- 20.2.1.14 Neuromuscular facilitation techniques, functional reeducation

- 20.2.1.15 Suspension therapy: Principles of suspension, types of suspension therapy, effects and uses of suspension therapy with their application either to mobilize a joint to increase joint range of motion or increase muscle power, explaining the full details of the components used for suspension therapy
- 20.2.1.16 Myofascial Release Therapy and related therapies used in Sports Medicine
- 20.2.1.17 Therapeutic applications

## 20.2.2 Electrotherapy

- 20.2.2.1 Electrical fundamentals
  - 20.2.2.1.1 Physical principles
  - 20.2.2.1.2 Structure and properties of matter
  - 20.2.2.1.3 Molecular atom, proton, neutron, electron, ion etc.
- 20.2.2.2 Electrical energy
  - 20.2.2.2.1 Nature of electricity current
  - 20.2.2.2.2 Static electricity
  - 20.2.2.2.3 Electric potentials generated by cell
- 20.2.2.3 Ohm's Law
- 20.2.2.4 Joule's Law
- 20.2.2.5 Magnetic energy
  - 20.2.2.5.1 Nature and property of a magnet
  - 20.2.2.5.2 magnetic induction
  - 20.2.2.5.3 Shaw rule
  - 20.2.2.5.4 Maxwell's corkscrew rule

## 20.2.2.6 Electromagnetic induction

20.2.2.6.1 principle and working of choke

20.2.2.6.2 Coil

20.2.2.6.3 Transformer

20.2.2.6.4 Rectification of AC to DC

20.2.2.6.5 Metal oxide rectifier

## 20.2.2.7 Semiconductor

20.2.2.7.1 Diode and Triode

## 20.2.2.8 Valves

## 20.2.2.9 Principles of working in a capacitor

20.2.2.9.1 Details of charging and discharging etc.

## 20.2.2.10 Transistors

## 20.2.2.11 measurement of current intensity

## 20.2.2.12 EMS and power

## 20.2.2.13 Moving coil milliammeter and voltmeter

## 20.2.2.14 Low frequency currents

20.2.2.14.1 Nature and principles of production of muscles stimulating currents

20.2.2.14.2 Types of low frequency currents used for treatment

20.2.2.14.3 Therapeutic electric stimulation

20.2.2.14.4 Ionotophoresis

20.2.2.14.5 Phonophoresis



- 20.2.2.15 Preparation for electrotherapy
  - 20.2.2.15.1 Preparation of apparatus
- 20.2.2.16 Patient treatment technique
  - 20.2.2.16.1 Stimulating muscles of extremity, back and face through the motor points
- 20.2.2.17 Faradic and Galvanic currents
- 20.2.2.18 High frequency current treatments
  - 20.2.2.18.1 Physics of high frequency currents
  - 20.2.2.18.2 Principles
  - 20.2.2.18.3 Biophysics of heat physiology and cold.
  - 20.2.2.18.4 Production, physiological and therapeutic effects and uses.
  - 20.2.2.18.5 Technique of treatment, dangers and precautions, contraindications of:
    - 20.2.2.18.5.1 Ultrasonic therapy
- 20.2.2.19 Principles of radiation therapy
  - 20.2.2.19.1 Physics of radiation therapy
  - 20.2.2.19.2 Laws governing radiation: Production, physiological and therapeutic effects, uses, techniques of treatment, dangers and precautions, contraindications etc. of:
    - 20.2.2.19.2.1 IRR therapy
    - 20.2.2.19.2.2 UV therapy
  - 20.2.2.19.3 Basic principles of TENS and IFT
  - 20.2.2.19.4 Laser Therapy

20.2.2.20 Wax therapy

20.2.2.20.1 Physics of wax therapy

20.2.2.20.2 Physiological and therapeutic effects and uses

20.2.2.20.3 Techniques of application

### 20.3 **Practical Electrotherapy**

#### 20.3.1 Interrupted/modified DC

20.3.1.1 Stimulation of muscles directly

20.3.1.2 Diagnostic tests:

20.3.1.2.1 FG test

20.3.1.2.2 SD curve

20.3.1.2.3 Fatigue test

20.3.1.3 Uses of surged Faradism and interrupted Galvanism in various peripheral nerve lesions

20.3.1.3.1 Neuropraxia

20.3.1.3.2 Axonotmesis

20.3.1.3.3 Neurotmesis

#### 20.3.2 High Frequency current treatment

20.3.2.1 UV radiation: Setting up of apparatus selection of lamps technique of application of UVR for various conditions like test dose, general body bath, acne vulgaris, alopecia areata and totalis, ulcers, psoriasis, rickets and general debility patients.

20.3.2.2 Ultrasonics: Setting up of apparatus, selection of dose, and technique of application of various conditions and to various parts of the body.

20.3.2.3 Laser – setting up apparatus including selection of method, technique, preparation of patient, checking contraindications, application for various conditions and parts of the body.

## 20.4 **Practical Exercise Therapy**

- 20.4.1 Demonstration and practice of active and passive movements
- 20.4.2 Demonstration and practice of putting suspension to shoulder joint and elbow joint in upper limbs, hip and knee joints in lower limbs for all movements. Demonstration of total suspension.
- 20.4.3 Muscle strength: Demonstration and practice of strengthening, reeducation of weak/paralyzed muscles of both upper and lower extremity, individual group muscles, abdominal muscle exercises
- 20.4.4 Joint movement: Demonstration and practice of techniques to improve joint range of motion of hip joint, knee joint, ankle and foot, shoulder, elbow joint, radio- ulnar joint, wrist, etc
- 20.4.5 Demonstration and practice of free exercise to improve joint range of motion (Small joint, Eg: Hand, fingers, toes, etc). Demonstration and practice of all crawling exercises, faulty posture, correcting techniques etc.
- 20.4.6 Demonstration of various pathological gaits.
- 20.4.7 Measurement of crutches, walking aids, strengthening muscles, crutch balance, demonstration and practice of all crutch gaits.
- 20.4.8 Breathing exercises: Demonstration and practice of diaphragmatic breathing, localized expansion exercises.
- 20.4.9 Passive stretching: Techniques of passive stretching to sternomastoid muscle, shoulder abductors, elbow flexors, supinator, wrist and finger flexors in upper limbs, passive stretching to hip flexors, adductors, iliotibial band, tensor fascia lata, quadriceps, knee flexors, tendoachilles, etc

## 20.5 **Reference Books**

20.5.1 Principles of Exercise therapy – Dina Gardiner

20.5.2 Tidy's Physiotherapy

20.5.3 Cash's Textbook of Physiotherapy

20.5.4 Clayton's Electrotherapy

## 20.6 **Scheme of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Physical Medicine and Rehabilitation	80	20	30	130	60	10	70	200

## **21. FIRST AID AND EMERGENCY MEDICINE (Duration: 12 Months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **21.1 Goals and Objectives**

#### **21.1.1 Goal:**

The goal of teaching First Aid and Emergency Medicine to undergraduate students is to provide them with the skills and knowledge required to manage medical emergencies efficiently.

#### **20.1.3 Objectives:**

##### **20.1.3.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 20.1.3.1.1 Illustrate working knowledge about Golden hour
- 20.1.3.1.2 Describe quick assessment and recognition of emergency conditions;
- 20.1.3.1.3 Demonstrate specific first aid measures and emergency treatments used for handling emergency cases before and after diagnosis of the condition;

##### **20.1.3.2 Skills:**

After the completion of the course, the student shall be able to:

- 20.1.3.2.1 Demonstrate usage of first aid procedures in various emergency situations
- 20.1.3.2.2 Describe assessment of emergencies and treatment of the same with suitable procedures.
- 20.1.3.2.3 Possess the knowledge and skills to perform Basic Life Support procedures in the Golden Hour.

20.1.3.2.4 Able to assess the severity of an emergency condition so as to act in accordance and take necessary steps to prevent further complications.

### **20.1.3.3 Integration**

At the completion of training, the student should be able to effectively use his/her knowledge of assessment and management of medical emergencies in his/her professional practice.

## **21.2 First Aid**

- 21.2.1 General principles of first aid-definition, principles, responsibilities and golden rules
- 21.2.2 Resuscitation techniques-basic life support, mouth to mouth ventilation, artificial ventilation, Sylvester method.
- 21.2.3 Unconsciousness and general principles of treatment, recovery position
- 21.2.4 Transportation and handling of patient
- 21.2.5 Hemorrhage and bleeding
- 21.2.6 Shock
- 21.2.7 Wounds
- 21.2.8 Bandages ,dressing and slings
- 21.2.9 Fractures, sprains and strains
- 21.2.10 Poisoning
- 21.2.11 Asphyxia, Aspiration, drowning, suffocation and strangulation
- 21.2.12 Road accidents
- 21.2.13 Effect of temperature, sunburn, hypothermia, frost bite, heat exhaustion, heat stroke

- 21.2.14 Burns and scalds, electrical injuries
- 21.2.15 Head injury, chest injury, blast injury, crush injury
- 21.2.16 Sports injuries
- 21.2.17 Epilepsy-febrile convulsions
- 21.2.18 Syncope
- 21.2.19 Dog bite, snake bite, scorpion bite and bee sting
- 21.2.20 Emergencies in diasthetic patients and cardiac patient

### **21.3 Recognition, Evaluation Of Clinical Emergencies**

#### **21.3.1 CVS**

- 21.3.1.1 Acute myocardial infarction
- 21.3.1.2 Cardiogenic shock
- 21.3.1.3 Cardiac arrhythmias
- 21.3.1.4 Cardiac arrest
- 21.3.1.5 Hypertensive emergencies
- 21.3.1.6 Pulmonary embolism
- 21.3.1.7 Dissection of aortic aneurysm
- 21.3.1.8 Cardiac tamponade
- 21.3.1.9 DVT

#### **21.3.2 Respiratory System**

- 21.3.2.1 Hemoptysis
- 21.3.2.2 Status asthmaticus
- 21.3.2.3 Spontaneous pneumothorax
- 21.3.2.4 Acute respiratory failure
- 21.3.2.5 Massive pulmonary collapse



21.3.2.6 Acute laryngeal obstruction

21.3.2.7 ARDS

21.3.2.8 Pneumonia

21.3.2.9 Massive pleural effusion

### 21.3.3 Gastrointestinal System

21.3.3.1 Acute vomiting

21.3.3.2 Perforation of Peptic Ulcer

21.3.3.3 Hematemesis

21.3.3.4 Hepatic Pre coma and coma

21.3.3.5 Acute pancreatitis

21.3.3.6 Acute pain in abdomen

21.3.3.7 Obstruction of intestine

### 21.3.4 Nervous System

21.3.4.1 Unconscious patient

21.3.4.2 Cerebrovascular catastrophes

21.3.4.3 Convulsions

21.3.4.4 Status epilepticus

21.3.4.5 TIA

21.3.4.6 Spinal cord injuries

21.3.4.7 Brain death

21.3.4.8 Head injury

21.3.4.9 Acute ascending polyneuritis

### 21.3.5 Renal System

21.3.5.1 Acute renal failure

21.3.5.2 Renal colic

21.3.5.3 Hematuria

21.3.5.4 Hyperkalaemia

21.3.5.5 Hypokalaemia

21.3.5.6 Hyponatremia

### 21.3.6 Endocrine and Metabolism

21.3.6.1 Thyroid crisis

21.3.6.2 Adrenal crisis

21.3.6.3 Diabetic ketoacidosis and coma

21.3.6.4 Hypoglycemia

21.3.6.5 Tetany

21.3.6.6 Hypercalcemia

### 21.3.7 Miscellaneous Emergencies

21.3.7.1 Syncope

21.3.7.2 Acute peripheral circulatory failure

21.3.7.3 Anaphylaxis

21.3.7.4 Hypothermia

21.3.7.5 Hyperpyrexia

21.3.7.6 Poisoning

21.3.7.7 Drug overdose

#### 21.4 **Practical**

- 21.4.1 History taking and physical examination of cases
- 21.4.2 Case sheet writing in different general cases (25)
- 21.4.3 Demonstration of equipment and instruments used for investigation in modern diagnostics
- 21.4.4 Demonstration tour of an ultra-modern super specialty hospital to see the latest techniques management of emergency conditions

#### 21.5 **Textbooks**

- 21.5.1 Hutchison's Clinical Methods
- 21.5.2 Manual of Clinical Methods – PS Shankar
- 21.5.3 First Aid – Red Cross Society
- 21.5.4 First Aid – St. John Ambulance Association
- 21.5.5 First Aid – LC Gupta
- 21.5.6 Bailey and Love's Short Practice of Surgery
- 21.5.7 Harrison's Principle of Internal Medicine
- 21.5.8 Davidson's Principle and Practice of Medicine
- 21.5.9 Medical Emergency, Diagnosis and Management

21.6 **Scheme of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	First Aid and Emergency Medicine	80	20	30	130	60	10	70	200

## **22. CLINICAL NATUROPATHY (Duration: 12 months)**

**Total hours: 300 (Theory: 200 Practical: 100)**

### **20.2 Goals and Objectives**

#### **20.2.1 Goal:**

The goal of teaching Clinical Naturopathy to undergraduate students is to train them to provide well integrated clinical service in Naturopathy.

#### **19.1.3 Objectives:**

##### **19.1.3.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 19.1.3.1.1 Illustrate decision making in Naturopathy ;
- 2.24.3.1.2 Understand the basic principles of screening and prevention of disease;
- 2.24.3.1.3 Comprehend the scope of practice- patterns of use, fields of practice, regulations, limitations;
- 2.24.3.1.4 Understand the concept of healing and disease crises and management of the same.
- 2.24.3.1.5 Understand the pathogenesis of the disease in Naturopathy basis and preventive measures of the same;
- 2.24.3.1.6 Create a specific module of therapy for the particular patient with varied presentations.

##### **2.24.3.2 Skills:**

After the completion of the course, the student shall be able to:

- 2.24.3.2.1 Apply his /her knowledge of clinical Naturopathy in managing various diseases;

2.24.3.2.2 Demonstrate usage of therapeutic aspect of clinical Naturopathy in curative and rehabilitative therapy;

2.24.3.2.3 Utilize his/ her knowledge of clinical Naturopathy for prevention of disease and promotion of health;

### **2.24.3.3 Integration**

At the completion of training, the student should be able to integrate knowledge of clinical Naturopathy and efficiently utilise the same for therapeutic purposes.

## **2.2 Theory**

### **2.2.1 Good Clinical Practice**

#### **2.2.1.1 Guidelines and Standards**

### **2.2.2 Decision-making in Naturopathy**

### **2.2.3 Screening and Prevention of Disease**

#### **2.2.3.1 Basic principles of screening**

### **2.2.4 Scope of practice**

#### **2.2.4.1 Patterns of use**

#### **2.2.4.2 Fields of practice**

#### **2.2.4.3 Regulations**

#### **2.2.4.4 Limitations**

### **2.2.5 Cardinal manifestations and presentation of disease**

**2.2.6 Naturopathic prescription-making and algorithmic line of management for the following diseases:**

Abscess, Acid-Peptic Disease, Acne, AIDS, Aging, Allergies, Alopecia, Alzheimer's disease, Anal fissures, Anemia, Anorexia nervosa, Anxiety disorders, Appendicitis, Arthritis – OA & RA, Asthma, ADD/ADHD, Back pain, Bad breath, Bedsore, Bladder infection, Bronchitis, Bruise, Bursitis, Cancer - Breast cancer, Cervical cancer, Colorectal cancer, Leukemia, Lung cancer, Prostate cancer, Skin cancer, Stomach cancer, Uterine cancer; Dental caries, Cardiovascular disease, Cerebrovascular disease, Chlamydia, Chloasma (Age spots), Chronic fatigue syndrome, Cirrhosis, Common cold, Colic, Colitis, Nasal congestion, Conjunctivitis, Constipation, Menstrual cramps, Crohn's disease, Cuts (cuts, wounds and scratches), Cyst, Cystitis, Dandruff, Deep venous thrombosis, Clinical depression, Dermatitis, Diabetes, Diarrhea, Diverticulitis, Dizziness, Duodenal ulcer, Dysmenorrhea, Dyspepsia, Diabetes mellitus, Earache, Earwax blockage, Eczema, Edema, Emphysema, Endometriosis, Epilepsy, Erectile dysfunction, External otitis, Fainting, Farsightedness, Fatigue, Fever, Fibromyalgia, Flatulence, Flu, Folliculitis, Food poisoning, Foot odor, Gallstones, Gas, Gastritis, Gastroenteritis, GERD, Gingivitis, Goiter, Gout, Headache, Heatstroke, Hemorrhoids, Hepatitis, Hernia, Herpes (genital), Obesity, Oligomenorrhea, Oral cancer, Ovarian cyst, Parkinson's disease, PID, Phlebitis, PMS, Postnasal drip, PTSD, Rashes (hives), Raynaud's disease, Sciatica, SAD, Seizure disorder, Sinusitis, Snoring, Sore throat, Scoliosis, Sprains, Acute Abdomen.

#### **22.2.7 Pathophysiology**

#### **22.2.8 Management of pains**

##### **22.2.8.1 Pain sensory systems**

##### **22.2.8.2 Chronic pain**

- 22.2.8.3 Types of pain
  - 22.2.8.3.1 Chronic discomfort and palpitation
  - 22.2.8.3.2 Abdominal pain
  - 22.2.8.3.3 Headache
  - 22.2.8.3.4 Back, neck pain
- 22.2.9 Fever, hyperthermia
- 22.2.10 Fever, rashes
- 22.2.11 Fever of unknown origin
- 22.2.12 Hypothermia & frostbite
- 22.2.13 Syncope, faintness, dizziness, vertigo
- 22.2.14 Weakness, disorders of movements and imbalance
- 22.2.15 Numbness, tingling and sensory loss
- 22.2.16 Aphasia, memory loss and other focal cerebral disorders
- 22.2.17 Sleep disorders
- 22.2.18 Dyspnea, cough
- 22.2.19 Edema
- 22.2.20 Dysphasia, nausea, vomiting and indigestion
- 22.2.21 Diarrhea, constipation
- 22.2.22 Weight loss
- 22.2.23 Jaundice, abdominal swelling
- 22.2.24 Sexual dysfunction
- 22.2.25 Healing crisis and Disease crisis
- 22.2.26 Approach to the patient in Naturopathic medicine with:



- 22.2.26.1 Skin disease
  - 22.2.26.2 Cardiovascular disease
  - 22.2.26.3 Disease of respiratory system
  - 22.2.26.4 Gastrointestinal disorders
  - 22.2.26.5 Liver and pancreatic disease
  - 22.2.26.6 Articular and musculoskeletal disorder
  - 22.2.26.7 Neurological disease
  - 22.2.26.8 Renal disorders
  - 22.2.26.9 Endocrinal disorders
  - 22.2.26.10 Menstrual disorders
  - 22.2.26.11 Peripheral neuropathy
- 22.2.27 Dictum of cure in Naturopathic medicine
- 22.2.27.1 Identify and remove the root cause
  - 22.2.27.2 Eliminate the toxins
  - 22.2.27.3 Supplement of the vital energy or nerve energy
- 22.2.28 Important modes and methods for natural rejuvenation

Note: Apart from the above-listed conditions, other clinical conditions may be discussed but the above-listed conditions are mandatory.

### 22.3 **Practical**

- 22.3.1 Case-history taking, documentation and complete management protocol of at least 30 cases.
- 22.3.2 Clinical dissertation on any one disease involving multiple patients.

22.4 **Textbooks:**

22.4.1 Clinical Naturopathy: An Evidence-Based Guide to Practice-Jerome Sarris, Jon Wardle

22.4.2 Clinical Naturopathic Medicine - Leah Hechtman

22.4.3 The Clinician's Handbook of Natural Medicine - Joseph E. Pizzorno Jr.

22.4.4 Fasting-The Ultimate Diet - Allan Cott

22.4.5 Mucusless Diet Healing System - Arnold Ehret

22.4.6 The Fasting Cure (Classic Reprint) - Upton Sinclair

22.4.7 Fasting Can Save Your Life - Herbert M. Shelton

22.5 **Scheme of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Clinical Naturopathy	80	20	30	130	60	10	70	200

## **23. RESEARCH METHODOLOGY & RECENT ADVANCES**

**(Duration 12 months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **23.1 Goals and Objectives**

#### **23.1.1 Goal:**

The goal of teaching Research Methodology and Recent advances to undergraduate students is to provide them with the latest updated scientific, knowledge in the field of Naturopathy and *Yoga* and introduce them to research methodology.

#### **23.1.2 Objectives:**

##### **23.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 2.24.4.1.1 Describe research methodology under process, materials and methods, design of a study, literature review, ethics, sampling, measurement tools, data organisation, statistics, data analysis, reliability and validity, etc, and implement this knowledge in practically designing, conducting, evaluating and publishing a study.
- 2.24.4.1.2 Illustrate statistics and probability theory;
- 2.24.4.1.3 Use technological aids for preparing research reports;
- 2.24.4.1.4 Demonstrate knowledge about inter-disciplinary research.

##### **2.24.4.2 Skills:**

After the completion of the course, the student shall be able to:

- 2.24.4.2.1 Prepare a research study, conduct, evaluate and publish it;

- 2.24.4.2.2 Interpret research findings and analyse whether data is significant or not;

### **2.24.4.3 Integration**

At the completion of training, the student should be able to integrate knowledge of clinical Naturopathy and *Yoga* with skills in research methodology to conduct and publish research studies in the field, to help shift the basis of Naturopathy and *Yoga* to an evidence-based science.

## **23.2 Research Methodology (50 hours)**

- 23.2.1 The research process. Methodology and methods.
- 23.2.2 The design of a study.
- 23.2.3 Literature review.
- 23.2.4 Ethics of research.
- 23.2.5 Types of common designs. Their advantages and disadvantages.
- 23.2.6 Sampling.
- 23.2.7 The experimental and quasi-experimental methods. Correlation studies.
- 23.2.8 Measurement tools: Observations, questionnaires and others.
- 23.2.9 Data organization in Excel and SPSS.
- 23.2.10 Descriptive statistics. Measures of central tendency, measures of dispersion.  
Correlation coefficients.
- 23.2.11 Graphical representations of data. Simple graphs, the box and whiskers plot.
- 23.2.12 Reliability. The different ways of measuring reliability.
- 23.2.13 Validity. Types of validity.

23.3 **Inferential Statistics and Probability Theory (20 hours)**

- 23.3.1 Inferential statistics – populations and samples.
- 23.3.2 Elementary concepts in probability theory
- 23.3.3 The normal distribution. Z-values and probability
- 23.3.4 Calculating probabilities when population parameters are known

23.4 **Research Reports (10 hours)**

- 23.4.1 Microsoft word, excel and power point
- 23.4.2 Reading research reports
- 23.4.3 Writing research reports
- 23.4.4 Presentations

23.5 **Other streams (20 hours)**

- 23.5.1 Inter-Disciplinary Research
- 23.5.2 Introduction to research in Management studies
- 23.5.3 Introduction to research in Education, History, and Anthropology.
- 23.5.4 Introduction to research in Social studies and Humanity.
- 23.5.5 Introduction to research in Linguistics
- 23.5.6 Introduction to research in Jurisprudence.
- 23.5.7 Introduction to research in Science and technology

23.6 **Practical**

- 23.6.1 Dissertation on any one research study (basic or clinical with sample size of minimum 10). Presentation of dissertation.
- 23.6.2 Research paper interpretation and presentation
- 23.6.3 Single case study from hospital

23.7 **Text Books:**

- 23.7.1 Kothari, C.R.: Research Methodology, Methods and Techniques(VishwaPrakashan, New Delhi, 1985)
- 23.7.2 Telles, S.: Research Methods (Swami Vivekananda YogaPrakashan, Bangalore)

23.8 **Reference:**

- 23.8.1 Robin Monro: *Yoga research bibliography scientific studies on Yoga and meditation*(Yoga Biomedical Trust, England 1989)
- 23.8.2 Michael H. Cohen: *Complementary and Alternative Medicine: Legal Boundaries and regulatory Perspectives* (Paperback - Aug 19, 1997)
- 23.8.3 Jerrold H. Zar: *Biostatistical Analysis person education.*
- 23.8.4 Russell A. Jones: *Research Methods in the Social and behavioral science* (Sinauer Associates, Saunderland's Massachusetts)
- 23.8.5 A.K. Singh: *Tests, Measurements and Research Methods in Behavioral Sciences* (BharatiBhavan Publishers)
- 23.8.6 J.N.S. Matthews: *An Introduction to randomized controlled clinical trials* (Arnold, London)
- 23.8.7 J.S.P. Lumley: *Research:- Some Ground Rules* W. Benjamin (Oxford University Press)
- 23.8.8 Herman J. Ader: *Research Methodology in the life, behavioral and social Sciences* Gideon J. Mellebeegh (SAGE Publications).

**BNYS 4<sup>th</sup> Year Syllabus  
Hospital Management (BNY-408 A)**

**CO: COURSE OBJECTIVES**

**CO-1** Provide a comprehensive understanding of the structure and functioning of healthcare systems,

including hospitals, clinics, and other healthcare facilities. Discuss the various types of hospitals (public, private, specialty) and how they are managed.

**CO-2** Introduce students to healthcare regulations, policies, and ethical issues, ensuring they understand the legal environment in which hospitals operate.

**CO-3** Develop students' ability to manage hospital finances, including budgeting, accounting, cost control, and revenue management.

**CO-4** Focus on ensuring the delivery of high-quality care, through quality management systems, patient safety protocols, and continuous improvement processes. Train students on accreditation standards, such as those from the Joint Commission or National Accreditation Board for Hospitals & Healthcare Providers (NABH).

## **Course Contents**

### **Unit I: Principles of Management in Healthcare**

- Introduction to management theories
- Role of a hospital manager
- Functions of management: Planning, Organizing, Leading, Controlling
- Decision-making in hospital settings

### **Unit II: Healthcare Systems and Organization**

- Overview of healthcare systems: global and regional perspectives
- Types of hospitals: public, private, teaching hospitals, etc.
- Structure and functions of healthcare organizations
- Healthcare delivery models and trends

### **Unit III: Hospital Operations Management**

- Patient care management
- Emergency services management
- Outpatient, inpatient, and ancillary services
- Capacity planning and resource allocation
- Medical records management

### **Unit IV: Human Resource Management in Healthcare**

- Recruitment, retention, and training of healthcare personnel
- Performance appraisal and staff development
- Labor laws and regulations in healthcare
- Managing multidisciplinary teams in hospitals

### **Unit V Financial Management in Hospitals**

- **Budgeting, cost control, and financial planning in healthcare**
- **Revenue cycle management and billing systems**
- **Healthcare insurance and reimbursement models**
- **Financial analysis and reporting**

### **Suggested Readings:**

1. Hospital and Healthcare Management" by Shailendra Nigam
2. Healthcare Operations Management" by Daniel B. McLaughlin and Julie M. Hays
3. Health Care Finance: Basic Tools for Nonfinancial Managers" by Judith J. Baker and R.W. Baker
4. Essentials of Health Care Finance" by William O. Cleverley and James O. Cleverley

## **COURSE OUTCOMES**

**COs-1** Gain in-depth knowledge of the structure and function of various healthcare systems and how hospitals fit within the broader healthcare ecosystem.

**COs-2** Apply management principles to optimize hospital operations, including patient flow, emergency services, and hospital logistics.

**COs-3** Develop expertise in financial management for hospitals, including budgeting, cost control, revenue generation, and financial reporting.

**COs-4** Apply marketing strategies to promote hospital services, improve patient satisfaction, and engage with the community.

## **BNYS 4<sup>th</sup> Year Syllabus Publication Ethics and Database (BNY-408 B)**

### **CO: COURSE OBJECTIVES**

**CO-1** Provide a clear understanding of the principles of research ethics, including honesty, accountability, transparency, and respect in research.

**CO-2** Identify and address common ethical issues in publishing, such as plagiarism, duplicate publication, data fabrication/falsification, and conflicts of interest.

**CO-3** Teach the principles and processes involved in peer review, including the roles of reviewers and editors.

**CO-4** Equip students with knowledge about ethical considerations in research data management, including data sharing, archiving, and preservation.

### **Course Contents**

#### **Unit I: Introduction to Research Ethics and Integrity**

- Definition of research integrity and its importance.
- Core ethical principles: honesty, accountability, transparency, and respect.
- Introduction to ethical guidelines (COPE, ICMJE).

#### **Unit II: Authorship and Contributor ship in Scholarly Publishing**

- Defining authorship: What qualifies someone to be an author?
- Ethical issues related to guest, ghost, and gift authorship.
- Guidelines on authorship

#### **Unit III: Peer Review Process and Ethical Considerations**

- The purpose and types of peer review (single-blind, double-blind, open review).
- Ethical responsibilities of reviewers and authors.

#### **Unit IV: Introduction to Research Databases**

- Overview of research databases: PubMed, Scopus, Web of Science, Google Scholar.
- Searching strategies: Boolean operators, filters, and advanced search techniques.
- Organizing and managing search results.



### **Unit V: Citation Management Tools**

- Introduction to citation management software (EndNote, Mendeley, Zotero).
- How to manage and organize references.
- Generating bibliographies and in-text citations.

### **Suggested Readings:**

- "Responsible Conduct of Research" by Adil E. Shamoo and David B. Resnik
- "Publication Ethics" by Wager, E., and Kleinert, S.
- COPE (Committee on Publication Ethics) Guidelines
- EndNote, Zotero, and Mendeley Documentation

### **COURSE OUTCOMES**

**COs-1** Students will gain a solid understanding of the ethical considerations in academic research and publishing, including plagiarism, data fabrication, and falsification. They will learn to identify and avoid ethical pitfalls in their work.

**COs-2** Participants will learn the basics of intellectual property rights, copyright laws, and how to properly attribute sources in their publications. They will also understand the implications of open access versus subscription-based publications.

**COs-3** Students will understand what qualifies as authorship and the importance of properly crediting all contributors to research. They will be able to navigate issues such as order of authorship and contribution transparency.

**COs-4** Students will learn how to identify and avoid predatory journals and conferences, ensuring that their work is published in credible and legitimate platforms.

23.9 **Scheme of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Research Methodology/Hospital Management/ Publication Ethics and Database	80	20	30	130	60	10	70	200

## **SECTION V**

### **TEACHING OF MEDICAL ETHICS IN BNYS COURSE**

#### **1. Introduction**

Medical ethics is a systematic effort to work within the ethos of medicine, which has traditionally been service to sick.

There is now a shift from the traditional individual patient doctor relationship of medical care. With the advances in science and technology and the needs of patients, their families and the community, there is an increased concern with the health of the society. There is a shift to greater accountability to the society. Doctors and other health professionals are confronted with many ethical problems. It is, therefore, necessary to be prepared to deal with these problems.

In keeping with its goal to improve quality of education, Rajiv Gandhi University of Health Sciences recommends introduction of medical ethics in the regular teaching of BNYS course beginning from first year and continuing till the end of internship.

#### **2. Objectives**

The objectives of teaching medical ethics should be to enable the students develop the students to develop the ability to:

1. Identify underlying ethical issues and problems in medical practice
2. Consider the alternatives under the given circumstances, and
3. Make decisions based on acceptable moral concepts and also traditions and practices

#### **3. Course contents (Syllabus)**

##### a. Introduction to medical ethics

- What are Ethics
- What are values and norms
- Relationship between being ethical and human fulfillment
- How to form a value system in one's personal and professional life
- **Heteronomous Ethics and Autonomous Ethics**
- Freedom and Personal Responsibility

##### b. Definition of Medical Ethics

- Difference between medical ethics and bioethics

- Major principles of Medical Ethics:
- Beneficence = Fraternity
- Justice = Equality
- Self-determination (autonomy) = Liberty

c. Perspectives of Medical Ethics

- The Hippocratic Oath
  - The Declaration of Helsinki
  - The WHO Declaration of Geneva
  - International Code of Medical Ethics (1983)
  - Medical Council of India Code of Ethics

d. Ethics of the Individual

- Patient as a person
- Right to be respected
- Truth and confidentiality
- Autonomy of decision
- Concept of disease, health and healing
- Right to health
- Ethics of behavior modification
- Physician-patient relationship
- Organ donation

e. Ethics of Human Life

- What is human life?
- Criteria for distinguishing human and non-human
- Reasons for respecting human life
- Beginning of human life
- Conception, contraception

- Abortion
  - Prenatal sex-determination
  - In vitro Fertilization (IVF)
  - Artificial Insemination by Husband (AIH)
  - Artificial Insemination by Donor (AID)
  - Surrogate motherhood
  - Semen Intra fallopian Transfer (SIFT)
  - Gamete Intra fallopian Transfer (GIFT)
  - Zygote Intra fallopian Transfer (ZIFT)
  - Genetic Engineering
- f. Family and Society in Medical Ethics
- Ethics of human sexuality
  - Family planning perspectives
  - Prolongation of life
  - Advanced life directives – The Living Will
  - Euthanasia
  - Cancer and Terminal Care
- g. Death and Dying
- Use of life-support systems
  - Death awareness
  - The moment of death
  - Prolongation of life
  - Ordinary and extraordinary life support
  - Advanced life directives
  - Euthanasia – passive and active
  - Suicide – the ethical outlook

- The right to die with dignity
- h. Professional Ethics
  - Code of conduct
  - Contract and confidentiality
  - Charging of fees, Fee-splitting
  - Prescription of drugs
  - Over-investigating the patient
  - Low-cost drugs, vitamins and tonics
  - Allocation of resources in health care
- i. Research Ethics
  - Animal and experimental research/humanness
  - Human experimentation
  - Human volunteer research – Informed
  - Consent Drug Trials
- j. Ethical Work-up of Cases
  - Gathering all scientific factors
  - Gathering all human factors
  - Gathering all value factors
  - Identifying areas of value – conflict
  - Setting of priorities
  - Working out criteria towards decisions

#### **4. Teaching/Learning Experience**

Classroom teaching would focus on professional relationship, patient-doctor relationship, issues at the beginning and end of life, reproductive technologies, resource allocation and health policy. It will also deal with values, ethical concepts and principles. Clinical ethics must be taught as part of bedside teaching. Group discussions, case studies, problem analyzing and problem solving exercises may also be employed.

The teacher involved in teaching ethics should show how the ethical principles are applied on a day-to-day and patient to patient basis by demonstrating by example, how to identify and resolve a particular problem, increasing the awareness and knowledge of students of students the value dimensions of interactions with patients, colleagues, relations and public.

Fostering the development of skills of analysis, decision making and judgment. Making the students aware of the need to respect the rights of the patient as also duties and responsibilities of the doctor

## 5. Evaluation

All major subjects should have at least one short answer question on Medical Ethics appropriate for the subject introduced in the University question paper, and a few questions may be asked in the viva voce examination, eg., basic principles of informed consent, confidentiality, etc.

## 6. Recommended Reading

- a. Francis CM, Medical Ethics, II Ed, 2004, Jaypee Brothers, New Delhi, Rs. 150/-
- b. Ethical Guidelines for Biomedical Research on Human Subjects, Indian Council of Medical Research, New Delhi. 2000.

**DIFFERENT METHODS RECOMMENDED FOR INTERNAL ASSESSMENT**

National Institute of Naturopathy (NIN), Pune, has given some examples of methods of Internal assessment of students, which may be followed by the colleges. They are:

1. Credit for preparation and presentation of seminars by students
2. Preparation of clinical case for presentation
3. Clinical case study/problem solving exercises
4. Participation in project for health care in the community
5. Proficiency in conduction a small research project or assignment
6. Multiple choice questions (MCQ) test after completion of a chapter/system

Each time shall be objectively assessed and recorded. Some of the items can be assigned as home work/vacation work.



**A COMPREHENSIVE LIST OF SKILLS RECOMMENDED AS DESIRABLE FOR BACHELOR OF NATUROPATHY AND YOGIC SCIENCES (BNYS) GRADUATE**

1. Clinical evaluation
  - a. To be able to take a proper and detailed history
  - b. To perform a complete and thorough physical examination and elicit clinical signs
  - c. To be able to properly use the stethoscope, blood pressure apparatus, otoscope, thermometer, nasal speculum, etc
  - d. To be able to perform internal examination-per rectum (PR), per-vaginum (PV), etc.
  - e. To arrive at a proper clinical diagnosis
2. Bedside diagnostic tests
  - a. To do and interpret hemoglobin (Hb), total count (TC), erythrocyte sedimentation rate (ESR), blood smear for parasites, urine examination/albumin/sugar/ketones/microscopy;
  - b. Stool exam for ova and cysts;
  - c. To do gram's stain and Ziehl-Neelsen stain for AFB;
  - d. To do skin smear for leprae bacilli;
  - e. To do and examine a wet film vaginal smear for Trichomonas;
  - f. To do a skin scraping and potassium hydroxide (KOH) stain for fungal infections;
  - g. To perform and read Mantoux test.
3. Ability to carry out procedures
  - a. To conduct CPR (Cardiopulmonary resuscitation) and First Aid in newborns, children and adults
  - b. To administer enema
4. Paediatrics
  - a. To assess newborns and recognize abnormalities and IU retardation
  - b. To teach infant feeding to mothers

- c. To monitor growth by the use of 'road to health chart' and to recognize development retardation
- d. To assess dehydration and prepare and administer Oral Rehydration Therapy (ORT)
- e. To recognize ARI clinically

#### 5. Community Health

- a. To be able to supervise and motivate community and para-professionals for corporate efforts for health care
- b. To be able to carry on managerial responsibilities, e.g., Management of stores, indenting, stock keeping and accounting
- c. Planning and management of health camps
- d. Implementation of national health programmes
- e. To effect proper sanitation measures in the community, e.g., disposal of infected garbage, chlorination of drinking water
- f. To identify and institute control measures for epidemics including its proper data collecting and reporting

#### 6. Management of emergencies

- a. To manage acute anaphylactic shock
- b. To manage peripheral vascular failure and shock
- c. To manage acute pulmonary edema and LVF
- d. Emergency management of drowning, poisoning and seizures
- e. Emergency management of bronchial asthma and status asthmaticus
- f. Emergency management of hyperpyrexia
- g. Emergency management of comatose patients regarding airways, positioning prevention of aspiration and injuries
- h. Assess and administer emergency management of burns



# Shobhit University, Gangoh

(Established by UP Shobhit University Act No. 3, 2012)

## School Of Naturopathy

### Ordinances, Regulations & Syllabus

For

**Bachelor of Naturopathy & Yogic Sciences (BNYS) 5 ½  
Year Programme Annual Pattern  
(w.e.f. session 2016-17)**

Approved and adopted in the year 2016 (Board of Studies 1<sup>st</sup>)

## **Programme Educational Objectives (PEOs)**

**PEO1 Knowledge of Naturopathy:** Graduates should have a solid foundation in naturopathic principles, philosophy, and practices. They should possess in-depth knowledge of various natural therapies, such as nutrition, herbal medicine, hydrotherapy, acupuncture, and lifestyle counselling.

**PEO2 Understanding of Human Anatomy and Physiology:**□Students should acquire a thorough understanding of human anatomy and physiology, including the structure and functions of different body systems. This knowledge is essential for diagnosing and treating health conditions using naturopathic methods.

**PEO3 Diagnostic Skills:** Graduates should be proficient in assessing patients' health conditions through various diagnostic techniques, including physical examination, laboratory tests, and assessment of health history. They should be able to identify the root causes of illnesses and design personalized treatment plans accordingly.

**PEO4 Therapeutic Skills:** Students should develop practical skills in implementing naturopathic therapies and modalities. These may include prescribing herbal remedies, designing nutritional plans, administering physical therapies, providing lifestyle counselling, and conducting yoga and meditation sessions.

**PEO5 Holistic Approach:** Graduates should understand the importance of treating patients holistically, considering their physical, mental, emotional, and spiritual well-being. They should be able to address health concerns by integrating naturopathy, yoga, and other complementary healing approaches.

**PEO6 Patient Management:** Students should learn effective patient management skills, including effective communication, patient education, and building a strong therapeutic relationship. They should be able to educate patients about their health conditions and motivate them to adopt healthy lifestyle practices.

**PEO7 Ethical and Professional Standards:** Graduates should adhere to high ethical and professional standards in their practice. They should understand the legal and regulatory frameworks governing naturopathic medicine and maintain confidentiality, integrity, and professionalism in their interactions with patients and colleagues.

## **Programme Specific Objectives (PSO's)**

**PSO1** Understanding of naturopathic principles and therapeutic modalities.

**PSO2** Knowledge of yogic sciences and their benefits.

**PSO3.** Proficiency in diagnostic skills, including conventional and naturopathic methods.

**PSO4** Familiarity with various naturopathic treatment modalities.

**PSO5** Ability to design individualized treatment plans and provide natural and modern therapies.

**PSO6** Enrich communication, ethical values team work, professional and leadership skill sets of students.

**PSO7** Focus on health promotion and disease prevention.

## **Programme Outcome (PO's)**

**PO1** Providing knowledge of basic principles of naturopathy through interactive classes.

**PO2** Making the students understand the disease through the perspective of naturopathy and yoga through clinical exposure.

**PO3** Demonstrating the students how to take case study for proper diagnosis of diseases.

**PO4** Working on the personal development and communication skills.

**PO5** Providing proper knowledge of anatomy, physiology, biochemistry of human body.

**PO6** Providing the basic knowledge of modern medicine

Ordinance Governing

# Bachelor of Naturopathy & Yogic Sciences (B.N.Y.S.)

Five and half years' Undergraduate Medical  
Degree in Yoga and Naturopathy  
With effective from 2016

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## **INTRODUCTION**

National Institute of Naturopathy (NIN), Pune, revised the BNYS syllabus, with a view of standardizing BNYS syllabi with uniform durations and course contents across the country in 2012. It was implemented by Rajiv Gandhi University of Health Sciences (RGUHS) in the academic year 2013-14. In the view of new regulations, University restructured the BNYS course and issued ordinance year wise of the course in 1996. The present volume is published incorporating the amendments made by the National Institute of Naturopathy, Pune, to the regulations of BNYS course and addition of certain topics to the syllabi, as well as change in duration from 5 years to 5½ years. The ordinance should be read with Revised Ordinance Governing BNYS Degree Course and Curriculum of first year to fourth year – 2013.

First year BNYS is of 1½ year duration, and consists of pre-clinical subjects and subjects describing Yoga and Naturopathy principles, Anatomy, Physiology, Biochemistry, Philosophy of Naturopathy, Principles of Yoga and Sanskrit. Second year BNYS is of 1 year duration, and consists of Para-clinical subjects and subjects describing philosophies of Yoga and Naturopathy clinical subjects, Pathology, Microbiology, Community Medicine, *Yoga* Philosophy, Basic Pharmacology, and Colour therapy and magneto biology. Third year BNYS is of 1 year duration, and consists of Para-clinical subjects and Yoga and Naturopathy clinical subjects, Forensic Medicine and Toxicology, Manipulative Therapies, Acupuncture and Acupressure, *Yoga* and its applications, Nutrition and Medicinal Herbs, Diagnostic Methods (I and II) Naturopathy and Conventional Medicine, Psychology and Basic Psychiatry, and Fasting therapy and Dietetics. Final year BNYS is of 1 year duration, and consists of clinical subjects and Yoga and Naturopathy clinical subjects Obstetrics and Gynecology, *Yoga* therapy, Hydrotherapy and Mud therapy, Physical

Medicine and Rehabilitation, First Aid and Emergency Medicine, Clinical Naturopathy and Research Methodology and Recent Advances.

In Section I, goals of BNYS course are given. Section II gives general objectives. Section III gives duration of the course, recommendations regarding attendance, internal assessment, distribution of marks for various subjects in professional examinations and criteria for pass. Revised course contents, subjects like Pharmacology, Forensic Medicine and Toxicology, Sanskrit, Principles of Yoga, Herbology, Clinical Naturopathy, Psychology and Basic Psychiatry, Clinical Naturopathy, Research Methodology and Recent Advances are added in this publication – are elaborated in Section IV. Section V deals with topics recommended for teaching of medical ethics.

## **SECTION I**

### **1 Goals of BNYS Course**

- 1.1 Recognize the health needs of the community, and carry out professional obligations ethically and in keeping with the objectives of the national health policy;
- 1.2 Develop the skills in most of the competencies, and training that are required to deliver the Naturopathy and Yoga health care system;
- 1.3 Become aware of the contemporary advances and developments in the discipline concerned;
- 1.4 Acquire a spirit of scientific inquiry and is oriented to the principles of research methodology and epidemiology;
- 1.5 Become proficient in their profession by developing scientific temper and improve educational experience;
- 1.6 Identify social, economic, environmental, biological and emotional determinants of health in a given case and take them into account while planning therapeutic, rehabilitative, preventive and promotive measures/strategies;
- 1.7 Plan and devise measures in Naturopathy and yoga for the prevention and rehabilitation of patients suffering from disease and disability ;
- 1.8 Demonstrate skills in documentation of individual case details as well as morbidity data relevant to the assigned situation;
- 1.9 Demonstrate empathy and humane approach towards patients and their families and exhibit interpersonal behavior in accordance with the societal norms and expectations;

- 1.10 Play the assigned role in the implementation of national health programs, effectively and responsibly;
- 1.11 Organize and supervise the chosen/assigned health care services  
Demonstrating adequate managerial skills in the clinic/hospital or the field Situation;
- 1.12 Develop skills as a self-directed learner; recognize continuing educational needs, select and use appropriate learning resources;
- 1.13 Demonstrate competence in basic concepts of research methodology and epidemiology, and be able to critically analyze relevant published research literature;
- 1.14 To implement all National health policies ;
- 1.15 Work towards realization of ‘\_Health for all’, as a national goal through naturopathy and yoga;
- 1.16 To follow the medical ethics and to fulfill the social and professional responsibilities as a Naturopathy and Yoga Physician through drugless therapies;
- 1.17 Be competent in the practice of holistic medicine with expert knowledge and experience in promotive, preventive, curative and rehabilitative aspects of diseases;
- 1.18 Become proficient in their profession by developing scientific temper and improve educational experience;

## 2 Institutional Goals

After the medical undergraduate program, the students must:

- 2.1 Be able to expertly diagnose and manage common diseases and health problems of individuals as well as community, work with the health team as a fully qualified doctor at primary, secondary or tertiary levels, with his/her clinical experience and skills in history, physical examination and relevant investigations;
- 2.2 Be proficient in promotive, preventive, curative and rehabilitative medicine and therapy for common health issues;
- 2.3 Be adept in different therapeutic modalities and their administration;
- 2.4 Develop a humane attitude towards one's clients and understand economic, environmental, social, psychological and cultural factors that influence health;
- 2.5 Enjoy an urge for self-improvement, directed towards advanced expertise or research in any chosen area of health care;
- 2.6 Have enough knowledge about implementation of National Health Programs and the basic factors required for the same, which are as follows;
  - 2.6.3 Family Welfare and Maternal and Child Health (MCH);
  - 2.6.4 Sanitation and Water Supply;
  - 2.6.5 Prevention and Control of communicable and non-communicable diseases;
  - 2.6.6 Immunization;
  - 2.6.7 Health education;
- 2.7 Possess management skills in human resources, materials and resource management in health care delivery;

- 2.8 Be competent in recognizing community health issues and design, institute curative and preventive measures and evaluate the outcome of these measures, thus working towards resolving these issues;
- 2.9 Be able to work successfully in a variety of health care settings;
- 2.10 Develop integrity, responsibility, reliability, dependability and compassion, which are characteristics required for successful professional life;
- 2.11 Develop leadership and communication skills to work as leading investigator or clinician in health care teams;

## **SECTION II**

### **1. Objectives of Medical Graduate Training Programme**

- 1.1. To effectively integrate the conventional basic sciences (e.g. human physiology) with the traditional medical systems and to enhance the understanding of their effects and therapeutic potential;
- 1.2 To provide state of the art learning facilities (e.g. audio visual aids, interactive learning systems) to conceptualize the ancient medical system;
- 1.3 To run advanced laboratories under each department (basic and clinical sciences) for effective experimental training and research;
- 1.4 To explore the possibilities of promoting effective integrated medical practice at conventional medical facilities attached to the institute;
- 1.5 To provide the best possible clinical setting for clinical training and research;
- 1.6 To prepare every Yoga and Naturopathic physician with an in depth understanding of Basic sciences, superior clinical training and with an outlook for research and development;



## **SECTION III**

### **1 Course of Study:**

The duration of the course shall be 5 ½ years (Five and half years). The course shall include a period of regular study of four and a half (4 ½) years, followed by a compulsory rotatory internship of one year.

The period of regular study shall be divided into four phases – first year of one and half (1½) years, and the Second, Third and Final years of one year each of the B.N.Y.S. Medical Degree Course respectively.

### **2 Attendance:**

A candidate shall be considered to have satisfied the requirement of attendance for each Part/Phase if he /she attends not less than 80 per cent of the theory and practical classes actually conducted up to the end of the Phase in that subject.

Such a candidate having shortage of attendance shall be required to attend 80 per cent of the theory and practical classes actually held up to the end of the term by repeating that subject of that Part/Phase during a subsequent term.

### **3 Teaching Hours:**

The allotment of time (in number of hours) to teach Theory and to conduct

Practical/Clinical and Tutorial /Demonstration, Seminar in each subject shall be:

#### **I YEAR B.N.Y.S. (18 months)**

<b>No. of Subjects</b>	<b>No. of Papers</b>	<b>SUBJECTS</b>	<b>TOTAL HOURS</b>
I	01.	Anatomy – I	550hrs
	02.	Anatomy – II	
II	03.	Physiology – I	500hrs
	04	Physiology – II	
III	05.	Biochemistry	300hrs
IV	06.	Philosophy of Naturopathy	325hrs
V	07.	Principles of <i>Yoga</i>	400hrs
		<b>Total Hours</b>	<b>2175hrs</b>

**II YEAR - B.N.Y.S. (12 Months)**

<b>No. of Subject s</b>	<b>No. of papers</b>	<b>SUBJECTS</b>	<b>TOTAL HOURS</b>
I	01.	Pathology	300
II	02.	Microbiology	200
III	03.	Community Medicine	250
IV	04.	<i>Yoga</i> Philosophy	350
V	05.	Basic Pharmacology	100
VI	06.	Colour Therapy and Magneto biology	150
VII	07.	Forensic Medicine & Toxicology	100
		<b>Total Hours</b>	<b>1450</b>

**III YEAR B.N.Y.S. (12 months)**

<b>No. of Subjects</b>	<b>No. of Papers</b>	<b>SUBJECTS</b>	<b>TOTAL HOURS</b>
I	01.	Manipulative Therapies	200
II	02.	Acupuncture & Acupressure	200
III	03.	<i>Yoga</i> & Its Applications	250
IV	04.	Nutrition & Medicinal herbs	250
V	05.	Diagnostic Methods - I (Naturopathy)	200
	06.	Diagnostic Methods -II (Conventional Medicine)	200
VI	07.	Psychology & Basic Psychiatry	150
		<b>Total Hours</b>	<b>1450</b>

**IV YEAR B.N.Y.S. (12 months)**

<b>No. of Subjects</b>	<b>No. of Papers</b>	<b>SUBJECTS</b>	<b>TOTAL HOURS</b>
I	01.	Fasting Therapy & Dietetics	200
II	02.	Obstetrics & Gynecology	150
III	03.	<i>Yoga</i> Therapy	250
IV	04.	Hydrotherapy & Mud Therapy	250
V	05.	Physical Medicine & Rehabilitation	200
VI	06.	First Aid & Emergency Medicine	100
VII	07.	Clinical Naturopathy	200
VIII	08.	Research Methodology & Recent Advances	100
		<b>Total Hours</b>	<b>1450</b>

GRAND TOTAL FOR 4 ½ YEARS IS 6525 hours.

**Internship program:**

A candidate after passing final B.N.Y.S. Medical Degree Examination shall undergo the compulsory rotatory internship of one year duration, which shall consist of work/duty postings in the following sections/departments for the period specified against them.

<b>S.No.</b>	<b>Department</b>	<b>Duration</b>
1.	Philosophy of <i>Yoga</i> and Naturopathy	1 Month
2.	<i>Yoga</i> and Mind-Body Medicine	1 Month
3.	Pathology and Microbiology	1 Month
4.	Community Medicine	1 Month
5.	Energy Medicine	1 Month
6.	Manipulative Therapies, Physical Medicine & Rehabilitation	1 Month
7.	Fasting, Dietetics, Nutrition, & Medicinal Herbs	1 Month
8.	Diagnostic Methods	1 Month
9.	Obstetrics & Gynecology	1 Month
10.	Hydrotherapy & Mud Therapy	1 Month
11.	Naturopathic Medicine	1 Month
12.	Allied Health Sciences	1 Month
	<b>TOTAL</b>	<b>12 Months</b>

#### **4 Scheme of Examination:**

The examination/s shall be held as per the date of Examination notified by the University.

There should be one Internal & One External Examiner for all practical & Viva exams for each subject. A candidate shall register for all the subjects of a term/year, when he/she appears for the first time to the examination of that Part.

##### **4.1 Internal Assessment: Scheme of Examination:**

There shall be an internal assessment which follows broadly the principles enunciated by the University in each subject for which 20 per cent of the marks are set apart and these will be added in the final grade in the University examinations. There shall be a minimum of two assignments and two periodical tests in every subjects of each year to assess the progress of the candidate.

If a candidate fails in an Examination, his/her internal assessment shall be assessed again as if he/she is a regular student for the second attempt only.

#### **Theory**

Minimum of 3 examinations is recommended. The examination preceding the university examination may be similar to the University Examination. Average marks of the better of the two notified internal examinations should be reduced to the marks allotted for internal assessment for each subject and should be sent to the university.

**Practical**

A minimum of one clinical test may be conducted at the end of each ward postings in all the clinical subjects.

Assistant professor and above or lecturer with five years of teaching experience can conduct internal assessment examination. Average of best two examination marks should be taken into consideration while calculating the marks of internal assessment.

The internal assessment marks of both theory and practical obtained by the candidates should be sent to the University at least 15 days prior to the commencement of the theory examination.



## 4.2 Subjects And Credit

### I YEAR BNYS

S.No.	Subject Name	Subject Code	Credit
1	Anatomy I	BNY - 101	3
2	Anatomy II	BNY - 102	3
3	Physiology I	BNY - 103	3
4	Physiology II	BNY - 104	3
5	Biochemistry	BNY - 105	3
6	Philosophy of Naturopathy	BNY - 106	4
7	Principles of Yoga	BNY - 107	3
8	Anatomy	BNY - 151	1
9	Physiology	BNY - 153	1
10	Biochemistry	BNY - 155	1
11	Philosophy of Naturopathy	BNY - 156	1
12	Principles of Yoga	BNY - 157	1

## II YEAR BNYS

S.No.	Subject Name	Subject Code	Credit
1	Pathology	BNY - 201	3
2	Microbiology	BNY - 202	2
3	Community Medicine	BNY - 203	3
4	Yoga Philosophy	BNY - 204	3
5	Color therapy and Magneto biology	BNY - 205	1
6	Basic Pharmacology	BNY - 206	3
7	Forensic Medicine and Toxicology	BNY - 207	2
8	Pathology	BNY - 251	1
9	Microbiology	BNY - 252	1
10	Community Medicine	BNY - 253	1
11	Yoga Philosophy	BNY - 254	1
12	Color therapy and Magneto biology	BNY - 255	1

### III YEAR BNYS

S.No.	Subject Name	Subject Code	Credit
1	Manipulative Therapies	BNY - 301	3
2	Acupuncture & Acupressure	BNY - 302	3
3	<i>Yoga</i> & Its Applications	BNY - 303	3
4	Nutrition & Medicinal herbs	BNY - 304	3
5	Diagnostic Methods - I(Naturopathy)	BNY - 305	3
6	Diagnostic Methods -II (Conventional Medicine)	BNY - 306	3
7	Psychology & BasicPsychiatry	BNY – 307	2
8	Manipulative Therapies	BNY – 351	1
9	Acupuncture & Acupressure	BNY – 352	1
10	<i>Yoga</i> & Its Applications	BNY – 353	1

11	Nutrition & Medicinal herbs	BNY – 354	1
12	Diagnostic Methods - I(Naturopathy)	BNY – 355	1
13	Diagnostic Methods -II (Conventional Medicine)	BNY – 356	1
14	Psychology & Basic Psychiatry	BNY – 357	1

#### IV YEAR BNYS

S.No.	Subject Name	Subject Code	Credit
1	Fasting Therapy & Dietetics	BNY - 401	3
2	Obstetrics & Gynecology	BNY - 402	3
3	<i>Yoga</i> Therapy	BNY - 403	3
4	Hydrotherapy & Mud Therapy	BNY - 404	3
5	First Aid & Emergency Medicine	BNY - 405	2
6	Clinical Naturopathy	BNY - 406	1
7	Physical Medicine & Rehabilitation	BNY - 407	3
8	Research Methodology &Recent Advances	BNY - 408	1
9	Fasting Therapy & Dietetics	BNY - 451	1

10	Obstetrics & Gynecology	BNY - 452	1
11	<i>Yoga</i> Therapy	BNY - 453	1
12	Hydrotherapy & Mud Therapy	BNY - 454	1
13	First Aid & Emergency Medicine	BNY - 455	1
14	Clinical Naturopathy	BNY – 456	1
15	Physical Medicine & Rehabilitation	BNY - 457	1
16	Research Methodology &Recent Advances	BNY – 458	1

A candidate who has passed in all the subjects of First B.N.Y.S. Medical Degree examination shall be eligible to be promoted to Second B.N.Y.S. Medical Degree course.

A candidate is eligible for carry over facility only if he/she has appeared for all the subjects of that particular examination.

First year to Second Year – 3 subjects carry over

Second year to Third year - 3 subjects carry over

Third Year to Final year – 3 subject carry over

Completion of the degree should not go beyond 11 years from the date of admission.

#### **4.3 Criteria for Pass**

To be eligible for promotion to the II, III & IV years, the candidate has to complete and pass in all the subjects of I, II & III years with an exemption of one subject in each year.

The candidate is declared to have been successful provided he/she secures minimum 40% and above in theory, 50% and above in oral/practical/clinical separately each subjects, but should get 50% in aggregate in all.

#### **4.4 Declaration of Class:**

A candidate who passes all the subjects of one examination in the first attempt only be eligible for a class.

No class or rank shall be declared for candidate who does not pass any examination in the first attempt, and such a candidate shall be eligible only for a pass class.

The percentage of marks for declaring pass/Second/First Class and First class with

Distinction shall be as follows:

Distinction	Not less than 75 percent of the Aggregate Marks
First class	Not less than 65 percent of the Aggregate Marks
Second class	Not less than 50 percent of the Aggregate Marks
Pass class	Candidate who passes the examination in more than one attempt

Note: - A candidate who passes in all the subjects of any Examination only in first attempt shall be eligible for First class with Distinction /First/Second Class



## **SECTION IV**

### **SUBJECTS & COURSE CONTENT**

#### **1. ANATOMY**

##### **1.1 Goals and Objectives**

###### **1.1.1 Goal**

It aims at giving inclusive knowledge of the gross and microscopic structure and development of human body to provide a basis for assessing the correlation of organs and structures and anatomical basis for disease presentations.

###### **1.1.2 Objectives**

###### **1.1.2.1 Knowledge:**

After completion of the program, the student must be able to:

- 1.1.2.1.1 Understand normal human anatomy clinically important inter-relationship and functional anatomy of bodily structures;
- 1.1.2.1.2 Comprehend histological structures of various tissues and organs and co- relate structure and function in order to understand diseased states;
- 1.1.2.1.3 Recognize basic structure and connections of the central nervous system, understand the regulation and integration of various organs and systems and be skilled in locating lesion sites according to deficits in diseased states;
- 1.1.2.1.4 Explain developmental basis of variations and abnormalities with respect to sequential development of organs and systems, teratogens, genetic mutations and environmental hazards.

### 1.1.2.2 Skills

After completion of the program, the student must be able to:

- 1.1.2.2.1 Locate and identify body structures including topography of living body;
- 1.1.2.2.2 Histologically, identify tissues and organs;
- 1.1.2.2.3 Identify gross congenital anomalies and be familiar with the principles of karyotyping;
- 1.1.2.2.4 Interpret new imaging techniques such as CT, Sonogram, MRI etc after understanding their basic principles;
- 1.1.2.2.5 Understand clinical basis of some common clinical procedures i.e., intramuscular and intravenous injection, lumbar puncture and kidney biopsy etc..

### 1.1.2.3 Integration

Student shall be capable of understanding the regulation and integration of the functions of the organs and systems in the body and interpret the anatomical basis of disease process using the combined teaching of other basic sciences.

## 1.2 **Human Anatomy – I (Duration: 18 months)**

**Total hours: 500 (Theory: 300 Practical: 200)**

### 1.2.1 Introduction to Anatomy

- 1.2.1.1 Nomenclature
- 1.2.1.2 Anatomical positions
- 1.2.1.3 Axes and planes
- 1.2.1.4 Tissues

- 1.2.1.5 Movements
- 1.2.2 General Histology
  - 1.2.2.1 Detailed structure of cell and its components and their functional mechanisms
- 1.2.3 Osteology (Including ossification)
  - 1.2.3.1 Types of bones
  - 1.2.3.2 Classification of bones
  - 1.2.3.3 Description of various bones
    - 1.2.3.3.1 Upper limb
    - 1.2.3.3.2 Thorax
    - 1.2.3.3.3 Abdomen and pelvis
    - 1.2.3.3.4 Vertebral column
- 1.2.4 Arthrology
  - 1.2.4.1 Classification of joints
  - 1.2.4.2 Construction of joints
  - 1.2.4.3 Description of various joints of:
    - 1.2.4.3.1 Upper limb
    - 1.2.4.3.2 Thorax
    - 1.2.4.3.3 Vertebral column
- 1.2.5 Myology
  - 1.2.5.1 Types of muscles
  - 1.2.5.2 Muscles of upper limb, thorax, abdomen and pelvis
  - 1.2.5.3 Origin, insertion, blood supply, nerve supply, applied anatomy and actions of these muscles
- 1.2.6 Respiratory System

- 1.2.6.1 Upper respiratory tract – Nose, Pharynx, Larynx
- 1.2.6.2 Trachea & Bronchial tree
- 1.2.6.3 Lungs
- 1.2.6.4 Pleura
- 1.2.6.5 Mediastinum
- 1.2.7 Cardiovascular System
  - 1.2.7.1 Heart – Position, Surface anatomy and its description
  - 1.2.7.2 Great vessels – Aorta, Pulmonary trunk, superior vena cava, inferior vena cava and their branches
  - 1.2.7.3 Arteries and Veins – Structure of arteries and veins, important arteries and veins of the body
- 1.2.8 Digestive System
  - 1.2.8.1 Oral cavity
  - 1.2.8.2 Teeth
  - 1.2.8.3 Hard palate
  - 1.2.8.4 Soft palate
  - 1.2.8.5 Esophagus
  - 1.2.8.6 Stomach
  - 1.2.8.7 Small intestine
  - 1.2.8.8 Large intestine
  - 1.2.8.9 Anal canal
  - 1.2.8.10 Liver
  - 1.2.8.11 Gall bladder
  - 1.2.8.12 Bile duct
  - 1.2.8.13 Pancreas

1.2.8.14 Spleen

1.2.8.15 Peritoneum

1.2.9 Mesentery and position of the above organs in the abdominal quadrants.

1.2.9.1 Urinary System

1.2.9.2 Kidney

1.2.9.3 Ureter

1.2.9.4 Urinary bladder

1.2.9.5 Male urethra

1.2.9.6 Female urethra

1.2.10 Lymphatic System

1.2.10.1 Lymph, lymph glands, lymph duct, thoracic duct, cisterna chyli

1.2.10.2 Location of major groups of lymph nodes in the body and their drainage areas

NOTE: The concerned colleges have to make necessary arrangements for providing human cadavers in the anatomy department for teaching.

### **1.3 Human Anatomy – II (Duration: 18 Months)**

#### **1.3.1 Osteology (Including ossification)**

Description of various bones of

1.3.1.1 Lower limb

1.3.1.2 Skull as a whole

1.3.1.3 Individual cranial bones of skull

#### **1.3.2 Arthrology**

Description of various joints of

1.3.2.1 Lower limb

1.3.2.2 Skull as a whole

1.3.2.3 Skull and vertebral column

#### **1.3.3 Myology**

Description of various muscles of

1.3.4 Lower limb

1.3.5 Head

1.3.6 Neck

(Origin, insertion, blood supply, nerve supply, applied anatomy and actions of these muscles)

#### **1.3.7 Reproductive System**

1.3.7.1 Male reproductive organs

Penis, Testes, Vas Deferens, Spermatic Cord, Epididymis, Seminal Vesicles, Ejaculatory Duct Prostate Gland Etc.

1.3.7.2 Female reproductive organs

1.3.7.2.1 External genital organs

Vulva, Clitoris, Vagina

1.3.7.2.2 Inguinal Region perineum

1.3.7.2.3 Internal genital organs

Uterus, Cervix, Fallopian tubes, Ovaries, Ligaments of uterus and ovaries

1.3.7.2.4 Mammary glands

### **1.3.8 Endocrine System**

Description of Pituitary, Pineal, Thyroid, Parathyroid, Thymus, Spleen, Pancreas, Suprarenal, Ovaries and Testes

### **1.3.9 Nervous System**

Division of nervous system, central nervous system, peripheral nervous system, cerebral hemispheres, midbrain, pons, medulla oblongata, cerebellum, spinal cord, autonomic nervous system.

1.3.9.1 Meninges: Dura mater and arachnoid mater

1.3.9.2 CSF

1.3.9.3 Ventricular system

1.3.9.4 Cranial nerves

1.3.10 Spinal nerves

1.3.11 Important plexuses: Cervical, Brachial, Lumbar, Sacral and their nerve descriptions.

1.3.12 Organs and Special Senses

1.3.12.1 Tongue

1.3.12.2 Nose

1.3.12.3 Eye and associated structures

1.3.12.4 Ear

1.3.12.5 Integumentary system

1.3.13 Surface Anatomy

- 1.3.13.1 Projection of the outline of heart, its borders, surface and valves.
- 1.3.13.2 Lungs – borders, fissures, hila, pleura and diaphragm
- 1.3.13.3 Liver
- 1.3.13.4 Kidney
- 1.3.13.5 Abdominal viscera
- 1.3.13.6 Pelvic viscera



## **1.4 Histology**

### **1.4.1 General Histology**

1.4.1.1 Microscope

1.4.1.2 Cell

1.4.1.3 Epithelial Tissue I

1.4.1.4 Epithelial Tissue II

1.4.1.5 Connective Tissue – Bones and Cartilages

1.4.1.6 Muscular Tissues

1.4.1.7 Nerve Tissues (TS & LS of peripheral nerve, sensory and sympathetic ganglion, optic nerve)

1.4.1.8 Epithelial glands (serous, mucous and mixed salivary gland)

1.4.1.9 Circulatory system (large artery, medium sized artery, larger vein)

1.4.1.10 Lymphatic system (lymph nodes, thymus, tonsils, spleen)

1.4.1.11 Skin and appendages

1.4.1.12 Placenta and umbilical cord

### **1.4.2 Systemic Histology**

1.4.2.1 Respiratory system(lungs ,trachea)

1.4.2.2 Esophagus and stomach

1.4.2.3 Liver, gall bladder, pancreas

1.4.2.4 Urinary system I (Kidney)

1.4.2.5 Urinary system II (Ureter, bladder)

1.4.2.6 Small and large intestine

1.4.2.7 Reproductive system – Female

1.4.2.8 Reproductive system – Male

1.4.2.9 Upper GIT (tongue)

1.4.2.10 Hypophysis cerebra, thyroid and suprarenal glands

1.4.2.11 Eye – cornea and retina

## **1.5 Practical**

### **1.5.1 Gross Anatomy (Dissection / Demonstration of following):**

#### **1.5.1.1 Upper Limb**

1.5.1.1.1 Dissection: Pectoral, scapular, shoulder, arm, forearm (5weeks)

1.5.1.1.2 Prosected Parts: Joints, Palm and dorsum of hand

#### **1.5.1.2 Thorax**

1.5.1.2.1 Dissection: Chest wall, mediastinum, lungs and heart

#### **1.5.1.3 Abdomen**

1.5.1.3.1 Dissection: anterior abdominal wall and inguinal region, viscera and posterior abdominal wall

#### **1.5.1.4 Pelvis**

1.5.1.4.1 Dissection: Pelvic viscera and blood vessels and nerve sagittal section (M & F) (2 weeks)

1.5.1.4.2 Prosected Parts: Sole of the foot and joints

#### **1.5.1.5 Head and Neck**

1.5.1.5.1 Dissection: Scalp, superficial and deep dissection of face and neck (8 – 10 weeks)

1.5.1.5.2 Prosected Parts: Orbit, eyeball, submandibular region, temporal and infra-temporal fossa, cranial cavity, naso and oropharyngeal regions, larynx and pharynx. Cross sections at C-4, C-6 levels, sagittal section of head and neck

#### **1.5.1.6 Nervous System**

Section of brain and prosected specimens and major functional areas; Gross structure of brain and spinal cord and study of gross sections as mentioned earlier (in brief).

## **1.5.2 Demonstrations**

1.5.2.1 Bones as described in the osteology section

1.5.2.2 Brain and Spinal Cord

## **1.5.3 Specific Skills**

1.5.3.1 To localize important pulsations and the structure against which pressure can be applied in case of bleeding and trauma of particular artery.

1.5.3.2 To elicit superficial and deep reflexes.

1.5.3.3 To demonstrate muscle testing and movements at joints.

1.5.3.4 To locate for: lumbar puncture, sterna puncture, pericardial tapping and liver biopsy.

1.5.3.5 To locate veins for venipuncture.

1.5.3.6 To locate the site for emergency such as tracheostomy.

## **1.6 Textbooks:**

1.6.1 Textbook of Anatomy (III volumes) – BD Chaurasia

1.6.2 Textbook of Anatomy – Hamilton

1.6.3 Practical Anatomy – Cunningham

1.6.4 Human Embryology – Inderbir Singh

1.6.5 Bailey's textbook of histology

1.6.6 Medical Embryology – Langman

1.6.7 Textbook of Clinical Anatomy by Neeta V Kulakarni

1.6.8 Histology text book by Latha V

## **1.7 Reference Books**

1.7.1 Textbook of Anatomy – Gray

1.7.2 Atlas of histology – Diforie

- 1.7.3 Atlas of histology – Poddar
- 1.7.4 Textbook of human histology – Veena Bharihoke
- 1.7.5 A color atlas of human anatomy – McMinn
- 1.7.6 Grant's method of Anatomy – Grant
- 1.7.7 Regional and applied Anatomy – RJ Last

1.8 **Scheme Of Examination**

S.N	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01.	Anatomy - I	80	20	30	130	60	10	70	200
02.	Anatomy – II	80	20	30	130	60	10	70	200

## 2. **PHYSIOLOGY**

### 2.1 **Goals and Objectives**

#### 2.1.1 **Goal**

The goal of teaching Physiology to undergraduate students is aimed at giving the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate comprehension of the physiological basis of health and disease.

#### 2.1.2 **Objectives**

##### 2.1.2.1 **Knowledge**

After completion of the program, the student will be able to:

- 2.1.2.1.1 Explicate the normal functioning of all the organ systems and their interactions for well co-ordinated body function;
- 2.1.2.1.2 Appreciate the relative contribution of each organ system to the homeostasis;
- 2.1.2.1.3 Explain the physiological aspects of normal growth and development;
- 2.1.2.1.4 Illustrate the physiological response and adaptations to environmental stresses;
- 2.1.2.1.5 List physiological principles underlying pathogenesis and disease management.

##### 2.1.2.2 **Skills**

After completion of the program, the student will be able to:

- 2.1.2.2.1 Conduct experiments designed to study physiological phenomena;
- 2.1.2.2.2 Interpret experimental/investigative data;

- 2.1.2.2.3 Differentiate between normal and abnormal data from results of tests, which he/she has done and observed in the laboratory.

### **2.1.2.3 Integration**

At the end of the integrated course the student shall acquire an integrated knowledge of organ structure and function and regulatory mechanisms.

## **2.2 Physiology – I (Duration: 18 Months)**

**Total hours: 500 (Theory: 300 Practical: 200)**

### **2.2.1 General Physiology**

2.2.1.1 Cell structure and function

2.2.1.2 Transport mechanisms across biological membrane

2.2.1.3 Body fluids and homeostasis

2.2.1.4 Thermoregulation

### **2.2.2 Blood**

#### **2.2.2.1 Plasma proteins**

2.2.2.1.1 Normal values

2.2.2.1.2 Origin, Functions and variations in health and disease

#### **2.2.2.2 Bone marrow**

2.2.2.2.1 Composition and functions

#### **2.2.2.3 Erythrocytes**

2.2.2.3.1 Morphology and variations in health and disease

2.2.2.3.2 Site and stages of development

2.2.2.3.3 Necessary factors

2.2.2.3.4 Regulation of development of erythrocytes

2.2.2.3.5 Life span and fate of erythrocytes

- 2.2.2.3.6 Erythrocyte sedimentation rate (ESR)
- 2.2.2.3.7 Packed cell volume (PCV)
- 2.2.2.4 Hemoglobin**
  - 2.2.2.4.1 Structure, synthesis, function and metabolism
  - 2.2.2.4.2 Types of hemoglobin
- 2.2.2.5 Anemia** – definition and classification
- 2.2.2.6 Jaundice** – definition and classification
- 2.2.2.7 Spleen-** structure and function
- 2.2.2.8 Leucocytes**
  - 2.2.2.8.1 Classification, morphology, development and functions
  - 2.2.2.8.2 Variation in health and disease
- 2.2.2.9 Thrombocytes**
  - 2.2.2.9.1 Development, morphology and functions
  - 2.2.2.9.2 Variation in health and disease
- 2.2.2.10 Hemostasis**
  - 2.2.2.10.1 Mechanism of hemostasis, coagulation of blood
  - 2.2.2.10.2 Fibrinolysis and bleeding disorders
- 2.2.2.11 Anticoagulants**
  - 2.2.2.11.1 Mechanism of action and clinical applications
- 2.2.2.12 Blood groups**
  - 2.2.2.12.1 Classification
  - 2.2.2.12.2 ABO and RH system
  - 2.2.2.12.3 Blood transfusion, indication and hazards
- 2.2.2.13 Lymph and tissue fluids**
  - 2.2.2.13.1 Formation and functions of lymph



2.2.2.13.2 Physiology of reticular system

**2.2.2.14 Immune system**

Cellular and humoral immunity

**2.2.3 Cardiovascular System**

**2.2.3.1 Heart**

2.2.3.1.1 Structure and properties of cardiac muscle

2.2.3.1.2 Innervations of heart, junctional tissue of heart

2.2.3.1.3 Generation and spread of cardiac impulse

**2.2.3.2 Electrocardiography**

2.2.3.2.1 Einthovan's Law

2.2.3.2.2 ECG leads, normal ECG and its interpretation

**2.2.3.3 Cardiac cycle**

2.2.3.3.1 Pressure and volume changes (mechanical events)

2.2.3.3.2 Principles of echo-cardiograph

2.2.3.3.3 Jugular venous pulse tracing, radial pulse tracing

2.2.3.3.4 Measurement and regulation of cardiac output

**2.2.3.4 Heart sounds**

2.2.3.4.1 Description, Causation and relation to other events in cardiac cycle

2.2.3.4.2 Clinical significance of heart sounds

2.2.3.4.3 Stethoscopy

**2.2.3.5 Blood pressure**

2.2.3.5.1 Definition, regulation and factors influencing BP

2.2.3.5.2 Measurement of blood pressure

2.2.3.5.3 Physiology of hemorrhage and shock

### **2.2.3.6 Circulations**

- 2.2.3.6.1 Blood vessels
- 2.2.3.6.2 Physical principles of blood flow, regulation of blood flow.
- 2.2.3.6.3 Coronary, Splanchnic, cutaneous and capillary, cerebral circulation
- 2.2.3.6.4 Cardiovascular changes in altitude and exercise

## **2.2.4 Respiratory System**

Introduction, internal and external respiration, physiological anatomy of respiratory system

### **2.2.4.1 Mechanism of Respiration**

- 2.2.4.1.1 Inspiration and expiration
- 2.2.4.1.2 Role of respiratory muscles and thoracic cage
- 2.2.4.1.3 Pressure and volume changes during respiration
- 2.2.4.1.4 Work of breathing
- 2.2.4.1.5 lung compliance and its significance in health and disease

### **2.2.4.2 Lung volumes and capacities**

- 2.2.4.2.1 Lung volumes and capacities and their measurements

### **2.2.4.3 Ventilation**

- 2.2.4.3.1 Composition of atmospheric, inspired, alveolar and expired air

### **2.2.4.4 Pulmonary circulation**

- 2.2.4.4.1 Pulmonary circulation, ventilation – perfusion relationship
- 2.2.4.4.2 Diffusion of gases across pulmonary membrane
- 2.2.4.4.3 Oxygen uptake, transport and delivery
- 2.2.4.4.4 Carbon dioxide uptake, transport and delivery

## **2.2.4.5 Organization of the respiratory centers**

- 2.2.4.5.1 Nervous and chemical regulation of respiration
- 2.2.4.5.2 Classification and characteristics of hypoxia, cyanosis, asphyxia, hypercapnea, hypocapnea dyspnea, apnea and orthopnea and periodic breathing
- 2.2.4.5.3 Respiratory changes in high altitude
- 2.2.4.5.4 Physiology of acclimatization and hyperbarism
- 2.2.4.5.5 Respiratory / pulmonary function tests
- 2.2.4.5.6 Non-respiratory functions of lungs
- 2.2.4.5.7 Artificial respiration
- 2.2.4.5.8 Importance of therapeutic administration of oxygen and carbon dioxide
- 2.2.4.5.9 Respiratory changes during exercise

## **2.2.5 Digestive System**

### **2.2.5.1 Introduction, functional anatomy of digestive system**

### **2.2.5.2 Salivary glands**

- 2.2.5.2.1 Composition, functions of saliva
- 2.2.5.2.2 Regulation of secretion of saliva

### **2.2.5.3 Stomach**

- 2.2.5.3.1 Functional anatomy of stomach
- 2.2.5.3.2 Functions of stomach
- 2.2.5.3.3 Composition and functions of gastric juice
- 2.2.5.3.4 Regulation of secretion and mechanism of HCL secretion
- 2.2.5.3.5 Methods of study of gastric function and its supplied aspect

#### **2.2.5.4 Pancreas**

2.2.5.4.1 Functional anatomy of pancreas

2.2.5.4.2 Composition and functions of pancreatic juice

2.2.5.4.3 Regulation of pancreatic secretion

2.2.5.4.4 Methods of study of pancreatic secretion

#### **2.2.5.5 Liver and Gall Bladder**

2.2.5.5.1 Functional anatomy of liver and biliary system

2.2.5.5.2 Functions of liver and gall bladder

2.2.5.5.3 Formation, storage and secretion of bile

2.2.5.5.4 Composition, function and regulation of release of bile

2.2.5.5.5 Entero-hepatic circulation

2.2.5.5.6 Tests for liver function

#### **2.2.5.6 Small intestine**

2.2.5.6.1 Functional anatomy and functions of small intestine

2.2.5.6.2 Composition, function and mechanism of secretions of Succus entericus

#### **2.2.5.7 Large intestine**

2.2.5.7.1 Functional anatomy and functions of large intestine

#### **2.2.5.8 Gastro-intestinal hormones**

2.2.5.8.1 Release and functions

#### **2.2.5.9 Gastro-intestinal movements**

2.2.5.9.1 Mastication, deglutition and vomiting

2.2.5.9.2 Movements of stomach, filling and emptying of stomach

2.2.5.9.3 Movements of small intestines

2.2.5.9.4 Movements of large intestine and defecation

2.2.5.9.5 Regulation of movement

**2.2.5.10 Digestion and absorption of carbohydrates, fats, proteins and vitamins, minerals and water**

**2.2.6 Excretory System**

2.2.6.1 General introduction, organs of excretion with special emphasis on evolution of excretory mechanisms

2.2.6.2 Functional anatomy of renal glands and renal circulation

2.2.6.3 Nephron -

2.2.6.3.1 Mechanism of urine formation

2.2.6.3.2 Concentration and acidification of urine

2.2.6.3.3 Renal function tests

2.2.6.4 Non-excretory functions of kidney

2.2.6.4.1 Physiology of micturition and its abnormalities

2.2.6.5 Skin – structure and functions

## 2.3 **Physiology-II (Duration: 18 Months)**

### 2.3.1 **Endocrine System**

2.3.1.1 **Introduction** - evolutionary background and organization of endocrine control systems

#### 2.3.1.2 **Hormones**

2.3.1.2.1 Classification of hormones and mechanism of hormone action

2.3.1.2.2 Regulation of hormone secretion and feedback system

2.3.1.3 Hypothalamo-hypophyseal system – hormones released

#### 2.3.1.4 **Endocrine glands**

2.3.1.4.1 Pituitary glands –functional anatomy of anterior and posterior pituitary glands. source, chemical nature, actions, regulation and applied aspect of anterior and posterior pituitary hormones

2.3.1.4.2 Thyroid gland – functional anatomy , hormones ,applied aspect

2.3.1.4.3 Parathyroid gland – functional anatomy, hormones, applied aspect

2.3.1.4.4 Adrenal gland – Functional anatomy of adrenal cortex and medulla, hormones and applied physiology of adrenal cortex and medulla

2.3.1.4.5 Islets of langerhans – Functional anatomy, hormones ,applied aspect

2.3.1.4.6 Other hormones – prostaglandins, thromboxanes, acetylcholine ,serotonin, histamine, bradykinin, leptin, prostacyclin, leukotrienes, atrial natriuretic peptide, brain natri uretic peptide,melatonin

## **2.3.2 Reproductive System**

### **2.3.2.1 Physiology of reproduction**

- 2.3.2.1.1 Introduction to physiology of reproduction
- 2.3.2.1.2 Sex determination, sex differentiation and chromosomal study

### **2.3.2.2 Male Reproductive System**

- 2.3.2.2.1 Development and structure of testes
- 2.3.2.2.2 Functions of testes
- 2.3.2.2.3 Gonadotropins and gonadal hormones
- 2.3.2.2.4 Composition of semen and structure of human sperm

### **2.3.2.3 Female Reproductive System**

- 2.3.2.3.1 Functional anatomy of female reproductive system
- 2.3.2.3.2 Functional anatomy and functions of ovary
- 2.3.2.3.3 Gonadotropins and ovarian hormones
- 2.3.2.3.4 Physiology of menstrual cycle
- 2.3.2.3.5 physiology of ovulation and pregnancy
- 2.3.2.3.6 Physiology of placenta, gestation and parturition
- 2.3.2.3.7 Physiological basis of tests for ovulation and pregnancy
- 2.3.2.3.8 Physiology of lactation

### 2.3.3 **Nerve and Muscle Physiology**

#### 2.3.3.1 **Neuron**

- 2.3.3.1.1 Morphology of neuron and Classification of neuron and nerve Fibres
- 2.3.3.1.2 Properties of nerve fibres and measure of excitability
- 2.3.3.1.3 Degeneration and regeneration of nerve fibres

#### 2.3.3.2 **Muscle**

- 2.3.3.2.1 Classification of muscle
- 2.3.3.2.2 Skeletal muscle – structure , properties and functions
- 2.3.3.2.3 Excitation -contraction coupling
- 2.3.3.2.4 Neuromuscular junction
- 2.3.3.2.5 Smooth muscle – structure, types, properties, functions
- 2.3.3.2.6 Cardiac muscle – structure, properties, functions
- 2.3.3.2.7 Myasthenia gravis
- 2.3.3.2.8 Starling's law and its applications

### 2.3.4 **Central Nervous System**

2.3.4.1 Structural and functional organization of central nervous system

2.3.4.2 Neuroglia

#### 2.3.4.3 **Sensory physiology**

2.3.4.3.1 Classification and general properties of receptors

#### 2.3.4.4 **Synapse**

2.3.4.4.1 Types of synapse and their structure

2.3.4.4.2 Functions and properties of synapse

2.3.4.4.3 Classification and actions of neuro -transmitters

#### 2.3.4.5 **Reflexes**



- 2.3.4.5.1 Classification of Reflexes
- 2.3.4.5.2 General properties of reflexes (with examples)
- 2.3.4.5.3 Reciprocal inhibition and reciprocal innervation

#### **2.3.4.6 Spinal cord**

- 2.3.4.6.1 Functional anatomy of spinal cord
- 2.3.4.6.2 Ascending tracts – situation, origin, course, termination and functions
- 2.3.4.6.3 Physiology of pain, different pathways of pain sensation
- 2.3.4.6.4 Physiology of referred pain,
- 2.3.4.6.5 Gate control theory, analgesia system
- 2.3.4.6.6 Descending tracts – situation, origin, course, termination and functions
- 2.3.4.6.7 Extrapyramidal tracts – situation, origin, course, termination and functions
- 2.3.4.6.8 Upper and lower motor neurons and their lesions
- 2.3.4.6.9 Brown Sequard syndrome, Syringomyelias

#### **2.3.4.7 Functional anatomy and functions of brain stem**

#### **2.3.4.8 Thalamus**

- 2.3.4.8.1 Functional anatomy, connections and functions
- 2.3.4.8.2 Effects of lesions

#### **2.3.4.9 Internal capsule – situation, divisions, effect of lesions**

#### **2.3.4.10 Hypothalamus**

- 2.3.4.10.1 Functional anatomy, connections and functions
- 2.3.4.10.2 Effect of lesions

#### **2.3.4.11 Cerebellum**

2.3.4.11.1 Functional anatomy, connections and functions

2.3.4.11.2 Effects of lesions and tests for cerebellar function

#### **2.3.4.12 Basal ganglia**

2.3.4.12.1 Functional anatomy, connections and functions

2.3.4.12.2 Diseases of basal ganglia and its clinical evaluation

#### **2.3.4.13 Cerebral cortex**

2.3.4.13.1 Functional anatomy of cerebral cortex

2.3.4.13.2 Functional areas and its functions of frontal lobe, parietal lobe, temporal lobe, occipital lobe

2.3.4.13.3 Methods of study of cortical connections and functions

#### **2.3.4.14 Limbic System**

2.3.4.14.1 Functional anatomy, connections and functions

#### **2.3.4.15 Reticular formation**

2.3.4.15.1 Functional anatomy, connections and functions of reticular formation

2.3.4.15.2 EEG, physiology of sleep and wakefulness

#### **2.3.4.16 Vestibular apparatus**

2.3.4.16.1 Functional anatomy, connections and functions

2.3.4.16.2 Effects of lesions and their assessment

2.3.4.16.3 Physiology of maintenance and regulation of muscle tone, posture and equilibrium

2.3.4.16.4 Decerebrated rigidity and righting reflexes

#### **2.3.4.17 Higher functions**

2.3.4.17.1 Learning, speech, memory, behavior and emotions

### **2.3.4.18 Cerebro-spinal fluids**

- 2.3.4.18.1 Formation, circulation, functions of CSF
- 2.3.4.18.2 Properties and composition of CSF
- 2.3.4.18.3 Method of collection of CSF and its clinical significance
- 2.3.4.18.4 Blood – brain barrier

### **2.3.4.19 Autonomic Nervous System**

- 2.3.4.19.1 Sympathetic nervous system and its functions
- 2.3.4.19.2 Parasympathetic nervous system and its functions

## **2.3.5 Special Senses**

### **2.3.5.1 Smell**

- 2.3.5.1.1 Structure of olfactory receptors,
- 2.3.5.1.2 Physiology of olfaction and olfactory discrimination
- 2.3.5.1.3 Olfactory pathway and defects of olfaction

### **2.3.5.2 Taste** structure of taste receptor, primary taste sensation and taste pathway and applied aspects

### **2.3.5.3 Vision**

- 2.3.5.3.1 Functional anatomy of eye
- 2.3.5.3.2 Structure of visual receptors
- 2.3.5.3.3 Neural, chemical, electrical basis of visual process
- 2.3.5.3.4 Visual acuity ,field of vision, tests for visual acuity and field of vision
- 2.3.5.3.5 Visual pathways and effects of lesions in visual pathways
- 2.3.5.3.6 Pupillary reflexes
- 2.3.5.3.7 Color vision, color blindness and tests for color blindness
- 2.3.5.3.8 Errors of refraction and its correction,

- 2.3.5.3.9 Physiology of aqueous humor
- 2.3.5.3.10 Dark and light adaptation
- 2.3.5.3.11 Lacrimal glands ,Formation and circulation of tears

#### **2.3.5.4 Hearing**

- 2.3.5.4.1 Functional anatomy and functions of external,middle and internal ear
- 2.3.5.4.2 Impedance matching and tympanic reflex
- 2.3.5.4.3 Auditory pathways and auditory cortex
- 2.3.5.4.4 Mechanism of hearing
- 2.3.5.4.5 Frequency analysis, sound localization,
- 2.3.5.4.6 Defects of hearing
- 2.3.5.4.7 Audiometry, other tests for hearing defects

## 2.4 **Physiology Practical**

### 2.4.1 **Blood**

- 2.4.1.1 Preparation and examination of peripheral blood smear and determination of differential leucocyte count
- 2.4.1.2 Determination of total red blood cell count
- 2.4.1.3 Determination of total leucocyte count
- 2.4.1.4 Determination of platelet count
- 2.4.1.5 Determination of osmotic fragility of erythrocytes
- 2.4.1.6 Determination of erythrocyte sedimentation rate, packed cell volume
- 2.4.1.7 Determination of hemoglobin concentration of blood
- 2.4.1.8 Determination of ABO and Rh blood groups
- 2.4.1.9 Determination of bleeding time, clotting time

### 2.4.2 **Cardiovascular system**

- 2.4.2.1 Determination of the effect of posture on blood pressure
- 2.4.2.2 Clinical examination of the human cardiovascular system (CVS)

### 2.4.3 **Respiration**

- 2.4.3.1 Spirometry (demonstration)
- 2.4.3.2 Examination of human respiratory system

### 2.4.4 **Neurophysiology**

- 2.4.4.1 Examination of motor and sensory system
- 2.4.4.2 Examination of cranial nerves

### 2.4.5 **Special senses**

- 2.4.5.1 Determination of visual acuity
- 2.4.5.2 Clinical assessment of color vision (Demonstration)
- 2.4.5.3 Perimetry: Mapping of visual field

## 2.5 Textbooks

- 2.5.1 Textbook of Medical Physiology – AC Guyton and Hall
- 2.5.2 Review of Medical Physiology – WF Ganong’s
- 2.5.3 Concise Textbook of Medical Physiology – SK Chaudhury
- 2.5.4 Understanding Medical Physiology – RL Bijlani
- 2.5.5 Essentials of Medical Physiology – K Sembulingam

## 2.6 Reference Books

- 2.6.1 Best and Taylor’s Physiological basis of medical practice
- 2.6.2 Berne and Levy Physiology
- 2.6.3 Practical Physiology – C L Ghai
- 2.6.4 Practical Physiology – Dr. V. G.Ranade

## 2.7 Scheme Of Examination

S.No	Subject	Theo-ry	Intern-al Assmt	Viva-Voce	Total	Practi-cals	Inter-nal Assmt	Total Marks	Grand Total Marks
03.	Physiology - I	80	20	30	130	60	10	70	200
04.	Physiology – II	80	20	30	130	60	10	70	200

### **3. BIOCHEMISTRY**

#### **3.1 Goals and Objectives**

##### **3.1.1 Goals:**

The goals of introducing biochemistry to the undergraduate students is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the application of the knowledge in solving clinical problems.

##### **3.1.2 Objectives**

###### **3.1.2.1 Knowledge**

After completion of the course, the student shall be able to:

- 3.1.2.1.1 Elucidate the molecular and functional organization of a cell and list its sub cellular components;
- 3.1.2.1.2 Outline structure, function and inter-relationships of bio molecules and consequences of deviation from normal;
- 3.1.2.1.3 Review the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered;
- 3.1.2.1.4 Illustrate digestion and assimilation of nutrients and consequences of malnutrition;
- 3.1.2.1.5 Integrate the various aspects of metabolism and their regulatory pathways;
- 3.1.2.1.6 Explain biochemical basis of inherited disorders with their associated sequelae;
- 3.1.2.1.7 Describe mechanisms involved in maintenance of body fluid and pH homeostasis;

- 3.1.2.1.8 Delineate the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application in medicine;
- 3.1.2.1.9 Summarize the molecular concept of body defenses and their application in medicine;
- 3.1.2.1.10 Outline the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;
- 3.1.2.1.11 Familiarize with principles of various conventional and specialized laboratory investigations and instrumentation analysis and interpretation of a given data;
- 3.1.2.1.12 Suggest experiments to support theoretical concepts and clinical diagnosis;

### **3.1.2.2 Skills**

At the end of the course, the student will be able to:

- 3.1.2.2.1 Perform conventional techniques/instruments to perform biochemical analysis relevant to clinical screening and diagnosis;
- 3.1.2.2.2 Analyse and interpret investigative data;
- 3.1.2.2.3 Demonstrate the skills of solving scientific and clinical problems and decision making

### **3.1.2.3 Integration**

The integrated knowledge of biochemistry will help the students to integrate molecular events with the structure and function of the human body in health and disease.



### **3.2 Theory (Duration: 18 months: Hours: 200+100)**

3.2.1 Biomolecules & biochemical perspective of a cell

3.2.2 Cell structure

3.2.3 Subcellular organelles

3.2.4 Cell membrane

3.2.5 Transport mechanisms

3.2.6 Chemistry of Carbohydrates

3.2.6.1 Definition, classification and biological importance of carbohydrates

3.2.6.2 Monosaccharides; Classification, Isomerism and properties of monosaccharides, modified monosaccharides

3.2.6.3 Disaccharides

3.2.6.4 Polysaccharides

3.2.7 Chemistry of Lipids

3.2.7.1 Definition, classification and biological importance of Lipids

3.2.7.2 Simple lipids: Composition of Triacyl glycerol & Waxes.

3.2.7.3 Compound lipids: Composition & functions of Phospholipids, glycolipids & lipoproteins

3.2.7.4 Derived lipids: Fatty acids - Classification & Properties fatty acids, Steroids & sterols

3.2.7.5 Micelle, Liposomes

### 3.2.8 Chemistry of Proteins

- 3.2.8.1 Definition, classification & properties of amino acids
- 3.2.8.2 Definition, classification & properties of proteins
- 3.2.8.3 Structural organization of proteins
- 3.2.8.4 Biological significance of amino acids & proteins
- 3.2.8.5 Plasma proteins, their functions and clinical significance

### 3.2.9 Enzymes

- 3.2.9.1 Definition, classification,
- 3.2.9.2 Kinetics, mechanism of enzymatic catalysis.
- 3.2.9.3 Factors influencing enzymatic catalyses, enzyme activators and inhibitors.
- 3.2.9.4 Regulation of enzyme activity,
- 3.2.9.5 Iso-enzymes & clinical enzymology

### 3.2.10 Vitamins

- 3.2.10.1 Definition and classification of vitamins
- 3.2.10.2 Brief account of chemistry, source, RDA, biochemical functions, deficiency diseases, Vitamin antagonists and hypervitaminosis of each vitamin

### 3.2.11 Mineral metabolism

- 3.2.11.1 Classification of minerals
- 3.2.11.2 Brief account of chemistry, source, RDA, biochemical functions, deficiency diseases of each mineral

### 3.2.12 Digestion and absorption

- 3.2.12.1 Digestion and absorption of carbohydrates
- 3.2.12.2 Digestion and absorption of lipids

3.2.12.3 Digestion and absorption of proteins.

### 3.2.13 Carbohydrate Metabolism

3.2.13.1 Major metabolic pathways: Glycolysis, pyruvate oxidation, Citric acid cycle, Gluconeogenesis, HMP Shunt pathway & glycogen metabolism

3.2.13.2 Minor metabolic pathways: Metabolism of Fructose and Galactose,

3.2.13.3 Regulation of blood sugar, glucose tolerance test, Diabetes mellitus & other disorders of carbohydrate metabolism.

### 3.2.14 Biologic Oxidation

3.2.14.1 Redox potential

3.2.14.2 High energy compounds

3.2.14.3 Oxidative Phosphorylation

3.2.14.4 Electron transport chain

### 3.2.15 Lipid metabolism

3.2.15.1 Biosynthesis and degradation of fatty acids

3.2.15.2 Metabolism of cholesterol

3.2.15.3 Ketone bodies: their synthesis, utilization and conditions leading to ketoacidosis

3.2.15.4 Chemistry and metabolism of lipoproteins, hyper lipoproteinemias

3.2.15.5 Prostaglandins

3.2.15.6 Fatty liver, Obesity & other lipid storage disease.

### 3.2.16 Protein metabolism

3.2.16.1 Overview of protein metabolism

3.2.16.2 Nitrogen balance

3.2.16.3 Formation and disposal of ammonia

3.2.16.4 General metabolism of amino acids

3.2.16.5 Inborn errors of amino acid metabolism

3.2.17 Molecular biology

3.2.17.1 Chemistry of Nucleic acids: Definition, classification, composition of nucleic acids; Structure and function of DNA ; Types, structure & functions of RNA

3.2.17.2 Metabolism of Nucleic acids : Synthesis and breakdown of purines; Synthesis and breakdown of pyrimidine

3.2.17.3 DNA Replication, Inhibitors of DNA replication

3.2.17.4 DNA Transcription & Post-transcriptional processing.

3.2.17.5 Genetic code

3.2.17.6 Protein synthesis, inhibitors of protein synthesis & Post-translational processing

3.2.18 Integration of metabolism

3.2.18.1 Metabolic effects of insulin & glucagon

3.2.18.2 The feed/fast cycle

3.2.18.3 Biochemistry of starvation

3.2.19 Biochemistry of blood

3.2.19.1 Porphyrins, Synthesis and degradation of heme; Porphyria; Jaundice

3.2.19.2 Structure & functions of hemoglobin

3.2.19.3 Abnormal hemoglobins & hemoglobinopathies

3.2.19.4 Plasma Proteins

3.2.19.5 Immunoglobulins

3.2.19.6 Blood pH & its regulation

3.2.19.7 Role of kidney and lungs in maintaining pH of blood

3.2.19.8 Acidosis and Alkalosis

3.2.20 Energy metabolism and Nutrition

3.2.20.1 Calorific value of foods

3.2.20.2 Basal metabolic rate and its importance

3.2.20.3 Specific dynamic action

3.2.20.4 Energy requirements for physical activity

3.2.20.5 Balanced diet; Role of carbohydrates, proteins & lipids

3.2.20.6 Nutritive value of proteins, protein-energy malnutrition (PEM)

3.2.21 Clinical biochemistry

3.2.21.1 Tools of biochemistry

3.2.21.2 Liver function tests

3.2.21.3 Renal function tests

3.2.22 Environmental biochemistry

3.2.22.1 Environmental pollutants

3.2.22.2 Xenobiotics, interaction with biomolecules, effects & metabolism

3.2.22.3 Biochemical characteristics of cancer and carcinogenesis

### 3.3 **Practicals**

3.3.1 **Qualitative Experiments**

3.3.1.1 General reactions Carbohydrates

3.3.1.1.1 Reactions of monosaccharides - glucose and fructose

3.3.1.1.2 Reactions of disaccharides - lactose, maltose and sucrose

3.3.1.1.3 Reactions of polysaccharides - starch and dextrin

**3.3.1.2** General reactions of proteins (albumin, casein and gelatin)

3.3.1.2.1 Colour reactions of proteins

3.3.1.2.2 Precipitation & coagulation reactions of proteins

**3.3.1.3** General reactions of non-protein-nitrogen compounds (N P N) - Urea, Uric acid and creatinine

**3.3.1.4** Analysis of Urine.

3.3.1.4.1 Analysis of normal urine.

3.3.1.4.2 Analysis of abnormal urine.

### **3.3.2 Quantitative Experiments**

**3.3.2.1** Blood Sugar estimation by Glucose Oxidase method

### **3.3.3 Demonstrative Experiments**

**3.3.3.1** Colorimetry and colorimeter

3.3.3.1.1 Estimation of concentration of serum Cholesterol

3.3.3.1.2 Estimation of concentration of serum Urea

3.3.3.1.3 Estimation of concentration of serum Uric acid

3.3.3.1.4 Estimation of concentration of serum triglycerides

3.3.3.1.5 Estimation of concentration of serum calcium

**3.3.3.2** Paper chromatography

**3.3.3.3** Electrophoresis

**3.3.3.4** Glucose tolerance test (GTT)

### 3.4 **Text Books**

#### 3.4.1 **Recommended text books for Biochemistry**

- 3.4.1.1 Text book of Biochemistry - by U. Sathyanarayana, U Chakrapani
- 3.4.1.2 Text book of Biochemistry – by DM Vasudevan, Sreekumari S
- 3.4.1.3 Lippincott’s Illustrated Reviews- Biochemistry by Pamela C Champe,  
Richard A Harvey
- 3.4.1.4 Textbook of Medical Laboratory Technology by Praful B Godkar, Darshan  
P Godkar
- 3.4.1.5 Essentials of Biochemistry by PankajNaik

#### 3.4.2 **Reference Books for Biochemistry**

- 3.4.2.1 Harper’s Illustrated Biochemistry, Robert K. Murray, Daryl K. Granner,  
and Victor W. Rodwell.
- 3.4.2.2 Biochemistry. Lubert Stryer. W.H. Freeman and Company, New York.
- 3.4.2.3 Principles of Biochemistry. Ed. Lehinger, Nelson and Cox. CBS  
Publishers and distributors.
- 3.4.2.4 Textbook of Biochemistry with Clinical Correlations. Ed. Thomas M.  
Devlin, Wiley-Liss Publishers.
- 3.4.2.5 Tietz Textbook of Clinical Chemistry. Ed. Burtis and Ashwood. W.B.  
Saunders Company.
- 3.4.2.6 Biochemistry. Ed. Donald Voet and Judith G. Voet. John Wiley & Sons,  
Inc
- 3.4.2.7 Text book of Biochemistry - by West and Todd.
- 3.4.2.8 Laboratory Manual of Biochemistry by Pattabhirama and Acharya.

### 3.5 Scheme Of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Biochemistry	80	20	30	130	60	10	70	200



## **4. PHILOSOPHY OF NATUROPATHY**

### **4.1 Goals and Objectives**

#### **4.1.1 Goals:**

The goals of introducing philosophy of Naturopathy to the undergraduate students is to make them understand philosophical basis of the system of Naturopathy, including concepts of health, causes and pathogenesis of disease and brief introduction to the various therapeutic modalities used in Naturopathy.

#### **4.1.2 Objectives**

##### **4.1.2.1 Knowledge**

After completion of the course, the student shall be able to:

- 4.1.2.1.1 Elucidate the history of Naturopathy including major contributors to the field and their work;
- 4.1.2.1.2 Understand the evolution and composition of the human body according to different schools of medicine such as Naturopathy, *Yoga, Ayurveda*, Homeopathy, Modern Medicine, etc.
- 4.1.2.1.3 Firmly establish his/her diagnostic and therapeutic thought processes in the fundamental principles of Naturopathy:
- 4.1.2.1.4 Laws of nature according to Henry Lindlahr
- 4.1.2.1.5 Concepts of health and disease according to Naturopathy
- 4.1.2.1.6 Ten basic principles of Naturopathy
- 4.1.2.1.7 Concept of *Panchamahabhuthas* and Naturopathy
- 4.1.2.1.8 Foreign matter, toxin accumulation, theory of Toxemia, Unity of disease and Unity of Cure
- 4.1.2.1.9 Concept of vitality

- 4.1.2.1.10 *Panchatantras, Shareera Dharmas*
- 4.1.2.1.11 Holistic approach of Naturopathy
- 4.1.2.1.12 Modern perspectives of Naturopathy
- 4.1.2.1.13 Natural rejuvenation
- 4.1.2.1.14 Understand naturopathic viewpoints of concepts like hygiene, vaccination, family planning, personal life and prevention of diseases, geriatrics, etc, and implement them in his/her practice
- 4.1.2.1.15 Understand Principles behind using the diagnostic procedures of Naturopathy, like spinal diagnosis, facial diagnosis, iris diagnosis, and chromo diagnosis.
- 4.1.2.1.16 Demonstrate knowledge of recent advances and research in Naturopathy principles/theories.

#### **4.1.2.2 Skills**

At the end of the course, the student will be able to:

- 4.1.2.2.1 Demonstrate basic knowledge of the various therapeutic modalities utilised in Naturopathy;
- 4.1.2.2.2 Describe the various principles of Naturopathy with respect to the body, health, disease and therapy.

#### **4.1.2.3 Integration**

The integrated knowledge of philosophy of Naturopathy will help the students to integrate concepts of human body in health and disease with respect to Naturopathy in terms of diagnosis and management.

## 4.2 **Theory (Duration: 18 months)**

**Total hours: 500 (Theory: 300 Practical: 200)**

- 4.2.1 The Medical Profession & Medical Evolution- an Introduction
- 4.2.2 Concept of Health & Disease through the ages
- 4.2.3 The Human Body
  - 4.2.3.1 The evolution of human body
  - 4.2.3.2 Philosophy of the body, mind, soul, life, spirit and spiritual body with reference to various cultures, philosophies, Vedas and Modern view
  - 4.2.3.3 Composition of the human body, according to *Ayurveda*, Naturopathy, *Yoga*, Modern Medicine, Homeopathy
- 4.2.4 An Introduction to Nature Cure or Naturopathy- Definitions, concepts & theories of various pioneers in the field
- 4.2.5 History of Naturopathy & Philosophy of Naturopaths
  - 4.2.5.1 Chronological highlights of Naturopathy
  - 4.2.5.2 Philosophy of Indian Naturopaths.
    - 4.2.5.2.1 Vegiraju Krishnamaraju
    - 4.2.5.2.2 Vinoba Bhave
    - 4.2.5.2.3 Mahatma Gandhi.
    - 4.2.5.2.4 Dr. S. J. Singh
    - 4.2.5.2.5 Dr. J. M. Jussawala
  - 4.2.5.3 Philosophy of Foreign Naturopaths.
    - 4.2.5.3.1 Aesculapius
    - 4.2.5.3.2 Hippocrates
    - 4.2.5.3.3 The School of Salerno
    - 4.2.5.3.4 Paracelsus.

- 4.2.5.3.5 Vincent Priessnitz
- 4.2.5.3.6 Sebastian Kneipp
- 4.2.5.3.7 Arnold Rickli
- 4.2.5.3.8 Louis Kuhne
- 4.2.5.3.9 Adolf Just
- 4.2.5.3.10 John H Tilden
- 4.2.5.3.11 Sigmund Freud
- 4.2.5.3.12 Henry Lindlahr

#### **4.2.6 Fundamental principles, concepts & theories of Naturopathy.**

- 4.2.6.1** Laws of Nature according to Henry Lindlahr
- 4.2.6.2** Catechism of Nature Cure according to Henry Lindlahr
- 4.2.6.3** Concepts of Health according to Naturopathy
- 4.2.6.4** Concepts of Disease according to Naturopathy
- 4.2.6.5** The 10 basic principles of Naturopathy
- 4.2.6.6** Principles of Natural Medicine in the West
  - 4.2.6.6.1 The Healing Power of Nature (*Vis Medicatrix Naturae*)
  - 4.2.6.6.2 Identify and Treat the Causes (*Tolle Causam*)
  - 4.2.6.6.3 First Do No Harm (*Primum Non Nocere*)
  - 4.2.6.6.4 Doctor as Teacher (*Docere*)
  - 4.2.6.6.5 Treat the Whole Person
  - 4.2.6.6.6 Prevention
  - 4.2.6.6.7 Herring's law of cure
- 4.2.6.7** Concept of *Panchamahabhootas* & Naturopathy
- 4.2.6.8** Foreign matter and toxins accumulation in the body and its importance in elimination through different ways or channels.

- 4.2.6.9 Unity of disease, Unity of cure and way of treatment.
- 4.2.6.10 Theory of Toxemia- Toxins and anti-toxins, their generation, mitigation in nature cure way
- 4.2.6.11 Concept of Vitality & Vital economy
- 4.2.6.12 How Nature Cures- The Natural healing mechanisms
- 4.2.6.13 *Arogya Rakshak Panchatantras* and their importance in maintenance of good health prevention of diseases and treatment of diseases through lifestyle modification.
- 4.2.6.14 *Shareera Dharmas – Ahara, Nidra Bhaya, Maithuna*
- 4.2.6.15 Natural Immunity & how to acquire natural immunity in diseases.
- 4.2.6.16 Inflammation- Naturopathic perspective.
- 4.2.6.17 Naturopathy: a blend of Drugless Therapies
- 4.2.6.18 Holistic approach of Naturopathy
- 4.2.6.19 *Ayurveda*
  - 4.2.6.19.1 Introduction
  - 4.2.6.19.2 Definition of *Prakriti* and its categories.
  - 4.2.6.19.3 *Swastha Vrittam*
    - 4.2.6.19.3.1 *Dinacharya*
    - 4.2.6.19.3.2 *Ratricharya*
    - 4.2.6.19.3.3 *Ritucharya*
    - 4.2.6.19.3.4 *Vegadharanam*
- 4.2.6.20 Homeopathy
- 4.2.11.4 *Unani*
- 4.2.11.5 *Siddha*
- 4.2.7 Comparative study of Naturopathy with other systems of Medicine

- 4.2.8 Basic essentials of a Naturopathy practitioner - an introduction to qualities of a Naturopathy & *Yoga* Practitioner, Approach to the Patient with a Naturopathy view, Ethical considerations, Understanding the Scope & Limitations
- 4.2.9 Recent Advances in Naturopathy & *Yoga*
  - 4.2.9.1 Introduction to Psychosomatic Diseases & Psychoneuroimmunology
  - 4.2.9.2 Introduction to Mind-Body Medicine
  - 4.2.9.3 Lifestyle & psychosocial behavior

#### 4.2.9.4 Introduction to Integrative Medicine

#### 4.2.10 An introduction to Research & its importance in Naturopathy

### 4.3 **Practical**

Students should be introduced to various treatment procedures used in Naturopathy. Brief outlines of the following therapies in naturopathy including understanding the basic classification & procedure through observation and demonstration:

#### 4.3.1 Fasting

#### 4.3.2 Exercises

#### 4.3.3 Rest and relaxation

#### 4.3.4 Regular habits like sun bath, barefoot walking on grass

#### 4.3.5 Hydrotherapy

##### 4.3.5.1 Baths

##### 4.3.5.1.1 Hip-bath

##### 4.3.5.1.2 Spinal bath

##### 4.3.5.1.3 Steam bath

##### 4.3.5.1.4 Foot bath

##### 4.3.5.1.5 Full Immersion bath

##### 4.3.5.2 Packs

##### 4.3.5.2.1 Chest pack

##### 4.3.5.2.2 Abdominal pack

##### 4.3.5.2.3 Gastro-Hepatic pack

##### 4.3.5.2.4 Kidney Pack

##### 4.3.5.2.5 Full wet-sheet pack

#### 4.3.6 Internal Application of Water

##### 4.3.6.1 Enema

- 4.3.6.2 Colon Hydrotherapy
- 4.3.6.3 Water Drinking
- 4.3.7 Mud Therapy
- 4.3.8 Balneotherapy
- 4.3.9 Heliotherapy & Chromo therapy
- 4.3.10 Massage Therapy
- 4.3.11 Magneto therapy
- 4.3.12 Chiropractic
- 4.3.13 Osteopathy
- 4.3.14 Physiotherapy
- 4.3.15 Nutrition & Dietetics with special emphasis on Natural Diet
- 4.3.16 Acupuncture, Acupressure & Reflexology
- 4.3.17 Aromatherapy
- 4.3.18 Bio feed back



A Practical Record book should be maintained to document the above observations.

#### 4.4 Text Books

4.4.1	Philosophy of Nature Cure	Henry Lindlahr
4.4.2	Practice of Nature Cure	Henry Lindlahr
4.4.3	Human Culture and Cure	Dr. E.D. Babbitt
4.4.4	Practical Nature Cure	K. Laxman Sharma
4.4.5	History and Philosophy of Nature Cure	S.J. Singh
4.4.6	My Nature Cure	M.K. Gandhi
4.4.7	Natural Health Care – A to Z	Belinda Gran
4.4.8	Introduction to Natural Hygiene	Herbert.M.Shelton
4.4.9	Text book of Natural Medicine	Joseph E. Pizzorno & Michael T. Murray
4.4.10	Nature Cure treatments	Jindal
4.4.11	Complete handbook of Nature cure	H. K. Bakhru
4.4.12	Toxemia	J. H. Tilden
4.4.13	Return to Nature	Adolf Just

#### 4.5 Reference Books

4.5.1	My Nature Cure or Practical Naturopathy	S.J. Singh
4.5.2	The Science of Facial Expression	Louis Kuhne
4.5.3	The Story of My Experiments With Truth	M.K Gandhi
4.5.4	<i>Ayurveda</i> for health and long life	Dr.R.K.Garde
4.5.5	Fundamentals of <i>Ayurveda</i>	K. N. Udupa
4.5.6	Siddha Medicine	Ram Murthy
4.5.7	Homeopathic Philosophy	Kent

4.5.8	Everybody's Guide to Nature Cure	Harry Benjamin
4.5.9	Prayer	M.K.Gandhi
4.5.10	Diet and Diet Reforms	M.K.Gandhi
4.5.11	Panchatantra	Venkat Rao
4.5.12	Nature Cure	J.N. Jussawalla
4.5.13	The Encyclopedia of Natural Medicine	Joseph E. Pizzorno & Michael T. Murray

#### 4.6 **Scheme Of Examination**

S.N o	Subject	Theo -ry	Intern -al Assm t	Viva- Voce	Total	Practi -cals	Inter- nal Assm t	Total Mark s	Gran d Total Mark s
01.	Philosophy of Naturopathy	80	20	30	130	60	10	70	200

## 5. **PRINCIPLES OF YOGA**

### 5.1 Goals and Objectives

#### 5.1.1 **Goal:**

The goal of teaching *Yoga* to undergraduate students is to familiarize them with basic principles of *Yoga* with respect to history, definitions, philosophy and practices of *Yoga*, with emphasis of *AshtangaYoga*.

#### 5.1.2 **Objectives:**

##### 5.1.2.1 **Knowledge:**

After the completion of the course, the student shall be able to:

- 5.1.2.1.1 Explain the various definitions of *Yoga*, history of *Yoga* and branches of *Yoga* ;
- 5.1.2.1.2 Describe kinds of *Yogasanas*, its importance, methods, rules, regulations and limitations;
- 5.1.2.1.3 Illustrate the various limbs of *Ashtanga Yoga*;
- 5.1.2.1.4 Demonstrate knowledge of *pranayamas*, *prana* and lifestyle, breathing and lifespan.

##### 5.1.2.2 **Skills:**

After the completion of the course, the student shall be able to:

- 5.1.2.2.1 Demonstrate various types of *Yogasanas* in their correct method of performance;
- 5.1.2.2.2 Demonstrate different *pranayamas*.
- 5.1.2.2.3 Explain about the definitions, origin, branches of *Yoga*.

##### 5.1.2.3 **Integration**

At the completion of training, the student should be able to comprehend the basic principles of *Yoga*.

## 5.2 **Theory (Duration: 12 months)**

**Total hours: 450 (Theory: 250 Practical: 200)**

- 5.2.1 What is *Yoga* and various definitions of *Yoga*.
- 5.2.2 History of *Yoga* (Relative chronology, *Yoga* before the time of *Patanjali*, Indus Valley Civilization).
- 5.2.3 Outlines on branches of *Yoga* – *Raja*, *Hatha*, *Jnana*, *Karma*, *Bhakti*, *Mantra*, *Kundalini* and *Laya*.
- 5.2.4 Introduction to *Yogasanas*
  - 5.2.4.1 Definition of *Yogasanas*
  - 5.2.4.2 *Yogasanas* and *Prana*
  - 5.2.4.3 *Yogasanas* and *Kundalini*
  - 5.2.4.4 *Yogasanas* and the mind-body connection
  - 5.2.4.5 *Yogasanas* and Exercises
- 5.2.5 Classifications of *Yogasanas* – Beginners group, Intermediate group, Advanced group, dynamic and static *Yogasanas*.
- 5.2.6 Introduction to *Pranayama*
  - 5.2.6.1 Definition
  - 5.2.6.2 *Prana* and lifestyle
  - 5.2.6.3 Breath, health and *Pranayama*
  - 5.2.6.4 Breathing and Lifespan
  - 5.2.6.5 *Pranayama* and spiritual aspiration
- 5.2.7 Introduction to *AshtangaYoga*
  - 5.2.7.1 *Yama*
  - 5.2.7.2 *Niyama*
  - 5.2.7.3 *Asana*

5.2.7.4 *Pranayama*

5.2.7.5 *Pratyahara*

5.2.7.6 *Dharana*

5.2.7.7 *Dhyana*

5.2.7.8 *Samadhi*

5.2.8 Relaxation postures

5.2.8.1 *Shavasana*

5.2.8.2 *Makarasana*

5.2.8.3 *Sitali Dandasana*

5.2.8.4 *Sitali Tadasana*

5.2.9 *Suryanamaskara*

### 5.3 **Practical**

5.3.1 Joint movements

5.3.2 Loosening exercises

5.3.3 *Sukshma Vyayama*

5.3.4 Stretchings

5.3.5 Breathing exercises

5.3.6 *Suryanamaskara*

5.3.7 *Asanas*

#### 5.3.7.1 Standing

5.3.7.1.1 *Tadasana*

5.3.7.1.2 *Ardha Kati Chakrasana*

5.3.7.1.3 *Kati Chakrasana*

5.3.7.1.4 *Trikonasana*

5.3.7.1.5 *Vrikshasana*

5.3.7.1.6 *Utthita Trikonasana*

5.3.7.1.7 *Veerabhadrasana*

5.3.7.1.8 *Parsvottanasana*

5.3.7.1.9 *Parighasana*

#### 5.3.7.2 Supine

5.3.7.2.1 *Shavasana*

5.3.7.2.2 *Matsyasana*

5.3.7.2.3 *Sarvangasana*

5.3.7.2.4 *Halasana*

5.3.7.2.5 *Chakrasana*

5.3.7.2.6 *Pawanamuktasana*

- 5.3.7.2.7 *Setubandhasana*
- 5.3.7.2.8 *Parvottanasana*
- 5.3.7.2.9 *Vipareetakarani*
- 5.3.7.2.10 *Karnapedasana*
- 5.3.7.2.11 *Suptakonasana*

### **5.3.7.3 Prone**

- 5.3.7.3.1 *Makarasana*
- 5.3.7.3.2 *Bhujangasana – 1 and 2*
- 5.3.7.3.3 *Ardha Shalabhasana*
- 5.3.7.3.4 *Shalabhasana – 1*
- 5.3.7.3.5 *Dhanurasana*
- 5.3.7.3.6 *Adho mukha svanasana*

### **5.3.7.4 Sitting**

- 5.3.7.4.1 *Vakrasana*
- 5.3.7.4.2 *Ardhamatsyendrasana*
- 5.3.7.4.3 *Paschimottanasana*
- 5.3.7.4.4 *Ushtrasana*
- 5.3.7.4.5 *Vajrasana*
- 5.3.7.4.6 *Padmasana*
- 5.3.7.4.7 *Baddha Padmasana*
- 5.3.7.4.8 *Supta Vajrasana*
- 5.3.7.4.9 *Ardha Navasana*
- 5.3.7.4.10 *Gomukhasana*
- 5.3.7.4.11 *Veerasana*
- 5.3.7.4.12 *Baddha Konasana*

5.3.7.4.13 *Janusirshasana*

5.3.7.4.14 *Upavista Konasana*

5.3.7.4.15 *Shashankasana*

### 5.3.8 *Pranayama*

5.3.8.1 *Bhastrika*

5.3.8.2 *Sheetkari*

5.3.8.3 *Sheetali*

5.3.8.4 *Anuloma Viloma*

5.3.8.5 *Ujjayi*

5.3.8.6 *Bhramari*

### 5.3.9 *Kriya*

5.3.9.1 *Jala neti*

5.3.9.2 *Sutra neti*

5.3.9.3 *Vamana dhauti*



#### 5.4 **Textbooks**

5.4.1 Basis and definitions of *Yoga* – Vivekananda Kendra

5.4.2 *Asanas* – Swami Kuvalyananda

5.4.3 The gospel of Buddha – Parul Caruso

5.4.4 The Gospel of Shri Ramakrishna – Mahendranatha Gupta

5.4.5 Complete works of Shri Aurobindo

5.4.6 *Asanas, Pranayama, Bandhas, Mudras* – Swami Satyananda Saraswati

5.4.7 *Hatha YogaPradipika* – Swami Svatmarama

5.4.8 *Raja, Hatha, Jnana, BhaktiYoga* – Swami Vivekananda

#### 5.5 **Scheme Of Examination**

S.N	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01.	Principles of <i>Yoga</i>	80	20	30	130	60	10	70	200



## **2. PATHOLOGY**

### **2.1 Goals and Objectives**

#### **2.1.1 Goal:**

The goal of teaching pathology to undergraduate students is to provide a comprehensive knowledge of the mechanisms and causes of disease, so that he/she is able to comprehend fully the natural history and clinical manifestations of disease.

#### **2.1.2 Objectives:**

##### **2.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 2.1.2.1.1 Explain the structure and ultra-structure of a sick cell, mechanism of cell degeneration, cell death and repair and be able to correlate structural and functional alterations.
- 2.1.2.1.2 Describe the pathophysiological processes which govern the maintenance of homeostasis, mechanisms of their disturbance and the morphological and clinical manifestations associated with it;
- 2.1.2.1.3 Delineate the mechanisms and patterns of tissue response to injury such that he/she can appreciate the pathophysiology of disease processes and their clinical manifestations;
- 2.1.2.1.4 Correlate normal and altered morphology (gross and microscopic) of different organ systems in common diseases to the extent needed for understanding of disease processes and their clinical significance.

### **2.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 2.1.2.2.1 Elaborate on principles, procedures and interpretation of results of diagnostic laboratory tests;
- 2.1.2.2.2 Perform with proper procedure simple bed side tests on biological fluid samples like blood, urine etc.
- 2.1.2.2.3 Prepare investigation flow-charts for diagnosing and managing common diseases;
- 2.1.2.2.4 Identify biochemical and physiological disturbances in diseases;

### **2.1.2.3 Integration**

At the completion of training, the student must be capable of integrating relationships between etiological factors such as social, economic and environmental in the natural history of common diseases in India.

## **2.2 Pathology – I (Duration: 12 months)**

**Total hours: 350 (Theory: 250 Practical: 100)**

2.2.1 History and Scope

2.2.2 Definition and various branches

2.2.3 Scientific study of disease and methodology

2.2.4 The cell and the reaction of cell, tissue and organ to injury

2.2.4.1 Structure and functions of cell

2.2.4.2 Causes and nature of cell injury

- 2.2.4.3 Toxic substances, physical agents and lack of nutrients
- 2.2.4.4 Infectious agents and parasites
- 2.2.4.5 Immune mechanisms and genetic defects
- 2.2.5 Reaction of cell to injurious agents**
  - 2.2.5.1 Lethal injury – necrosis and gangrene
  - 2.2.5.2 Sub lethal injury
    - 2.2.5.2.1 Cloudy swelling
    - 2.2.5.2.2 Fatty changes in liver, heart and kidney
    - 2.2.5.2.3 Glycogen infiltration and hyaline degeneration
    - 2.2.5.2.4 Lipid degeneration Gaucher's disease
    - 2.2.5.2.5 Muroid degeneration
  - 2.2.5.3 Excessive or abnormal accumulations – i) amyloid
  - 2.2.5.4 Pathological calcification
- 2.2.6 Inflammation and Repair**
  - 2.2.6.1 Definition, classification and nomenclature
  - 2.2.6.2 Acute inflammation
  - 2.2.6.3 Vascular and cellular phenomenon, cells of exudates chemical mediators and tissue changes in acute inflammation, cardinal signs of acute inflammation
  - 2.2.6.4 Fate, types and systemic effects of acute inflammation
- 2.2.7 Chronic Inflammation**
  - 2.2.7.1 Difference between acute and chronic inflammation
  - 2.2.7.2 Definition of Granuloma
- 2.2.8 Wound healing**

- 2.2.8.1 Restitution, regeneration and repair
- 2.2.8.2 Repair of epithelial and mesenchymal tissue
- 2.2.8.3 Primary union and secondary union
- 2.2.8.4 Mechanism involved and factors modifying repair process
- 2.2.9 Granulomas**
  - 2.2.9.1 Classification
  - 2.2.9.2 Tuberculosis, genesis and fate of tubercle, primary and secondary tuberculosis
  - 2.2.9.3 Definition, classification and pathology of leprosy
  - 2.2.9.4 Acquired primary, secondary and tertiary stages syphilis
  - 2.2.9.5 CNS syphilis, CVS syphilis and tertiary stages syphilis
  - 2.2.9.6 Actinomycosis, maduramycosis, rhinosporidiosis
- 2.2.10 Fluid and Hemodynamic Changes (circulatory disturbances)**
  - 2.2.10.1 Hyperemia, congestion and hemorrhage
  - 2.2.10.2 Thrombosis, embolism, DIC
  - 2.2.10.3 Ischemia, infarction and shock
- 2.2.11 Immunopathology**
  - 2.2.11.1 Basic pathological mechanism in autoimmune disorders
  - 2.2.11.2 Concept of immunodeficiency disorders
  - 2.2.11.3 Pathology of AIDS
  - 2.2.11.4 Growth disorders and definitions
- 2.2.12 Growth disorders**
  - 2.2.12.1 Definition of agenesis, aplasia, atrophy, hyperplasia, hypertrophy, hypoplasia, metaplasia

2.2.12.2 Concept of dysplasia, anaplasia and carcinoma in-situ

**2.2.13 Neoplasia**

2.2.13.1 Definition, classification and nomenclature

2.2.13.2 Characteristic features of benign and malignant tumors

2.2.13.3 Route of spread of malignant tumors

2.2.13.4 Grading and staging of cancers and pre-cancerous conditions

2.2.13.5 Carcinogenesis and carcinogens

2.2.13.6 Effect of tumor on host, and effect of host on tumors

2.2.13.7 Laboratory diagnosis of cancer – Biopsy, exfoliative cytology, prognostic prediction in cancer

2.2.13.8 Description of common tumors like – Fibroma, Lymphoma, Lipoma, Angioma, Leiomyoma, Fibrosarcoma, Lymphosarcoma, Liposarcoma, Angiosarcoma, and Leiomyosarcoma

2.2.13.9 Embryonal tumors like teratoma and retinoblastoma

**2.2.14 Mineral and Pigment Metabolism**

2.2.14.1 Pathology of melanin pigment

2.2.14.2 Pathology of hemoglobin and its derivatives

2.2.14.3 Hemosiderosis and hemochromatosis

**2.2.15 Genetic disorders**

2.2.15.1 Klinefelter's Syndrome, Turner's Syndrome, Down's Syndrome

## **2.3 Pathology – II (Duration: 12 months)**

### **2.3.1 Disorders of RBC**

- 2.3.1.1 Definition, morphologic and etio-pathologic classification of anemia
- 2.3.1.2 Iron deficiency anemia, B12 and folate deficiency anemia, sideroblastic anemia, post-hemorrhagic anemia
- 2.3.1.3 Concept and classification of hemolytic anemia
- 2.3.1.4 Acquired hemolytic anemia and aplastic anemia
- 2.3.1.5 Polycythemia
- 2.3.1.6 Laboratory investigations in anemia

### **2.3.2 Disorders of WBC**

- 2.3.2.1 Leukopenia, Leukocytosis
- 2.3.2.2 Leukemia, Agranulocytosis and Tropical eosinophilia

### **2.3.3 Coagulation and bleeding disorders**

- 2.3.3.1 Structure, function and pathology of platelets
- 2.3.3.2 Definition and classification of blood dyscrasias
- 2.3.3.3 Laboratory investigations in bleeding disorders

### **2.3.4 Diseases of cardiovascular system**

- 2.3.4.1 Arteriosclerosis and atherosclerosis
- 2.3.4.2 Aneurysm
- 2.3.4.3 Vasculitis and thromboangitis obliterans
- 2.3.4.4 Rheumatic heart disease, endocarditis, myocardial infarction
- 2.3.4.5 Congenital heart diseases, pericarditis
- 2.3.4.6 Congestive cardiac failure



### **2.3.5 Diseases of Respiratory system**

2.3.5.1 Lobar pneumonia, bronchopneumonia, pulmonary tuberculosis

2.3.5.2 Atelectasis, bronchiectasis and pneumoconiosis

2.3.5.3 Chronic Obstructive Pulmonary Diseases (COPD)

2.3.5.4 Bronchial asthma, chronic bronchitis

2.3.5.5 Acute respiratory distress syndrome (ARDS)

2.3.5.6 Tumors of lung and pleura

### **2.3.6 Diseases of gastrointestinal system**

2.3.6.1 Pleomorphic adenoma of salivary gland

2.3.6.2 Barrett's esophagus

2.3.6.3 Gastritis and peptic ulcer and tumors of stomach

2.3.6.4 Inflammatory bowel diseases – Crohn's disease, ulcerative colitis, typhoid  
ulcer, tumors of small intestine

2.3.6.5 Megacolon and tumors of colon

2.3.6.6 Malabsorption syndrome, tropical sprue and celiac tuberculosis

### **2.3.7 Diseases of liver, biliary tract and pancreas**

2.3.7.1 Liver function test and hepatic failure, viral hepatitis

2.3.7.2 Cirrhosis of liver, tumors of liver

2.3.7.3 Cholecystitis, gall stones

2.3.7.4 Acute pancreatitis, diabetes mellitus

2.3.7.5 Cystic fibrosis (mucoviscidosis)

2.3.7.6 Liver abscess and alcoholic liver disease

2.3.7.7 Indian childhood cirrhosis

### **2.3.8 Diseases of Kidney**

2.3.8.1 Renal function tests, renal failure, polycystic kidney

2.3.8.2 Acute glomerulonephritis, crescentic glomerulonephritis, membranous glomerulonephritis, nephritic syndrome

2.3.8.3 Chronic glomerulonephritis, acute tubular necrosis

2.3.8.4 Pyelonephritis, kidney in hypertension

2.3.8.5 Urolithiasis, tumors of kidney and pelvis

### **2.3.9 Diseases of Male Genital System**

2.3.9.1 Orchitis and testicular tumors

2.3.9.2 Nodular hyperplasia of prostate, carcinoma of prostate

2.3.9.3 Carcinoma of penis and lesions of penis

### **2.3.10 Diseases of Female Genital System**

2.3.10.1 Endometrial hyperplasia, adenomyosis and endometriosis

2.3.10.2 Carcinoma of cervix, tumors of ovary

2.3.10.3 Pelvic inflammatory diseases

2.3.10.4 Carcinoma and other diseases of vulva

### **2.3.11 Diseases of Breast**

2.3.11.1 Fibrocystic disease and tumors of breast

2.3.11.2 Gynecomastia

### **2.3.12 Endocrine pathology**

2.3.12.1 Pituitary, acromegaly, hypothyroidism and Grave's disease

2.3.12.2 Thyroiditis, tumors of thyroid and thyroid function tests

2.3.12.3 Hypoparathyroidism and hyperparathyroidism

- 2.3.12.4 Hyperplasia and adenoma of parathyroid
- 2.3.12.5 Adrenal gland, Addison's disease, Cushing's syndrome
- 2.3.12.6 Pheochromocytoma, neuroblastoma
- 2.3.13 Musculoskeletal pathology**
  - 2.3.13.1 Osteomyelitis and osteoporosis
  - 2.3.13.2 Rickets and osteomalacia
  - 2.3.13.3 Osteitis fibrosa cystic and Paget's disease, fibrous dysplasia
  - 2.3.13.4 Tumors of bone
  - 2.3.13.5 Rheumatoid arthritis, Gout
  - 2.3.13.6 Myasthenia gravis and progressive muscular dystrophy
- 2.3.14 Diseases of Nervous System**
  - 2.3.14.1 Meningitis, tumors of CNS
  - 2.3.14.2 Tumors of peripheral nerves
  - 2.3.14.3 Encephalitis
- 2.3.15 Diseases of Lymph nodes and Spleen**
  - 2.3.15.1 Lymphadenopathy
  - 2.3.15.2 Malignant lymphomas and splenomegaly
- 2.3.16 Pathology of skin**
  - 2.3.16.1 Squamous cell carcinoma, basal cell carcinoma
  - 2.3.16.2 Malignant melanoma
  - 2.3.16.3 Warts, molluscum contagiosum
  - 2.3.16.4 Superficial and deep fungal diseases

## 2.4 **Practical**

### 2.4.1 Hematology

- 2.4.1.1 Blood groups (A B O system)
- 2.4.1.2 Estimation of hemoglobin
- 2.4.1.3 Enumeration of RBCs (RBC count)
- 2.4.1.4 Total leucocyte count (Total count)
- 2.4.1.5 Differential leucocyte count (DC)
- 2.4.1.6 Peripheral smear staining and reporting
- 2.4.1.7 Absolute eosinophil count
- 2.4.1.8 Demonstration of
  - 2.4.1.8.1 Hemograms in anemia
    - 2.4.1.8.1.1 Iron deficiency anemia
    - 2.4.1.8.1.2 Macrocytic anemia
    - 2.4.1.8.1.3 Microcytic anemia
    - 2.4.1.8.1.4 Hemolytic anemia
  - 2.4.1.8.2 Hemograms in leukemias
    - 2.4.1.8.2.1 Acute types
    - 2.4.1.8.2.2 Chronic types
- 2.4.1.9 Slide study of
  - 2.4.1.9.1 Acute myeloid leukemia
  - 2.4.1.9.2 Chronic myeloid leukemia
  - 2.4.1.9.3 Chronic lymphatic leukemia

## 2.4.2 Clinical pathology

2.4.2.1 Urine analysis

2.4.2.2 Semen analysis

2.4.2.3 Pregnancy tests

2.4.2.4 Liver function tests

2.4.2.5 Fractional test meal

2.4.2.6 Glucose tolerance test

2.4.2.7 CSF analysis

## 2.5 **Textbooks**

2.5.1 Pathological basis of disease – Robbins, Cotran and Kumar

2.5.2 Textbook of Pathology – NC. Dey

## 2.6 **Reference Books**

2.6.1 Textbook of Pathology – Anderson

2.6.2 Systemic Pathology – Symmers

2.6.3 Medical Laboratory Technology – Ramnik Sood

## 2.7 **Scheme Of Examination**

S.No	Subject	Theo-ry	Intern-al Assmt	Viva-Voce	Total	Practi-cals	Inter-nal Assmt	Total Marks	Grand Total Marks
01.	Pathology	80	20	30	130	60	10	70	200

### **3. MICROBIOLOGY**

#### **2.1 Goals and Objectives**

##### **2.1.1 Goal:**

The goal of teaching microbiology to undergraduate students is to provide a comprehensive knowledge of the natural history, mechanisms and causes of infectious disease, including etiology, pathogenesis, laboratory diagnosis, treatment and control of diseases in the community.

##### **2.1.2 Objectives:**

###### **2.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 2.1.2.1.1 Remember and recall all the infectious micro-organisms of the human body and host-parasite relationship
- 2.1.2.1.2 Describe parasitic micro-organisms (viruses, fungi, bacteria, parasites) with the pathogenesis of the diseases they cause;
- 2.1.2.1.3 Enumerate and illustrate sources and modes of transmission, including insect vectors, of pathogenic and opportunistic organisms;
- 2.1.2.1.4 Describe the pathways and mechanisms of immunity to infection
- 2.1.2.1.5 Acquire knowledge about different vaccines that are available for the prevention of communicable diseases;

2.1.2.1.6 Effectively use sterilization and disinfection to control and prevent nosocomial and community acquired infections;

2.1.2.1.7 Order laboratory investigations for bacteriological examination of food, water and air.

#### **2.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

2.1.2.2.1 Prescribe and interpret laboratory investigations for diagnosis of communicable diseases and identify infectious agents by clinical manifestations;

2.1.2.2.2 Perform common bed-side tests to detect and identify pathogenic agents, such as blood film for malaria, filaria, gram stain and Acid Fast Bacilli (AFB) staining and stool sample for ova cyst, etc.

#### **2.1.2.3 Integration**

3.1 At the completion of training, the student must be knowledgeable about clinical, therapeutic and preventive aspects of diseases most prevalent in India.

#### **3.2 Theory (Duration: 12 months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

3.2.1 Infection and a brief description of Nosocomial infection

3.2.2 Immunology

- 3.2.2.1 Reticuloendothelial system, components and functions of the innate and adaptive immunity
- 3.2.2.2 Role of T and B lymphocytes
- 3.2.2.3 Induction of immune response
- 3.2.2.4 Cell-mediated immune response
- 3.2.2.5 Immunoglobulin structure and functions
- 3.2.2.6 Humoral immune response
- 3.2.2.7 Fate of antigen antibody complex
- 3.2.2.8 Complement system
- 3.2.2.9 Generation of antibody diversity
- 3.2.2.10 Hypersensitivities
- 3.2.2.11 Immunoregulation, autoimmunity, tolerance
- 3.2.2.12 HLA, disease association and transplantation
- 3.2.2.13 Serological and Immunological techniques, application in medicine (vaccines, immunotherapy, immunoassays and immune diagnosis)
- 3.2.2.14 Antibacterial Susceptibility testing
- 3.2.3 Cell as structural unit of life
- 3.2.4 Classification of living organisms
- 3.2.5 Classification of microorganisms
- 3.2.6 Distinctive characteristics of major groups of microorganisms
  - 3.2.6.1 Protozoa
  - 3.2.6.2 Algae
  - 3.2.6.3 Fungi



- 3.2.6.4 Bacteria
- 3.2.6.5 Viruses
- 3.2.7 General bacteriology
  - 3.2.7.1 Bergey's manual of systemic bacteriology
    - 3.2.7.1.1 Gram positive eubacteria: Cocci, endospore forming bacteria, regular shaped rods, irregular shaped rods, mycobacteria, actinomycetes, mycoplasmas
    - 3.2.7.1.2 Gram negative eubacteria: Spirochetes, microaerophilia curved bacteria, aerobic rods and Cocci, facultative rods, anaerobes, rickettsias and Chlamydiae
  - 3.2.7.2 Morphology, structure and staining
  - 3.2.7.3 Growth and nutrition of bacteria
  - 3.2.7.4 Sterilization and disinfections
  - 3.2.7.5 Culture media and methods
  - 3.2.7.6 Identification of bacteria
    - 3.2.7.6.1 Phenotypic characteristics – morphology, resistance, metabolism, biochemical test, antigenic structure, typing of bacterial strain, pathogenicity of tests, serological tests, molecular diagnostics
    - 3.2.7.6.2 Bacterial genetics – plasmids, genetic variation
    - 3.2.7.6.3 Mechanism of bacterial pathogenesis
    - 3.2.7.6.4 Bacteriophage
    - 3.2.7.6.5 Systemic bacteriology - Streptococcus, Staphylococcus, Pneumococcus, Gonococci, Meningococcus, Coryne

bacterium, Clostridium, Hemophilus, Mycobacterium, Spirochetes,  
Bordetella, Chlamydia

3.2.7.6.6 Virology- General properties of viruses and their diagnosis.

Study of Herpes, Adenovirus, Picornavirus, Hepatitis virus, Pox virus,  
Rabies, HIV, Poliovirus

3.2.7.6.7 Parasites- Protozoa- Entamoeba and Plasmodium

Helminthology---Ancylostoma, Ascaris, Taenia, Wuchereria

3.2.7.6.8 Mycology—General characteristics and methods used for study  
and diagnosis of fungal infections

Superficial mycoses, Opportunistic mycoses

Systemic mycoses

3.2.7.7 Bacteriology of water

### 3.3 **Practical**

3.3.1 Demonstration of culture media, demonstration of sterilization techniques

3.3.2 Systemic – identification of the pathogen from the given clinical material based  
on staining, property, cultural characters, biochemical and serological tests

3.3.3 Immunology – interpretation of given immunological test

3.3.4 Agglutination – slide, tube and passing agglutination precipitation – VDLR, Elisa

3.3.5 Parasitology – stool examination

3.3.6 Blood smear for malarial parasite and others for identification and interpretation

### 3.4 **Textbooks**

3.4.1 Textbook of microbiology – R Ananthanarayana and CK Jayakumar

3.4.2 Parasitology – Jayaram Panicker

3.4.3 Bacteriology – Dey

3.4.4 Textbook of microbiology – Chakravarthy

3.4.5 Immunology and microbiology – Gupta

### 3.5 **Reference Books**

3.5.1 Parasitology – Chaterjee

3.5.2 Practical microbiology – R Cruick Shank

3.5.3 Clinical microbiology – Bailey & Scott

3.5.4 Medical Laboratory – Manual for tropical countries – Monica Cheesbrough

### 3.6 **Scheme Of Examination**

S.No	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01.	Microbiology	80	20	30	130	60	10	70	200

## **4. COMMUNITY MEDICINE**

### **4.1 Goals and Objectives**

#### **4.1.1 Goal:**

The goal of teaching Community Medicine to undergraduate students is to prepare them to function as community and first level physicians in accordance with the institutional goals.

#### **4.1.2 Objectives:**

##### **4.1.2.1 Knowledge:**

After completion of the course, the student shall be able to:

- 4.1.2.1.1 Describe the health care delivery system including rehabilitation of the disabled in the country;
- 4.1.2.1.2 Describe the National Health Programmes with particular emphasis on maternal and child health programmes, family welfare planning and population control;
- 4.1.2.1.3 List epidemiological methods and describe their applications to communicable and non-communicable diseases in the community or hospital situation;
- 4.1.2.1.4 Apply bio-statistical methods and techniques;
- 4.1.2.1.5 Delineate the demographic pattern of the country and appreciate the roles of the individual family, community and socio-cultural environment in health and disease;
- 4.1.2.1.6 Explain the health information systems;

- 4.1.2.1.7 Enunciate the principles and components of primary health care and national policies to achieve the goal of 'Health administration, Health education in relation to community'.
- 4.1.2.1.8 Able to plan a Health Program and able to evaluate a Programme.
- 4.1.2.1.9 Able to describe principles of organization.

4.1.2.2 **Skills:**

After the end of the course, the student should be able to:

- 4.1.2.2.1 Use epidemiology as a scientific tool for making national decisions relevant to community and individual patient intervention;
- 4.1.2.2.2 Collect, Analyse, interpret and present simple community and hospital based data;
- 4.1.2.2.3 Diagnose and manage common health issues and emergencies at the individual family and community levels with existing healthcare resources, respecting socio-cultural beliefs.
- 4.1.2.2.4 Diagnose and manage maternal and child health problems and conduct family planning counseling and community programs keeping in mind national priorities;
- 4.1.2.2.5 Diagnose and manage common nutritional problem at individual and community level;
- 4.1.2.2.6 Design, implement and evaluate health education program using simple audio-visual aids
- 4.1.2.2.7 Participate with team members in organising and implementing health care programs;

4.1.2.2.8 Conduct group meetings, give talks on medical issues.

**4.1.2.3 Integration:**

Develop capabilities to form a synthesis between cause of illness in the environment or community and individual health and respond with leadership qualities to institute remedy for the same.

**4.2 Theory (Duration: 12 months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

**4.2.1** Man and Medicine: Towards Health for All

**4.2.2** Concepts of Health

4.2.2.1 Concept

4.2.2.2 Definitions

4.2.2.3 Dimensions

4.2.2.4 Determinants

4.2.2.5 Positive health

4.2.2.6 Concept of wellbeing

4.2.2.7 Responsibility towards health

4.2.2.8 Health development and its indicators

4.2.2.9 Health science philosophies

**4.2.3** Concept of Disease

4.2.3.1 Concepts of causation

4.2.3.2 Natural history of disease

- 4.2.4 Concepts of control and prevention
- 4.2.5 Modes of intervention
- 4.2.6 Population medicine
- 4.2.7 International classification of diseases
- 4.2.8 Principles of epidemiology and epidemiologic methods
  - 4.2.8.1 Definition, basic measurements in epidemiology
  - 4.2.8.2 Epidemiological methods – descriptive, analytical and experimental epidemiology
  - 4.2.8.3 Uses of epidemiology
  - 4.2.8.4 Dynamics of disease transmission
  - 4.2.8.5 Disease prevention and control
  - 4.2.8.6 Investigation of an Epidemic
- 4.2.9 Screening of diseases: Concepts, Uses, Criteria for screening, sensitivity & specificity
- 4.2.10 Epidemiology of communicable diseases
  - 4.2.10.1 Respiratory infections – small pox, varicella, measles, rubella, mumps, influenza, diphtheria, pertussis, tuberculosis, acute respiratory tract infection(ARTI)
  - 4.2.10.2 Intestinal infections – polio, viral hepatitis, cholera, acute diarrheal diseases, typhoid, food poisoning, amoebiasis, ascariasis, ancylostomiasis, taeniasis
  - 4.2.10.3 Arthropod – borne infections – yellow fever, Japanese encephalitis, malaria, filarial
  - 4.2.10.4 Surface infections – rabies, trachoma, tetanus, leprosy, STD, AIDS

- 4.2.11** Epidemiology of non-communicable diseases – cancer, cardiovascular diseases, obesity, blindness, accidents, hypertension, stroke, rheumatic heart disease
- 4.2.12** Demography and Family Planning – Demographic cycle, population trends, fertility related statistics, health aspects of family planning, contraceptive methods and delivery system, National family welfare program.
- 4.2.13** Preventive medicine in Obstetrics, Pediatrics and Geriatrics – Antenatal, Intra natal, Postnatal care, Low birth weight, infant feeding, growth and development, growth chart, under-fives clinic, national health policy, indicators of MCH care, school health services, behavioral problems, geriatrics, Anganwadi ICDS programs.
- 4.2.14** Environmental health and occupational health: Purification of water and water quality standards, air, ventilation, lighting, noise, radiation, air temperature and humidity, housing, solid wastes disposal and control, excretory disposal, water carriage system, modern sewage treatment, entomology-mosquito, housefly, lice, itch mite, Cyclopes, rat flea, rodents, insecticides-hazards, diseases, pre- placement examination, measures for general health, protection of workers, prevention of occupational hazards
- 4.2.15** Basic Medical Statistics: Census, Vital events, legislation, SRS, notification of diseases, measures of dispersion and centering, sampling, tests of significance, correlation and regression
- 4.2.16** Health education and communication: Objectives, principles, aids, practice of Health education, planning and evaluation



- 4.2.17 Health planning – Management – International health organizations: Planning cycle, management methods and techniques, national health policy, health planning in India, five year plans, health systems in India, five year plans, health systems in India – at centre, state and district levels, panchayat raj, rural development schemes
- 4.2.18 Healthcare of community – Health System and National Programs: Levels of healthcare, Health for All, primary healthcare, healthcare delivery, health problems, healthcare services and systems, voluntary health agencies, national health programs
- 4.2.19 Nutrition and Health: Classification of food, vitamin, mineral, carbohydrate, protein, fat, energy balance, balanced diet, nutritional problems in public health, low birth N+PEM, xerophthalmia, nutritional anemia, IDPs, endemic fluorosis, lathyrism, assessment of nutritional status, nutritional surveillance, social aspects of nutritional food hygiene, food-borne disease.
- 4.2.20 International health agencies: WHO, UNICEF, RED CROSS
- 4.2.21 Voluntary health agencies.

### 4.3 **Practical**

- 4.3.1 Posting at any PHC, CHC, RHC or district hospital for National Immunization Program
- 4.3.2 Nutritional Assessment Surveys
- 4.3.3 1 day workshop or awareness program on AIDS with NACO
- 4.3.4 Posting at Blood donation camp
- 4.3.5 Field visits

- 4.3.5.1 Anganwadis
- 4.3.5.2 PHC / CHC / RHC / District hospital and understanding description of existing healthcare services
- 4.3.6 A study on health related problem in the community
- 4.3.7 Family Health Advisory Service
  - 4.3.7.1 To study the family structure & health status of individual members with reference to
    - 4.3.7.1.1 General health status
    - 4.3.7.1.2 Socio-economic status
    - 4.3.7.1.3 Nutritional status
    - 4.3.7.1.4 Environmental
    - 4.3.7.1.5 Immunization status
    - 4.3.7.1.6 Family welfare planning status
- 4.3.8 Health Practices in 4 conditions
  - 4.3.8.1 Pulmonary Tuberculosis
    - 4.3.8.1.1 Index case: occupation, literacy, social status etc
    - 4.3.8.1.2 Preventive measures for other family members
    - 4.3.8.1.3 Health education
  - 4.3.8.2 Antenatal Care
    - 4.3.8.2.1 Literacy of the family and woman
    - 4.3.8.2.2 Customs – social / religious during pregnancy, delivery, lactation
    - 4.3.8.2.3 Dietary habits: knowledge, aptitude and practices

4.3.8.3	Antenatal high risk care		
4.3.8.3.1	Health education, family planning advice		
4.3.8.4	Protein energy malnutrition		
4.3.8.4.1	Socio-economic status of family		
4.3.8.4.2	Infant feeding and weaning practices		
4.3.8.4.3	Social customs regarding diet for children		
<b>4.3.9</b>	<b>Insecticides</b>	-	10+ models
<b>4.3.10</b>	<b>Universal Immunization Program</b>	-	10+ models
<b>4.3.11</b>	<b>Communicable diseases</b>	-	10+ models
<b>4.3.12</b>	<b>Insect-borne diseases</b>	-	10+ models
<b>4.3.13</b>	<b>Microscope slides</b>	-	10+ models
<b>4.3.14</b>	<b>Environment and Sanitation</b>	-	10+ models
<b>4.3.15</b>	<b>Statistical charts</b>		
<b>4.3.16</b>	<b>Field visits</b>		
4.3.16.1	Rural health Centers		
4.3.16.2	Sewage Disposal Plant		
4.3.16.3	Water Filtration Plant		
4.3.16.4	Nature Cure Hospitals		
4.3.16.5	<i>Yoga</i> Institutes		
4.3.16.6	Nutritional Assessment surveys		
4.3.16.7	Sanatoriums		
4.3.16.8	NACO programs etc		

#### 4.4 **Textbooks**

4.4.1 Textbook of Preventive and Social Medicine – JE Park & K Park

4.4.2 Textbook of Preventive and Social Medicine – BK Mahajan& MC Gupta

#### 4.5 **Reference Books**

4.5.1 Preventive medicine – Ghosh

4.5.2 Preventive medicine – Yeshpal

#### 4.6 **Reference Papers**

4.6.1 WHO Program papers

4.6.2 National Health Program Papers

4.6.3 Voluntary health Program Papers

4.6.4 Red Cross Program papers

4.6.5 UNICEF Program Papers

#### 4.7 **Scheme Of Examination**

S.N o	Subject	Theo -ry	Intern -al Assm t	Viva- Voce	Total	Practi -cals	Inter- nal Assm t	Total Mark s	Grand Total Mark s
01.	Community Medicine	80	20	30	130	60	10	70	200

## 5. YOGA PHILOSOPHY

### 5.1 Goals and Objectives

#### 5.1.1 **Goal:**

The goal of teaching *Yoga* philosophy to undergraduate students is to understand the intricacies of *Yoga* as a philosophy, its relation to ancient texts, other religious thoughts like Buddhism, with reference to *nyaya*, *vasistha*, *samkhya*, *mimamsa*, *Vedanta* and *PatanjaliYogasutras*.

#### 5.1.2 **Objectives:**

##### 5.1.2.1 **Knowledge:**

After the completion of the course, the student shall be able to:

- 5.1.2.1.1 Explain the basic understanding of *Yoga* as a philosophy
- 5.1.2.1.2 Describe the various schools of philosophy which had an influence on *Yogic text* like buddhism, *samkhya*, *mimamsa* etc.
- 5.1.2.1.3 Comprehend the concept of *brahman* according to *vedanta*

##### 5.1.2.2 **Skills:**

After the completion of the course, the student shall be able to:

- 5.1.2.2.1 Perform and demonstrate various *asanas*, *pranayamas*, *kriyas* and meditations;
- 5.1.2.2.2 Describe various philosophies of *Yoga* and apply them therapeutically, relating to a patient's life situation or personality.

##### 5.1.2.3 **Integration**

5.1 At the completion of training, the student should be able to comprehend the basic principles of *Yoga* and therapeutically apply them in his/her professional practice.

**5.2 Theory (Duration: 12 months)**

**Total hours: 350 (Theory: 150 Practical: 200)**

- 5.2.1 *Yoga*, its definition, its basis, its relation to philosophy and its application.
- 5.2.2 Ancient roots of *Yoga* – literature review on reference to *Yoga* in *Upanishads*, *Vedas*, *Smritis* and *Puranas*.
- 5.2.3 Buddhism – 4 main schools of Buddhist philosophy.
- 5.2.4 *Nyaya* – Nature of physical world, individual soul, liberation and concept of supreme soul in Indian philosophy, theory of Body, Mind, Life and Soul and its philosophical background.
- 5.2.5 *Vaisheshika* – Category of substance – *Nava dravyas*, category of quality – 24 gunas.
- 5.2.6 *Sankhya* – theory of cause and effect; *Prakriti*, *Purusa*; Process of evolution of universe; concept of liberation; Practical teachings of *Sankhya*.
- 5.2.7 *Mimamsa* – Major teachings of *Mimamsa* system; selfless action, nonattachment, self-control, self-discipline, daily schedule for psychophysical wellbeing, social awareness, sense of equality, unity with diversity, selectiveness.
- 5.2.8 *Vedanta* – Concept of *Atman*, *Brahma*, *Maya*, Universe, God; the self and human life; liberation and the means of attaining it.
- 5.2.9 *PatanjaliYogaSutras* – Samadhi Pada, SadhanaPada.
- 5.2.10 *AshtangaYoga* (8 limbs of *Yoga* - *Patanjali*).

5.2.11 Spiritual values of *pranayama* and *kriyas*, their methods, importance, rules and regulations, difference between breathing exercises and *Pranayama*.

5.2.12 **Practical**

5.2.13 Entire first year syllabus.

5.2.14 *Asanas*

5.2.14.1 Sitting

5.2.14.1.1 *Siddhasana*

5.2.14.1.2 *Bhadrasana*

5.2.14.1.3 *Samasana*

5.2.14.1.4 *Swastikasana*

5.2.14.1.5 *Simhasana*

5.2.14.1.6 *Ardha Matsyendrasana*

5.2.14.1.7 *Kurmasana*

5.2.14.1.8 *Mayurasana*

5.2.14.1.9 *Sirshasana*

5.2.14.1.10 *Akarna Dhanurasana*

5.2.14.1.11 *Parivarta Janusirshasana*

5.2.14.1.12 *Garbhasana*

5.2.14.1.13 *Tolangulasana*

5.2.14.1.14 *Badhakonasana*

5.2.14.1.15 *Upavistakonasana*

*5.2.14.2 Prone*

*5.2.14.2.1 Shalabhasana – 2 and 3*

*5.2.14.3 Supine*

*5.2.14.3.1 Yoganidrasana*

*5.2.14.3.2 Karnapeedasana*

*5.2.14.3.3 Naukasana*

*5.2.14.4 Standing*

*5.2.14.4.1 Ardha Katichakrasana*

*5.2.14.4.2 Parshvakonasana*

*5.2.14.4.3 Suptakonasana*

*5.2.14.4.4 Padangushtasana*

*5.2.14.4.5 Garudasana*

*5.2.14.4.6 Padahastasana (Advanced)*

*5.2.15 Pranayama*

*5.2.15.1 Surya anulomaviloma*

*5.2.15.2 Ujjayi*

*5.2.15.3 Bhramari*

*5.2.16 Kriya*

*5.2.16.1 VastraDhauti*

*5.2.16.2 Trataka – Jyoti&Bindu*

*5.2.16.3 Kapalabhati*



### 5.3 **Textbooks**

- 5.3.1 Basis and definitions of *Yoga* – Vivekananda Kendra
- 5.3.2 *Asanas* – Swami Kuvalyananda
- 5.3.3 The gospel of Buddha – Parul Caruso
- 5.3.4 The Gospel of Shri Ramakrishna – Mahendranath Gupta
- 5.3.5 Complete works of Shri Aurobindo
- 5.3.6 *Asanas, Pranayama, Bandhas, Mudras* – Swami Satyananda Saraswati
- 5.3.7 *Hatha YogaPradipika* – Swami Svamarama
- 5.3.8 Raja, Hatha, Jnana, Bhakti *Yoga* – Swami Vivekananda

### 5.4 **Scheme Of Examination**

S.N	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01.	Yoga Philosophy	80	20	30	130	60	10	70	200

## **6. BASIC PHARMACOLOGY**

### **6.1 Goals and Objectives**

#### **6.1.1 Goal:**

6.1.1.1 The goal of teaching Pharmacology to undergraduate students is to provide a comprehensive knowledge of scientific, evidence based treatment of diseases through drug administration.

#### **6.1.2 Objectives:**

##### **6.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

6.1.2.1.1 Illustrate pharmacokinetics and pharmacodynamics of essential and common drugs

##### **6.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

6.1.2.2.1 Be proficient in describing pharmacokinetics and pharmacodynamics of essential and common drugs

6.1.2.2.2 Observe medical ethics in his professional practice

##### **6.1.2.3 Integration**

At the completion of training, the student must be trained in medico legal responsibilities of physicians at all levels of health care as well as scientifically based clinical toxicology, being skilled in allied disciplines like Pathology, Radiology, Forensic Sciences, Hospital Administration, Medicine, Pharmacology, etc.

## 6.2 **Theory (Duration: 12 months)**

**Total hours: 100**

### 6.2.1 General Pharmacology

6.2.1.1 Nature and sources of drugs

6.2.1.2 Routes of administration

6.2.1.3 Absorption and bioavailability of a drug – factors affecting drug absorption and its bioavailability

6.2.1.4 Distribution of a drug in the body

6.2.1.4.1 Plasma concentration

6.2.1.4.2 Drug storage

6.2.1.4.3 Placental transfer

6.2.1.5 Fate of the drug

6.2.1.6 Drug excretion

6.2.1.7 Drug receptors

6.2.1.8 Mechanism of action of a drug – types of drug action

6.2.1.9 Adverse reaction to drug

6.2.1.10 Drug toxicity in man –

6.2.1.10.1 drug intolerance

6.2.1.10.2 hemopoietic toxicity

6.2.1.10.3 hepatotoxicity

6.2.1.10.4 nephrotoxicity

6.2.1.10.5 abnormalities of taste and smell

6.2.1.10.6 behavioral toxicity

- 6.2.1.10.7 production of a disease
- 6.2.1.10.8 electrolyte disturbances
- 6.2.1.10.9 endocrine disturbances
- 6.2.1.10.10 skin toxicity
- 6.2.1.10.11 carcinogenesis
- 6.2.1.10.12 teratogenicity
- 6.2.1.10.13 drug dependence

6.2.1.11 Factors modifying the effects of a drug

6.2.1.12 Role of a placebo

## **6.2.2** Brief description of the following drugs

(Their mode of action, dosage, adverse reaction, the method of tapering their dosage, including the adverse effects with the abrupt stoppage of their use)

## **6.2.3** Drugs acting on the CNS

6.2.3.1 General sedatives

6.2.3.2 Anticonvulsant drugs

6.2.3.3 Opioid and Non-Opioid analgesics

6.2.3.4 Analgesics, antipyretics and non-steroidal anti-inflammatory drugs (NSAID)

6.2.3.5 CNS stimulants – Xanthine alkaloids

6.2.3.6 Psychopharmacology

6.2.3.6.1 Anti-anxiety drugs – Meprobamate, Benzodiazepines,  
Chlormethiazole

- 6.2.3.6.2 Anti-depressant drugs – Classification, actions, adverse reaction  
(monoamine oxidase inhibitors, *tricyclic* compounds,  
carbamazepine, lithium)
- 6.2.3.6.3 Psychotogenic drugs – LSD, Mescaline, Cannabis
- 6.2.3.7 Local Anesthetics – adverse reactions
- 6.2.3.8 Drug action on ANS
  - 6.2.3.8.1 Skeletal muscle relaxants – Diazepam, Baclofen, Dantrolene
  - 6.2.3.8.2 Anti-Parkinsonian drugs – Levodopa, Amantadine
- 6.2.3.9 Biogenic Amines and Polypeptides
  - 6.2.3.9.1 Histamine and Antihistamine drugs
  - 6.2.3.9.2 Angiotensin, Kinins, Leukotrienes, Cytokines & PGs
- 6.2.3.10 Drugs used in Respiratory Disorders
  - 6.2.3.10.1 Expectorants, Central cough suppressants, antitussives, mucolytic  
agents
  - 6.2.3.10.2 Pharmacotherapy of bronchial asthma and rhinitis
    - 6.2.3.10.2.1 Drug therapy during an acute attack
      - 6.2.3.10.2.2 Prevention of acute attacks
      - 6.2.3.10.2.3 Treatment of acute severe asthma
      - 6.2.3.10.2.4 Treatment of acute respiratory failure
      - 6.2.3.10.2.5 Treatment of chronic persistent asthma
      - 6.2.3.10.2.6 Drug therapy of rhinitis

6.2.3.11 Cardiovascular drugs

6.2.3.11.1 Digitalis

6.2.3.11.2 Pharmacotherapy of cardiac arrhythmias – Sodium channel blockers, beta blockers, potassium channel blockers, calcium channel blockers

6.2.3.11.3 Pharmacotherapy of Hypertension – Clonidine, alpha methyldopa, Guanethidine, Reserpine, Phentolamine etc.

6.2.3.12 Drugs acting on Blood and blood forming organs

6.2.3.12.1 Drugs effective in iron deficiency anemia

6.2.3.12.2 Treatment of acute iron poisoning

6.2.3.13 Water, Electrolytes and drugs affecting Renal functions

6.2.3.13.1 Nutritional supplementation therapy

6.2.3.13.2 Diuretic and Anti-diuretic drugs

6.2.3.14 Drugs used in GIT disorders

6.2.3.14.1 Appetizers, Digestants, Carminatives, Appetite suppressants and agents lowering serum lipid

6.2.3.14.2 Emetics, drug therapy of vomiting and diarrhea

6.2.3.14.3 Pharmacotherapy of constipation

6.2.3.14.4 Pharmacotherapy of peptic ulcer

6.2.3.15 Drugs used in Endocrine disorders

6.2.3.15.1 Thyroid and antithyroidal drugs

6.2.3.15.2 Insulin and oral antidiabetic drugs

6.2.3.15.3 Adrenal cortical steroids

6.2.3.15.4 Gonadotropins, estrogens, progestins

6.2.3.15.5 Antifertility agents and ovulation including drugs

6.2.3.15.6 Drug therapy in lipidemia

6.2.3.15.7 Drug therapy in obesity

**NOTE: All the drugs mentioned in the syllabus are strictly for understanding drug reactions and NOT to be prescriptive in nature. Students, after graduation are not expected to prescribe any of the above-mentioned medication.**

### **6.3 Textbooks**

6.3.1 Pharmacology and Pharmacotherapeutics – RS Satoskar, SD Bhandarkar, SS

Ainapure

6.3.2 Essentials of Medical Pharmacology – KD Tripathi

6.3.3 Pharmacology – Rang and Dale

**6.4 Scheme Of Examination**

S.N o	Subject	Theo -ry	Intern -al Assm t	Viva- Voce	Total	Practi -cals	Inter- nal Assm t	Total Mark s	Grand Total Mark s
01.	Basic Pharmacology	80	20	50	150	----- ---	----- ---	----- ---	----- ---



## **7. Colour Therapy and Magneto biology**

### **7.1 Goals and Objectives**

#### **7.1.1 Goal:**

The goal of teaching Colour therapy and Magneto biology to undergraduate students is to provide them with comprehensive understanding of philosophy, science and modes of applications of colours and magnets in preventive, curative and rehabilitative therapy.

#### **7.1.2 Objectives:**

##### **7.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 7.1.2.1.1 Demonstrate basic understanding of principles along which colours and magnets can be used as therapeutic agents, along with history of therapeutic uses of colours and magnets;
- 7.1.2.1.2 Understand bio-magnetism, electro-magnetism, properties of magnets, mechanisms of action of magnets on the human body, magnetic overload, charging, modes of application, etc. and apply this knowledge to therapeutically use magnets;
- 7.1.2.1.3 Be aware of the contraindications and harmful effects of colours and magnets;
- 7.1.2.1.4 Illustrate classification of colours, physics of light, electromagnetic spectrum, pathway of vision, human aura, chakras, heliotherapy, colour breathing, chromo charging, and latest research, applying the same to disease management;

### **7.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 7.1.2.2.1 Diagnose various diseases and disorders of the body and mind using the principles of colour diagnosis;
- 7.1.2.2.2 Outline and implement a plan of treatment using colours and magnets as therapeutic tools
- 7.1.2.2.3 Evaluate the therapeutic values of colours and magnets in treatment of various diseases
- 7.1.2.2.4 Utilise latest research finding in improving his/her professional practice

### **7.1.2.3 Integration**

At the completion of training, the student should be able to comprehend the basic principles of Colour therapy and Megneto biology and therapeutically apply them in his/her professional practice.

## **7.2 Theory (Duration: 12 months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **7.2.1 Magnetobiology**

- 7.2.1.1 Definitions of magneto therapy
- 7.2.1.2 Historical highlights
- 7.2.1.3 Vedic references related to magneto therapy

#### 7.2.1.4 Biomagnetism

7.2.1.4.1 Effects on plants , birds and animals.

7.2.1.4.2 Effects on mankind

#### 7.2.1.5 Principles electromagnetism

#### 7.2.1.6 Types of magnets

7.2.1.6.1 Natural

7.2.1.6.2 Artificial

7.2.1.6.2.1 Permanent

7.2.1.6.2.2 Electromagnets

#### 7.2.1.7 Classification of magnets according to

7.2.1.7.1 Power

7.2.1.7.2 Shapes

7.2.1.7.3 Clinical use

#### 7.2.1.8 Measurement of magnetic field

#### 7.2.1.9 Mechanism of action of magnets in the body

#### 7.2.1.10 Properties effects and corresponding features of north & south poles

#### 7.2.1.11 Maintenance of permanent magnets

7.2.1.12 Magnetic field deficiency syndrome

7.2.1.13 Magnetic overload

7.2.1.14 Earth as a huge magnet

7.2.1.15 Effect of biomagnetism in various organ systems

7.2.1.16 Modes of application of magnets

7.2.1.16.1 General

7.2.1.16.2 Local

7.2.1.16.3 Different kinds of magnetic devices used in application of therapy

7.2.1.17 Magnetic charging , mechanism, dosage and its effect and limitations

7.2.1.17.1 Water, oil, milk, honey

7.2.1.18 Magnetic therapy through shad chakras

7.2.1.19 Contraindications, complications, and limitations of magneto therapy.

7.2.1.20 Harmful effects of EMF and measures for minimizing it.

**7.2.1.21 Reference Books:**

7.2.1.21.1 The book of magnetic Healing by Roger Coghill

7.2.1.21.2 Magnet therapy – by Ghanashyamsingh Birla and Colette Hemlin

**7.2.2 Colour Therapy**

7.2.2.1 Definition

7.2.2.2 Historical highlights

7.2.2.2.1 Ghadiyali's principle

7.2.2.2.2 Babbitt postulates

7.2.2.2.3 Modern history of color therapy

- 7.2.2.3 Classification of colors
- 7.2.2.4 How do rainbows form
- 7.2.2.5 Physics of light
- 7.2.2.6 Electromagnetic spectrum
- 7.2.2.7 Pathway of vision and color sensing
- 7.2.2.8 The human aura and colors
- 7.2.2.9 Relation of colors with shad chakras
- 7.2.2.10 Impact of color sense on emotions and psychology
- 7.2.2.11 Therapeutic effect of colors
- 7.2.2.12 Heliotherapy –
  - 7.2.2.12.1 Health benefits
  - 7.2.2.12.2 Physiological and chemical properties of sunlight
  - 7.2.2.12.3 modes of application, plantain leaf sun bath, chromothermoleum
  - 7.2.2.12.4 Procedure, precaution, indication and limitations.
  - 7.2.2.12.5 Dr. Rikli's method of Sun bath , Dr .Kuhne's method of sun bath
- 7.2.2.13 Advanced colour therapy
  - 7.2.2.13.1 Photochemotherapy
  - 7.2.2.13.2 Photobiological coloured lighting to produce immunoregulation
- 7.2.2.14 Color breathing
- 7.2.2.15 Chromo charging of water, oil honey and food stuffs. And their effect on health and disease.

**7.2.2.16 Reference Books:**

7.2.2.16.1 Color therapy - Jonathan Dee and Lesley Taylor

7.2.2.16.2 Healing with color –Theo Gimbel

7.2.2.16.3 The power of color – Dr.Marton Walker

**7.3 Practical**

**7.3.1** Procedural standards / guidelines for application of magnets

**7.3.2** General application – lead system of application

**7.3.3** Local application

7.3.3.1 high power magnets

7.3.3.2 Medium power magnets

7.3.3.3 Low power magnets

7.3.3.4 Specialized magnetic devices

**7.3.4** Case documentation and application of magneto biology and color therapy - at least 20 cases

#### 7.4 Scheme Of Examination

S.No	Subject	Theo-ry	Intern-al Assm-t	Viva-Voce	Total	Practi-cals	Inter-nal Assm-t	Total Marks	Grand Total Marks
01	ColourTherap yand Magneto Biology	80	20	30	130	60	10	70	200

## **8. FORENSIC MEDICINE AND TOXICOLOGY (Duration: 12 Months)**

**Total hours: 100 (Theory: 100)**

### **8.1 Goals and Objectives**

#### **8.1.1 Goal:**

The goal of teaching Forensic Medicine and Toxicology to undergraduate students is to provide a comprehensive knowledge of medico-legal responsibilities in the practice of medicine. He/she learns about law with respect to medical practice, medical negligence and respect for codes of medical ethics.

#### **8.1.2 Objectives:**

##### **8.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 8.1.2.1.1 Outline basic medico-legal aspects of hospitals and general practice;
- 8.1.2.1.2 Define medico-legal responsibilities of a general physician working in a rural primary health center or an urban health center.

##### **8.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 8.1.2.2.1 Observe and infer well, to enquire in criminal and medico-legal matters;
- 8.1.2.2.2 Diagnose and manage acute poisoning and chronic toxicity;



8.1.2.2.3 Be proficient in post mortem examinations including interpretation of findings

8.1.2.2.4 Observe medical ethics in his professional practice

### **8.1.2.3 Integration**

At the completion of training, the student must be trained in medico legal responsibilities of physicians at all levels of health care as well as scientifically based clinical toxicology, being skilled in allied disciplines like Pathology, Radiology, Forensic Sciences, Hospital Administration, Medicine, Pharmacology, etc.

## **8.2 Theory**

### **8.2.1 Forensic Medicine**

8.2.1.1 Definition and scope of forensic medicine

8.2.1.2 Procedure of giving medical evidence with reference to Indian evidence act

8.2.1.3 Methods of identification of living and dead body, race, age, sex etc

8.2.1.4 Death – medico-legal aspects, certification of death, sudden death, causes, medico-legal importance of signs of death, changes due to death and calculating time of death

8.2.1.5 Medico-legal autopsy

8.2.1.6 Medico-legal wounds, their classification and study and Medico-legal aspects

8.2.1.7 Examination of blood stains, hair and seminal stains

8.2.1.8 Miscellaneous causes of death from heat, cold, electricity, starvation etc.

8.2.1.9 Violent asphyxia deaths – hanging, strangulation, suffocation, and drowning

8.2.1.10 Sexual offences – impotency and sterility, virginity, legitimacy, unnatural offences, medico-legal aspects

8.2.1.11 Infanticide

8.2.1.12 Medico-legal aspects of insanity

8.2.1.13 Forensic psychiatry

8.2.1.14 Definition, police inquest, difficulties in detection of crime, legal procedure in criminal courts and their powers oath, medical evidence, medical certificate, dying declaration

8.2.1.15 Rules of giving evidence, professional secrecy

8.2.1.16 Postmortem examinations

8.2.1.17 Death – signs of death, cadaveric rigidity and spasm, putrefaction, estimation of time since death

8.2.1.18 Death from asphyxia, differences between hanging and strangulation, suffocation and drowning

8.2.1.19 Death from burns, scalds and lightning

8.2.1.20 Rape and unnatural offences

8.2.1.21 Abortion, pregnancy and delivery, miscarriage

8.2.1.22 Laws in relation to a medical man, medical ethics, duties, professional privilege and responsibilities

## **8.2.2 Toxicology**

8.2.2.1 General considerations of poisoning and classification

8.2.2.1.1 Actions of poison, factors, modifying their action

8.2.2.1.2 Diagnosis of poisoning

- 8.2.2.1.3 Treatment of poisoning in general
- 8.2.2.2 Poisons
  - 8.2.2.2.1 Corrosives
  - 8.2.2.2.2 Non-metallic poisons
  - 8.2.2.2.3 Insecticides and weed killers
  - 8.2.2.2.4 Metallic poisons
  - 8.2.2.2.5 Organic irritant poisons
  - 8.2.2.2.6 Somniferous poisons
  - 8.2.2.2.7 Inebriant poisons
  - 8.2.2.2.8 Deliriant poisons
  - 8.2.2.2.9 Drug dependence
  - 8.2.2.2.10 Food poisoning
  - 8.2.2.2.11 Spinal poisons
  - 8.2.2.2.12 Cardiac poisons
  - 8.2.2.2.13 Asphyxiants
  - 8.2.2.2.14 Miscellaneous
- 8.2.2.3 Legal responsibilities – Medical Ethics
- 8.2.2.4 Responsibilities and duties of medical practitioners to the State, professional secrecy and privileged communication
- 8.2.2.5 Unprofessional conduct, malpractice
- 8.2.2.6 The rights and privileges and duties of medical practitioners
- 8.2.2.7 The functions of state medical council and its relationship to IMC
- 8.2.2.8 Medical ethics approved by IMC

### **8.3 Practical**

- 8.3.1 Age estimation
- 8.3.2 Autopsies – 10
- 8.3.3 Skeleton remains
- 8.3.4 Spotters
- 8.3.5 Examination of injured
- 8.3.6 Alcoholic
- 8.3.7 Psychiatric
- 8.3.8 Toxicology

### **8.4 Textbooks**

- 8.4.1 Medical Jurisprudence – Modi
- 8.4.2 A textbook of Forensic Medicine – Narayana Reddy
- 8.4.3 A textbook of Forensic Medicine – MRK Krishna

### **8.5 Reference Books**

- 8.5.1 The essentials of Forensic Medicine – Dr. CJ Polson, DJ Gee and B. Knight
- 8.5.2 Forensic Medicine – Corden and Shapiro
- 8.5.3 Principles and practice of Medical Jurisprudence – Taylor's

**8.6 Scheme Of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Forensic Medicine & Toxicology	80	20	50	150	----- ---	----- ---	----- ---	----- ---

## **9. MANIPULATIVE THERAPIES**

### **9.2 Goals and Objectives**

#### **9.2.1 Goal:**

The goal of teaching Manipulative Therapies to undergraduate students is to provide them with comprehensive understanding of science and modes of applications of different manipulative modalities like Massage, Chiropractic, Osteopathy, Aromatherapy in preventive, curative and rehabilitative therapy.

#### **9.2.2 Objectives:**

##### **9.2.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 9.2.2.1.1 Understand the principles and historical highlights of massage and manipulative techniques;
- 9.2.2.1.2 Demonstrate basic understanding of principles and procedures of different types of massage, their physiological effects, indications, and contraindications;
- 9.2.2.1.3 Delineate the principles and procedures of various manipulative therapies like chiropractic, osteopathy, reflexology and aromatherapy;
- 9.2.2.1.4 Describe essential oils with respect to the extraction, uses and combinations that are therapeutically used;

### **9.2.2.2 Skills:**

After the completion of the course, the student shall be able to:

9.2.2.2.1 Perform different types of massage and manipulative therapies, such as Osteopathy, Chiropractic, Aromatherapy, Swedish massage, Kellogg's massage, Shiatsu, Geriatric Massage, Pediatric massage, Antenatal massage, Ayurvedic massage, etc;

9.2.2.2.2 Use therapies such as Reflexology and Zone therapy in their professional practice for musculoskeletal disorders, etc.

### **9.2.2.3 Integration**

At the completion of training, the student should be able to comprehend the basic principles of Manipulative Therapies and apply it in clinical practice.

## **9.3 Theory (Duration: 12 Months)**

Total hours: 250 (Theory: 150 Practical: 100)

**9.3.1** Introduction and historical highlights of Massage and Manipulative Techniques

**9.3.2** Classification of (lubricants) massage

**9.3.2.1** Basic Therapeutic massage (Swedish) techniques – procedure, indications, contraindications, physiological action

**9.3.2.2** Joint movements in massage therapy

**9.3.2.3** Massage to local areas

**9.3.3** Professional standards of massage professionals

**9.3.4** Physiological effects, indications, contraindications of massage in various organ systems

- 9.3.5 Kellogg's massage
- 9.3.6 Shiatsu
- 9.3.7 Pediatric massage
- 9.3.8 Geriatric massage
- 9.3.9 Massage for antenatal care
- 9.3.10 Ayurvedic massage – terminology, procedure and manipulations
- 9.3.11 *Panchakarma* in brief
- 9.3.12 Chiropractic
  - 9.3.12.1 History
  - 9.3.12.2 Importance of spine in chiropractic
  - 9.3.12.3 Physiological effect
  - 9.3.12.4 Chiropractic examination
  - 9.3.12.5 Spinal manipulative therapy
  - 9.3.12.6 Treatment for various diseases
- 9.3.13 Osteopathy
  - 9.3.13.1 Definition
  - 9.3.13.2 History
  - 9.3.13.3 Basic principles
  - 9.3.13.4 Relation of osteopathy to musculoskeletal system
- 9.3.14 Basic principles and procedure of different types of massage – Thai, Balanese, Hot-stone massage, dry brush massage, deep tissue massage, powder massage, vibrator massage etc.



### **9.3.15 Aromatherapy**

#### **9.3.15.1 Definition, Origin and History**

#### **9.3.15.2 Essential Oils**

##### 9.3.15.2.1 Types

9.3.15.2.2 Extraction – Distillation, cold pressing or expression, solvent extraction

9.3.15.2.3 Storage of essential oils

9.3.15.2.4 How to recognize an essential oil

9.3.15.2.5 How to select aroma oils

9.3.15.2.6 How essential oils work

9.3.15.2.7 Carrier oils – Almond oil, Apricot kernel oil, Avocado oil, Carrot oil, Corn oil, Primrose oil, Grape seed Oil, Hazelnut oil, Jojoba oil, Olive oil, Peanut oil, Safflower oil, Sesame oil, Soya bean oil, Sunflower oil

**9.3.15.3** Different methods of using essential oils – Inhalation, Diffusers, Vaporizers, Massage, Baths, Foot bath, Potpourri, Compresses, Oral intake, Beauty treatment, Room sprays, Insect repellants etc.

#### **9.3.15.4 Description of different essential oils and their benefits**

9.3.15.4.1 Amrette seed, Aniseed, Angelica, Basil, Bergamot, Black Pepper, Camphor, Cardamom, Chamomile, Clove bud, Cedar wood, Cypress, Clay sage, Eucalyptus, Fennel, Frankincense, Geranium, Ginger, Juniper berry, Lavender, Lemon, Lemongrass, Marjoram, Neroli, Orange, Palma Rosa, Peppermint, Patchouli, Pine, Rose,

Rosemary, Sandalwood, Tarragon, Tea tree, Thyme (white),  
Vetiver, Ylang Ylang

**9.3.15.5** The best essential oils

9.3.15.5.1 5 fragrance categories – green, floral, citrus, woody and spicy

9.3.15.5.2 Mixing of aroma oils, equipment required for mixing oils

**9.3.15.6** Precautions for use of aroma oils – Skin patch test, testing essential oils in its pure state

**9.3.15.7** Ill effects of aroma oils – in eyes, toxic effects, allergic effects etc.

**9.3.15.8** Careful handling of essential oils

**9.3.15.9** Contraindications

9.3.15.9.1 Oils to be avoided – Phototoxic or photosensitive oils, oils to be avoided in pregnancy, oils that cause skin irritation etc.

**9.3.16** Reflexology and Zone therapy

**9.3.16.1** What is Reflexology, history and development

**9.3.16.2** How does it work

**9.3.16.3** Body and its reflex zones

**9.3.16.4** Applications, indications and contra-indications

**9.3.16.5** Preventive effects of reflexology

**9.3.17** Milestones of females and its management through massage

**9.4 Practical**

**9.4.1** 10 full body massages

**9.4.2** 35 partial massages

**9.4.3** 10 Panchakarma demonstration Identification of different oils

9.4.4 Demonstration of different methods of application

9.4.4.1 Inhalation

9.4.4.2 Compress

9.4.4.3 Diffuses

9.4.5 Local baths

9.5 **Textbooks**

9.5.1 Massage – George Downing

9.5.2 Massage Therapy – Dr. JH Kellogg

9.5.3 Massage – Constant Young

9.5.4 The Complete Book of Massage – Claire Maxwell Hudson

9.5.5 Step-by-Step Massage – Carole McGilvery

9.5.6 All You Wanted to Know About Aromatherapy – Lalita Sharma

9.5.7 Aromatherapy – Julie Sadler

9.5.8 *Ayurveda*& Aromatherapy – Dr. Light Miller & Dr. Bryan Miller.

9.6 **Reference Books**

9.6.1 Massage Therapy – Susan G. Salvo

9.6.2 Magic of Massage – Tanushree Podder

9.6.3 Art of massage – Dr John Harvey Kellogg

### 9.7 Scheme Of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Manipulative Therapies	80	20	30	130	60	10	70	200

## **10. ACUPUNCTURE AND ACUPRESSURE (Duration:12 Months)**

**Total hours: 200(Theory:100 Practical:100)**

### **10.1 Goals and Objectives**

#### **10.1.1 Goal:**

The goal of teaching acupuncture to undergraduate students is to provide them with a comprehensive understanding of the science and art of Acupuncture, Acupressure and related therapies.

#### **10.1.2 Objectives:**

##### **10.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 10.1.2.1.1 Illustrate the definitions of Acupuncture;
- 10.1.2.1.2 Understand the principles and historical highlights of Acupuncture;
- 10.1.2.1.3 Explain the concepts and theories behind the mechanism in which Acupuncture works, both traditional and modern
- 10.1.2.1.4 Demonstrate basic understanding of procedures of different styles of Acupuncture and related therapeutic modalities, such as Traditional Acupuncture, Scalp Acupuncture, Auriculotherapy, Acupuncture Anaesthesia, Reflexology, Zone Therapy, Acupressure, etc;
- 10.1.2.1.5 Describe basic and advanced tools used in Acupuncture;

10.1.2.1.6 Be aware of the contraindications and dangers of Acupuncture, so as to avoid these in his/her professional practice;

**10.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

10.1.2.2.1 Diagnose common diseases and disorders using diagnostic techniques employed in Acupuncture, such as Tongue Diagnosis, Pulse Diagnosis, etc;

10.1.2.2.2 Demonstrate skill in topographically locating meridians and Acupuncture points on the human body;

10.1.2.2.3 Perform Needling and other essential skills in delivering Acupuncture therapy to a patient;

10.1.2.2.4 Plan, implement and evaluate Acupuncture sessions with expertise in his/her professional practice;

**10.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively understand traditional and modern approaches to Acupuncture and effectively utilise the same in preventive, promotive, curative and rehabilitative clinical practice as well as research projects.

**10.2 Theory**

**10.2.1** Definition, concepts of Acupuncture

**10.2.2** Traditional and modern theories of Acupuncture

**10.2.3** Materials and methods of Acupuncture

- 10.2.4** Principles of Acupuncture
- 10.2.5** Rules for the selection of Acupuncture points
- 10.2.6** Contraindications and complications of Acupuncture
- 10.2.7** The concept of Meridians:
  - 10.2.7.1 Lung Meridian (Lu)
  - 10.2.7.2 Large intestine Meridian (LI)
  - 10.2.7.3 Spleen Meridian (Sp)
  - 10.2.7.4 Stomach Meridian (St)
  - 10.2.7.5 Heart Meridian (H)
  - 10.2.7.6 Small intestine meridian (SI)
  - 10.2.7.7 Urinary bladder meridian (UB)
  - 10.2.7.8 Kidney Meridian (K)
  - 10.2.7.9 Triple warmer meridian (TW)
  - 10.2.7.10 Gall bladder meridian (GB)
  - 10.2.7.11 Liver Meridian (Liv)
  - 10.2.7.12 Governing vessel Meridian (GV)
  - 10.2.7.13 Conceptional vessels Meridian (CV)
  - 10.2.7.14 Extra Meridians
- 10.2.8** The extra-ordinary points
- 10.2.9** Examination methods of Traditional Chinese Medicine
- 10.2.10** Auriculotherapy

10.2.11 Scalp acupuncture

10.2.12 Moxibustion

10.2.13 Types of Stimulation in Acupuncture

10.2.13.1 Manual stimulation

10.2.13.2 Electro acupuncture

10.2.14 Acupuncture Therapeutics

10.2.15 Acupuncture Anesthesia

10.3 **Practicals**

10.3.1 Demonstration of needling techniques and electro-stimulation, Moxibustion.

10.3.2 Each student should give treatment for at least 20 patients during the practical.



#### **10.4 Reference Books :-**

- 10.4.1 Clinical Practice of Acupuncture - A.L. Aggarwal
- 10.4.2 Clinical Acupuncture - Dr. Anton Jayasurya
- 10.4.3 Principles and Practice of Acupuncture - Dr. J.K. Patel
- 10.4.4 Health in Your Hands - DevendraVora
- 10.4.5 Clinical Acupuncture and Moxibustion - Liu Gong Wang
- 10.4.6 Fundamentals of Acupuncture and Moxibustion - Liu Gong Wang/Akira Hyodo.
- 10.4.7 Advanced Acupuncture Therapy - Arjun L Agarwal, Govind N Sharma
- 10.4.8 Classical Acupuncture - The Standard Textbook - Poret. Hemen, the China Academy
- 10.4.9 Reiki
  - 10.4.9.1 Empowerment through Reiki - Paula Horan
  - 10.4.9.2 Reiki - Energy Medicine - Libby Barnett & Maggie Chambers with Susan Davidson
- 10.4.10 Pranic Healing
  - 10.4.10.1 Pranic healing using Breathing with Healing Mantras - Dr. L.R. Chowdhry
  - 10.4.10.2 Advanced Pranic Healing- Choa Kok Sui
  - 10.4.10.3 The Ancient Science and Art of Pranic Crystal Cleaning- Choa Kok Sui.

### 10.5 **Scheme Of Examination**

S.No	Subject	Theo-ry	Inter-Nal Assmt	Viva-Voce	Total	Practi-cals	Inter-Nal Assmt	Total Marks	Grand Total Marks
01.	Acupuncture & Acupressure	80	20	30	130	60	10	70	200

## **11. YOGA AND ITS APPLICATIONS (Duration: 12 Months)**

**Total hours: 200 (Theory: 100 Practical: 100)**

### **11.1 Goals and Objectives**

#### **11.1.1 Goal:**

The goal of teaching *Yoga* and its applications to undergraduate students is to provide them with comprehensive understanding of *Yoga* with reference to traditional texts like *PatanjaliYogasutras*, *Hatha YogaPradipika*, *Shiva samhita*, *Gheranda samhita* and *Swara Yoga*; various streams of *Yoga*, advanced meditative techniques like *Yoganidra*, *Omkar*, *Cyclic*, *Vipassana* and learn about benefits of *Yoga* as compared to exercise.

#### **11.1.2 Objectives:**

##### **11.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 11.1.2.1.1 Illustrate the knowledge of traditional texts like *Patanjali Yoga Sutras*, *Hatha Yoga*, *Shiva Samhita* and *Gheranda Samhita*;
- 11.1.2.1.2 Understand the principles behind various meditative practices like *Yoganidra*, *Om* meditation, *cyclic* meditation, *Vipassana* and so on;
- 11.1.2.1.3 Explain about *Yoga* in relation to its application in education, sports;
- 11.1.2.1.4 Demonstrate basic understanding of procedures of stretching and exercises;

11.1.2.1.5 Describe basic physiological changes of *asanas*

11.1.2.1.6 Be aware of the effects of shat *kriyas* and their adverse effects.

#### **11.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

11.1.2.2.1 Describe the concept of *Yoga* as explained in the traditional texts;

11.1.2.2.2 Deliver a meditative session using any of the meditative styles;

11.1.2.2.3 Implement various exercises loosening or eye exercises or stretching to complement *Yoga* practice.

#### **11.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively understand traditional approaches to *Yoga* and employ the same for therapeutic purposes.

### **11.2 Theory**

11.2.1 *PatanjaliYogaSutras* – First two chapters (i.e. *Samadhi Pada* and *SadhanaPada*, brief summary of *VibhutiPada* and *Kaivalyapada*)

11.2.2 *Hatha YogaPradipika* – full text with necessary reference to *GherandaSamhita* and *Siva Samhita*

11.2.2.1 Description of practice of *asanas*: Verses – 15, 16, 17, 32, 34, 35, 38, 44, 47, 48, 50, 51, 53, 54, 57, 58, 59, 62, 63, 64, 65, 67

11.2.2.2 Description of practice of *pranayama*: Verses – 2, 3, 5-12, 14, 16-20, 22, 24, 26-32, 34-37, 39, 40, 44-51, 54, 57, 59

11.2.3 Introduction to other streams of *Yoga - Kundalini, Tantra, Swaraand Kriya*

11.2.4 *Yoganidra*- methods, applications, effects and benefits

11.2.5 Meditation – types –*omkar, cyclic, vipassana*etc. methods of application, benefits, precaution, its influence on health and disease

11.2.6 *Yoga* – in relation to personality and education

11.2.7 *Yoga* – in relation to sports and games, social and political life

11.2.8 Eye exercises – benefits, methods, precautions

11.2.9 Physiological aspects of *asana*

11.2.10 Physiological, neurophysiological aspects of *pranayama*

11.2.11 *Shatkriyas* – comparative study of *shat kriyas*with other systems of medicine

11.2.12 Physiological aspects of exercises

### 11.3 **Practical**

11.3.1 All previous years' asana plus – *veerasana, koormasana, kukkutasana, utthankoormasana, matsyendrasana, padmamayurasana, simhasana, sarvangasana* (all variants), *sirsasana*(all variants)

11.3.2 All loosening (*Sithilikarana Vyayama*) and breathing exercises

11.3.3 All previous years' *Pranayama* plus – *suryabhedana, Chandra bhedana*, cat and tiger breathing, new variants of *pranayama*

11.3.4 All previous years' *Kriyas*plus – *Dandadhouti, agnisara, nauli, bandhas, mudras*

### 11.4 **Textbooks**

11.4.1 Autobiography of a Yogi – ParamahansaYogananda

- 11.4.2 *Yoga as Philosophy and Religion* – SN Dasgupta
- 11.4.3 *Yoga – the Science of Holistic Living* – VK *Yoga*
- 11.4.4 *A Complete Illustrated Book of Yoga* – Swami Vishnu
- 11.4.5 *Encyclopedia of Indian Physical Culture* – DC Mujumdar
- 11.4.6 *Preksha Meditation* – Acharya Tulsi

### 11.5 Scheme Of Examination

S.No	Subject	Theo -ry	Inter- Nal Assmt	Viva- Voce	Total	Practi- cals	Inter- Nal Assmt	Total Marks	Grand Total Marks
01.	Yoga & its Applications	80	20	30	130	60	10	70	200

## **12. NUTRITION AND MEDICINAL HERBS**

### **12.1 Goals and Objectives**

#### **12.1.1 Goal:**

The goal of teaching Nutrition and Medicinal Herbs to undergraduate students is to enable them to analyse nutritional profiles of their patients and prescribe diets to them based on nutritional requirements, as well as use herbs in the management of various diseases.

#### **12.1.2 Objectives:**

##### **12.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 12.1.2.1.1 Describe fundamentals of nutrition, with respect to different nutrients and food groups;
- 12.1.2.1.2 Illustrate details of nutritional requirements for different age groups, as well as pregnant and lactating women;
- 12.1.2.1.3 Demonstrate therapeutic application of nutrition for common diseases;
- 12.1.2.1.4 Compare modern nutrition to traditional Naturopathic diets;
- 12.1.2.1.5 Have detailed knowledge of recent advances and studies, such as carcinogens in food, food additives, contaminants, etc;
- 12.1.2.1.6 Illustrate the use of specific herbs in common diseases, with therapeutic values;



### **12.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

12.1.2.2.1 Assess the nutritional status of a patient;

12.1.2.2.2 Plan, implement and evaluate nutritional advice for people of different ages and patients of different diseases, including the use of herbs.

### **12.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively integrate traditional Naturopathic nutrition and modern nutritional along with herbs, and employ the same for therapeutic purposes.

## **12.2 Theory (Duration: 12 Months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

### **12.2.1 Nutrition**

12.2.1.1 Definition of food, nutrition, nutrient and diet

12.2.1.2 What is nutrition healing

12.2.1.3 Defining essential nutrients

12.2.1.4 Proteins and amino acids

12.2.1.5 Carbohydrates

12.2.1.6 Lipids, sterols and their metabolism

12.2.1.7 Energy needs: assessment and requirements in humans

12.2.1.8 Electrolytes, water and acid-base balance

- 12.2.1.9 Minerals – calcium, phosphorous, magnesium, iron zinc, copper, iodine,  
selenium, chromium, ultra trace minerals
- 12.2.1.10 Vitamins – A, retinoid, D, E, K, Thiamine, Riboflavin,  
Niacin, Pantothenic acid, Folic acid, B12, Biotin, C.
- 12.2.1.11 Clinical manifestations of human vitamin and mineral disorders
- 12.2.1.12 Role/significance of nutrition
  - 12.2.1.12.1 Regulation of gene expression
  - 12.2.1.12.2 Membrane and transport
- 12.2.1.13 Control of food intake
- 12.2.1.14 Antioxidants
- 12.2.1.15 Food groups
- 12.2.1.16 Metabolic consequences of starvation
- 12.2.1.17 Fiber and other dietary factors affecting nutrient absorption  
and metabolism
- 12.2.1.18 Hormone, cytokine and nutrient reactions
- 12.2.1.19 Nutrition and immune system
- 12.2.1.20 Oxidative stress and oxidant defense
- 12.2.1.21 Diet in work and exercise performance
- 12.2.1.22 Body composition: influence of nutrition, physical activity, growth  
and aging
- 12.2.1.23 Maternal nutrition
- 12.2.1.24 Nutritional requirements during infancy
- 12.2.1.25 Diet, nutrition and adolescence

- 12.2.1.26 Nutrition in the elderly
- 12.2.1.27 Clinical nutrition assessment of infants and children
- 12.2.1.28 Clinical and functional assessment of adults
- 12.2.1.29 Nutritional assessment of malnutrition by anthropometric methods
- 12.2.1.30 Laboratory tests for assessing nutritional status
- 12.2.1.31 Dietary assessment
- 12.2.1.32 Childhood obesity
- 12.2.1.33 Nutritional management of infants and children with specific  
diseases and/or conditions
- 12.2.1.34 Assessment of mal absorption
- 12.2.1.35 Nutrition in pancreatic disorders
- 12.2.1.36 Nutrition in liver disorders
- 12.2.1.37 Nutrition and diet in the management of hyperlipidemia  
and atherosclerosis
- 12.2.1.38 Nutrition, diet and hypertension
- 12.2.1.39 Diet, nutrition and prevention of cancer
- 12.2.1.40 Carcinogens in foods
- 12.2.1.41 Nutritional support of the cancer patient
- 12.2.1.42 Nutrition and diet in rheumatic diseases
- 12.2.1.43 Nutritional management of diabetes
- 12.2.1.44 Obesity
- 12.2.1.45 Nutritional aspects of hematologic disorders
- 12.2.1.46 Renal disorders and nutrition

- 12.2.1.47 Nutrition, respiratory function and disease
- 12.2.1.48 Diagnosis and management of food allergies
- 12.2.1.49 Nutrition and diet in alcoholism
- 12.2.1.50 The hypercatabolic state
- 12.2.1.51 Nutrition and infection
- 12.2.1.52 Nutritive value of food ingredients commonly used in India
- 12.2.1.53 Enteral feeding (only theory)
- 12.2.1.54 Parenteral nutrition (only theory)
- 12.2.1.55 Nutrition and medical ethics – the interplay of medical decisions, patients' rights, and the judicial system
- 12.2.1.56 RDA – individuals and populations
- 12.2.1.57 Nutritional implications of vegetarian diets
- 12.2.1.58 Social and cultural influences on food consumption and nutritional status
- 12.2.1.59 Food additives, contaminants and natural toxins
- 12.2.1.60 Comparative study of modern nutrition and traditional naturopathy diet

### **12.3 Textbooks**

- 12.3.1** Davidson and Passamore Human Nutrition – Passamore
- 12.3.2** Clinical Dietetics and Nutrition – FP Antia
- 12.3.3** Normal Therapeutic Nutrition – Corinne Robinson
- 12.3.4** Essentials of Food and Nutrition – Swaminathan
- 12.3.5** Sprouts – JD VaishYogaSamsthan
- 12.3.6** Science and Art of Food and Nutrition – Herbert Shelton
- 12.3.7** Nutritive Values of Indian Foods – NIN (Hyd)

- 12.3.8 Publications of NIN, Hyderabad
- 12.3.9 Herbs that Heal – HK Bakhru
- 12.3.10 *Charaka and Sushruta Samhita*
- 12.3.11 Fundamentals of *Ayurveda* – Mahadev Shastri

#### 12.4 Scheme Of Examination

S.No	Subject	Theo -ry	Inter- Nal Assmt	Viva- Voce	Total	Practi- cals	Inter- Nal Assmt	Total Marks	Grand Total Marks
01.	Nutrition & Medicinal Herbs	80	20	30	150	60	10	70	200

## **13. DIAGNOSTIC METHODS IN NATUROPATHY – I**

(Duration: 12 months)

Total hours: 200 (Theory: 100 Practical: 100)

### **13.1 Goals and Objectives**

#### **13.1.1 Goal:**

The goal of teaching Diagnostic Methods in Naturopathy to undergraduate students is to provide them with comprehensive knowledge of diagnostic methods employed by traditional Naturopaths that can be used efficiently to diagnose various diseases without the use of sophisticated technology.

#### **13.1.2 Objectives:**

##### **13.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 13.1.2.1.1 Define and be aware of historically significant developments in diagnostic procedures used in Naturopathy
- 13.1.2.1.2 Illustrate the characteristics of a Healthy Body with respect to Naturopathic Principles
- 13.1.2.1.3 Describe philosophical theories of causation of disease according to Naturopathy
- 13.1.2.1.4 Utilise knowledge of theory of encumbrances, their types and interpretation, along with naturopathic ways to therapeutically correct them;

13.1.2.1.5 Describe in detail Iris Diagnosis, with respect to history, techniques, iris signs, interpretations and tools used, and use the same to diagnose diseases;

13.1.2.1.6 Comprehend the techniques and interpretations of stool and urine diagnosis, correlating modern medical knowledge and Ayurvedic *sthoola* and *muthrapariksha*;

13.1.2.1.7 Describe the characteristics of normal and unhealthy skin, in different diseases.

### **13.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

13.1.2.2.1 Use knowledge of different diagnostic procedures in Naturopathy to effectively and accurately diagnose various diseases, such as Iris Diagnosis, Facial Diagnosis, Stool and Urine Diagnosis, etc.

### **13.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively understand the principles and procedures of Diagnostic Methods in Naturopathy and employ the same for diagnostic and prognostic purposes.

## **13.2 Theory**

### **13.2.1 Facial Diagnosis**

#### **13.2.1.1 Introduction**



13.2.1.1.1 Definition

13.2.1.1.2 Historical Highlights

13.2.1.2 Characteristics of Healthy Body

13.2.1.3 Foreign matter theory , toxemia theory, vitality theory

13.2.1.4 Physiological and pathological perspective of foreign matter, toxemia and vitality theory

13.2.1.5 Unity of disease and unity of cure – interpretation with contemporary medicine

13.2.1.6 Encumbrance, its types and its interpretation in health and disease

13.2.1.7 Habits – significance /consequences and its correspondence in encumbrance

13.2.1.8 Significance of naturopathy treatment modalities in correction of encumbrances.

## 13.2.2 Iridiagnosis

13.2.2.1 Definition and Historical Highlights

13.2.2.2 Anatomy of iris in detail

13.2.2.3 Conceptual theories of Iridiagnosis

13.2.2.4 Comparison of the science of iridiagnosis with concepts of *Drishtipraraksha* in *Ayurveda* and ophthalmology in modern medicine.

13.2.2.5 Technique in iris reading

13.2.2.5.1 Normal and abnormal iris

13.2.2.5.2 The vibratory theory and its significance

13.2.2.5.3 Diagnostic chart

13.2.2.6 Iridoscope

13.2.2.7 Zones

13.2.2.8 Sectorial division

13.2.2.9 Interpretation of iris manifestation

13.2.2.9.1 Inherent lesions and weakness

13.2.2.9.2 Cataract

13.2.2.9.3 Toxic settlements

13.2.2.9.4 Nerve rings

13.2.2.9.5 Lymphatic rosary

13.2.2.9.6 Injuries and surgeries

13.2.2.9.7 Psora spot, scurf rim

13.2.2.9.8 Radii Solaris

13.2.2.9.9 Sympathetic nerve wreath

13.2.2.9.10 Closed and open lesions

13.2.2.9.11 Sodium ring

13.2.2.9.12 Circulatory indicators

13.2.2.9.13 Drugs and chemicals' appearance in the iris and their effect on the body

13.2.2.9.13.1 Arsenic, bismuth, bromides, coal tar products, ergot, glycerin, iodine, iron, lead, mercury, opium, phosphorus, quinine, salicylic acid,, sodium, strychnine, sculpture, turpentine, vaccines etc.

### 13.3 **Practical**

13.3.1 Case sheet writing - minimum 25 cases with naturopathic diagnostic methods

13.3.2 Regular hospital visit

13.3.3 Dissertation of at least 20 cases studies with significant and relevant Naturopathic diagnostic modalities

13.4 **Reference Books:**

13.4.1 Macfaddans Encyclopedia of Physical Culture - Bernard Macfadden

13.4.2 *Asthangahridayam*

13.4.3 *Charaka samhitha*

13.4.4 *Susrutha samhitha*

13.4.5 The Science of Facial Expression – Louis Kuhne

13.4.6 Iridology - Dr. Bernard Jenson

### 13.5 Scheme Of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Diagnostic Methods - I (Naturopathy)	80	20	30	130	60	10	70	200

## **14. DIAGNOSTIC METHODS IN CONVENTIONAL MEDICINE – II**

**(Duration: 12 Months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

### **14.1 Goals and Objectives**

#### **14.1.1 Goal:**

The goal of teaching Diagnostic Methods in Conventional Medicine to undergraduate students is to provide them with comprehensive knowledge of diagnostic methods employed by conventional doctors that can be used efficiently to diagnose various diseases, for diagnosis as well as prognosis.

#### **14.1.2 Objectives:**

##### **14.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 14.1.2.1.1 Understand the procedures and nuances in approaching a patient and taking a detailed history and writing a case report;
- 14.1.2.1.2 Illustrate examination procedures and techniques generally as well as for specific systems and make provisional diagnoses of common diseases;
- 14.1.2.1.3 Describe laboratory investigations used for supporting the provisional diagnosis made after history taking and examinations;
- 14.1.2.1.4 Prescribe and interpret radiological investigations, biochemical investigations, sonography, EEG, ECG,

EMG, echocardiography, CT, PET, MRI, etc for  
diagnostic and prognostic purposes;

- 14.1.2.1.5 Explain and demonstrate knowledge of invasive tests  
such as paracentesis, thoracocentesis, lumbar puncture,  
laparoscopy, endoscopy, biopsy, etc.

#### **14.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 14.1.2.2.1 Effectively take a case history with examinations and  
prepare a detailed case report;
- 14.1.2.2.2 Prescribe and interpret any further investigations  
required for the provisional diagnosis made.

#### **14.1.2.3 Integration**

At the completion of training, the student should be able to comprehensively understand the principles, procedures and nuances of Diagnostic Methods in Conventional Medicine and employ the same for diagnostic and prognostic purposes.

### **14.2 Theory**

#### **14.2.1 Examination of the Patient**

- 14.2.1.1 Approach to a patient
- 14.2.1.2 History taking and case sheet writing
- 14.2.1.3 Symptomatology
- 14.2.1.4 Examination of vital data

- 14.2.1.5 Importance of height, weight, abdominal girth
- 14.2.1.6 General physical examination
- 14.2.1.7 Examination of skin, nail and hair
- 14.2.1.8 Systemic examination of the patient
  - 14.2.1.8.1 Examination of Abdomen (digestive system)
  - 14.2.1.8.2 Examination of Cardiovascular system
  - 14.2.1.8.3 Examination of Respiratory system
  - 14.2.1.8.4 Examination of Renal and urogenital system
  - 14.2.1.8.5 Examination of Central nervous system
  - 14.2.1.8.6 Examination of Locomotor system
  - 14.2.1.8.7 Examination of ear, nose and throat
  - 14.2.1.8.8 Gynecological examination
  - 14.2.1.8.9 Endocrine system and metabolic disorder
  - 14.2.1.8.10 Examination of eye
- 14.2.1.9 Provisional diagnosis
- 14.2.1.10 Routine and special investigations
  - 14.2.1.10.1 Laboratory investigations: Urine analysis, stool examination, blood examination-peripheral smear, total WBC count, differential WBC count; ESR, Hb estimation ;BT ,CT ,platelet count, red cell indices, bone marrow examination.
  - 14.2.1.10.2 Radiological investigations: Plain X ray chest, K.U.B., lumbar and cervical spine, skull and para nasal sinuses, joints

- 14.2.1.10.3 Contrast Radiology: Barium swallow, barium meal, barium enema; cholecystography, pyelography, angiography, bronchogram, myelogram
- 14.2.1.10.4 Electrocardiography
- 14.2.1.10.5 Echo-cardiograph
- 14.2.1.10.6 Coronary angiography
- 14.2.1.10.7 Electro-encephalography
- 14.2.1.10.8 Biochemical investigations: LFT, creatinine clearance test, Vanillic acid (VMA) excretion test in urine, SGOT and SGPT, LDH, CPK, blood urea, serum creatinine, cholesterol, renal function test, serum uric acid and serum amylase
- 14.2.1.10.9 Diagnostic Paracentesis
- 14.2.1.10.10 Diagnostic Thoracocentesis
- 14.2.1.10.11 Lumbar puncture and CSF analysis
- 14.2.1.10.12 Radioactive iodine uptake studies
- 14.2.1.10.13 Thyroid T3, T4, TSH estimation
- 14.2.1.10.14 Diagnostic skin tests
- 14.2.1.10.15 Endoscopic procedures
- 14.2.1.10.16 Ultra-sonography
- 14.2.1.10.17 CT, PET, MRI, Doppler
- 14.2.1.10.18 Tissue biopsy and FNAC

## 14.2.2 Final Diagnosis



### 14.3 **Practical**

- 14.3.1 History taking and physical examination of cases
- 14.3.2 Case sheet writing of different types of cases (25)
- 14.3.3 Demonstration of equipment and instruments used for investigation in modern diagnostics
- 14.3.4 Demonstration tour of an ultra-modern super-specialty hospital to view the latest technique of modern diagnosis

### 14.4 **Textbooks**

- 14.4.1 Hutchison's Clinical Methods
- 14.4.2 Manual of clinical Methods – PS Shankar
- 14.4.3 Clinical Diagnosis – JalVakil
- 14.4.4 Clinical Methods – Chamberlin
- 14.4.5 Physical Diagnosis – Golwala
- 14.4.6 Harrison's Principles of Internal Medicine
- 14.4.7 Manipal Manual of Clinical Medicine
- 14.4.8 Macleod's Clinical Examination
- 14.4.9 Davidson's Principles and Practice of Medicine
- 14.4.10 Essentials in Hematology and Clinical Pathology

#### 14.5 Scheme Of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Diagnostic Methods – II (Conventional)	80	20	30	130	60	10	70	200

## **15. PSYCHOLOGY AND BASIC PSYCHIATRY**

**(Duration: 12 months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **15.1 Goals and Objectives**

#### **15.1.1 Goal:**

The goal of teaching Psychology and Basic Psychiatry to undergraduate students is to provide them with comprehensive knowledge of normal and abnormal psychology and assessment of the same for therapeutic purposes.

#### **15.1.2 Objectives:**

##### **15.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 15.1.2.1.1 Describe the evolution of Psychology from speculation to science;
- 15.1.2.1.2 Illustrate mechanisms of sense and perception, states of consciousness and their functions;
- 15.1.2.1.3 Understand basic and complex functions such as learning, memory, thinking, language, motivation, emotion, intelligence, development of psychology across lifespan, personality, stress coping, social psychology, attitudes, etc.
- 15.1.2.1.4 Explain abnormal psychology and describe aetiology and psychopathology along with classification of disorders;

15.1.2.1.5 Demonstrate knowledge of therapies aimed at psychological health, such as psychotherapy, *Yoga*, etc;

### **15.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

15.1.2.2.1 Utilise knowledge of psychology and psychiatry in diagnosing and managing various psychological disorders, assessing psychological profile;

15.1.2.2.2 Demonstrate usage of various therapeutic tools in psychiatry to improve mental health in professional practice.

### **15.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of normal and abnormal psychology and psychiatric therapies and efficiently utilise the same for therapeutic purposes.

## **15.2 Theory**

### **15.2.1 Psychology**

15.2.1.1 Unit 1: The Evolution of Psychology- How psychology developed from speculation to science

15.2.1.1.1 Studying the mind and behaviour

15.2.1.1.2 Early scientific approaches to psychology

15.2.1.1.2.1 Structuralism

15.2.1.1.2.2 Functionalism

15.2.1.1.3 Contemporary approaches to psychology

- 15.2.1.1.3.1 Behavioural approach
- 15.2.1.1.3.2 Psychodynamic approach
- 15.2.1.1.3.3 Cognitive approach
- 15.2.1.1.3.4 Behavioural neuroscience approach
- 15.2.1.1.3.5 Evolutionary psychology approach
- 15.2.1.1.3.6 Sociocultural approach
- 15.2.1.1.4 Positive approach to psychology: Humanistic movement and the positive psychology movement

#### 15.2.1.2 Unit 2: Sensation and Perception

- 15.2.1.2.1 How we sense and perceive the world
  - 15.2.1.2.1.1 The visual system
    - 15.2.1.2.1.2 The auditory system
    - 15.2.1.2.1.3 Other senses
  - 15.2.1.2.2 States of consciousness
    - 15.2.1.2.2.1 Levels of awareness
    - 15.2.1.2.2.2 Sleep and dreams
  - 15.2.1.2.3 Altered states of consciousness
    - 15.2.1.2.3.1 Hypnosis
    - 15.2.1.2.3.2 Meditation
    - 15.2.1.2.3.3 Drug induced states

#### 15.2.1.3 Unit 3: Learning and Memory

- 15.2.1.3.1 Types of learning
  - 15.2.1.3.1.1 Classical conditioning
  - 15.2.1.3.1.2 Operant conditioning
  - 15.2.1.3.1.3 Observational learning

- 15.2.1.3.1.4 Cognitive factors in learning
- 15.2.1.3.2 Memory
  - 15.2.1.3.2.1 Nature of memory
  - 15.2.1.3.2.2 Memory encoding: getting information into memory – the role of attention
  - 15.2.1.3.2.3 Levels of processing
  - 15.2.1.3.2.4 Enriching encoding
  - 15.2.1.3.2.5 Memory storage
    - 15.2.1.3.2.5.1 Sensory memory
    - 15.2.1.3.2.5.2 Short-term memory
    - 15.2.1.3.2.5.3 Long-term memory
  - 15.2.1.3.2.6 Memory retrieval
    - 15.2.1.3.2.6.1 Serial position effect
    - 15.2.1.3.2.6.2 Retrieval cues and the retrieval task
    - 15.2.1.3.2.6.3 Retrieval of autobiographical memories
    - 15.2.1.3.2.6.4 Retrieval of emotional memories
    - 15.2.1.3.2.6.5 Forgetting
  - 15.2.1.3.2.7 Biochemistry of memory
  - 15.2.1.3.2.8 Neural circuitry of memory
  - 15.2.1.3.2.9 Anatomy of memory
  - 15.2.1.3.2.10 Are there multiple memory systems? Implicit versus explicit memory
  - 15.2.1.3.2.11 Declarative versus procedural memory
  - 15.2.1.3.2.12 Semantic versus episodic memory
- 15.2.1.4 Unit 4: Thinking and Language

- 15.2.1.4.1 The cognitive revolution in psychology
- 15.2.1.4.2 Concept formation
- 15.2.1.4.3 Problem solving
- 15.2.1.4.4 Critical thinking
- 15.2.1.4.5 Reasoning and decision making
- 15.2.1.4.6 Language and thought language acquisition and development

#### 15.2.1.5 Unit 5: Motivation and Emotion

- 15.2.1.5.1 Approaches to motivation
  - 15.2.1.5.1.1 Evolutionary approach
  - 15.2.1.5.1.2 Drive reduction theory
  - 15.2.1.5.1.3 Optimum arousal theory
  - 15.2.1.5.1.4 The cognitive approach
- 15.2.1.5.2 Hunger
  - 15.2.1.5.2.1 The biology of hunger and thirst
  - 15.2.1.5.2.2 Environmental factors in the regulation of hunger
  - 15.2.1.5.2.3 Eating and weight
  - 15.2.1.5.2.4 Sexuality - the biology of sex and the human sexual response:  
cognitive and sensory/perceptual factors
  - 15.2.1.5.2.5 Cultural factors
  - 15.2.1.5.2.6 Psychosexual dysfunctions
  - 15.2.1.5.2.7 Sexual behavior and orientation

#### 15.2.1.6 Unit 6: Intelligence

- 15.2.1.6.1 Nature of intelligence
- 15.2.1.6.2 Intelligence testing
- 15.2.1.6.3 Neuroscience and intelligence

- 15.2.1.6.4 Theories of multiple intelligences
- 15.2.1.6.5 The extremes of intelligence and creativity
- 15.2.1.6.6 The influence of heredity and environment

15.2.1.7 Unit 7: Human development across the life span

- 15.2.1.7.1 Exploring human development
- 15.2.1.7.2 Prenatal development
- 15.2.1.7.3 Child development: physical, cognitive and socio emotional development in childhood
- 15.2.1.7.4 Adolescence positive psychology and adolescents
- 15.2.1.7.4.1 Physical, cognitive and socio emotional development in adolescence
- 15.2.1.7.5 Adult development and aging
- 15.2.1.7.6 Physical, cognitive and socio emotional development in adulthood

15.2.1.8 Unit 8: Personality

- 15.2.1.8.1 The nature of personality
- 15.2.1.8.2 Psychodynamic perspectives
- 15.2.1.8.3 Behavioral perspectives
- 15.2.1.8.4 Humanistic perspectives
- 15.2.1.8.5 Biological perspectives and contemporary empirical approaches to personality

15.2.1.9 Unit 9: Stress coping and health

- 15.2.1.9.1 The nature of stress
- 15.2.1.9.2 Major types of stress
- 15.2.1.9.3 Responding to stress



- 15.2.1.9.4 The effects of stress on psychological functioning
- 15.2.1.9.5 The effects of stress on physical health
- 15.2.1.9.6 Factors moderating the impact of stress
- 15.2.1.9.7 Health-impairing lifestyles
- 15.2.1.9.8 Reactions to illness
- 15.2.1.9.9 Improving coping and stress management
- 15.2.1.10 Unit 10: Social Psychology
  - 15.2.1.10.1 Social thinking
    - 15.2.1.10.1.1 Attribution
    - 15.2.1.10.1.2 Social perception
    - 15.2.1.10.1.3 Attitudes
  - 15.2.1.10.2 Social influences
    - 15.2.1.10.2.1 Conformity and obedience
    - 15.2.1.10.2.2 Group influence
    - 15.2.1.10.2.3 Leadership
  - 15.2.1.10.3 Inter group relations
    - 15.2.1.10.3.1 Group identity
    - 15.2.1.10.3.2 Prejudice
    - 15.2.1.10.3.3 Ways to improve interethnic relations
  - 15.2.1.10.4 Social interaction
    - 15.2.1.10.4.1 Aggression
  - 15.2.1.10.5 Relationships
    - 15.2.1.10.5.1 Attraction
    - 15.2.1.10.5.2 Love
    - 15.2.1.10.5.3 Relationships and gender

## 15.2.2 Abnormal psychology: Psychiatry

### 15.2.2.1 Unit 1: Abnormal behavior in historical context- the science of psychopathology

#### 15.2.2.1.1 The historical conceptions of abnormal behavior

##### 15.2.2.1.1.1 The supernatural tradition

##### 15.2.2.1.1.2 The biological tradition

##### 15.2.2.1.1.3 The psychological tradition

#### 15.2.2.1.2 An integrative approach to psychopathology

#### 15.2.2.1.3 One-dimensional and multidimensional models

#### 15.2.2.1.4 Genetic contributions to psychopathology neuroscience and its contributions to psychopathology

#### 15.2.2.1.5 Behavioral and cognitive science

#### 15.2.2.1.6 Cultural, social and interpersonal factors

#### 15.2.2.1.7 Classification of psychological disorders: DSM IV and ICD 10 Classifications

### 15.2.2.2 Unit 2: Anxiety disorders

#### 15.2.2.2.1 Generalized anxiety disorders

#### 15.2.2.2.2 Panic disorders; phobias

#### 15.2.2.2.3 Obsessive-compulsive disorders

### 15.2.2.3 Unit 3: Somatoform and Dissociative disorders

#### 15.2.2.3.1 Hypochondriasis

#### 15.2.2.3.2 Somatization disorder

#### 15.2.2.3.3 Conversion disorder

#### 15.2.2.3.4 Pain disorder

#### 15.2.2.3.5 Dissociative disorders

15.2.2.4 Unit 4: Mood disorders

15.2.2.4.1 Depressive disorders

15.2.2.4.2 Bipolar disorders

15.2.2.4.3 Suicide

15.2.2.5 Unit 5: Substance-related disorders

15.2.2.5.1 Depressants

15.2.2.5.1.1 Alcohol use disorders

15.2.2.5.1.2 Sedative substance use disorders

15.2.2.5.1.3 Hypnotic substance use disorders

15.2.2.5.1.4 Anxiolytic substance use disorders

15.2.2.5.2 Stimulants

15.2.2.5.2.1 Amphetamine use disorders

15.2.2.5.2.2 Cocaine use disorders

15.2.2.5.2.3 Nicotine use disorders

15.2.2.5.2.4 Caffeine use disorders

15.2.2.5.3 Opioids use disorders

15.2.2.5.4 Hallucinogens

15.2.2.5.4.1 Marijuana

15.2.2.5.4.2 LSD

15.2.2.5.4.3 Other Hallucinogens

15.2.2.5.5 Other drugs of abuse

15.2.2.6 Unit 6: Schizophrenia and other psychotic disorders

15.2.2.6.1 Schizophrenia

15.2.2.6.1.1 Clinical description

15.2.2.6.1.2 Causes

15.2.2.6.1.3 Types and treatment

15.2.2.6.2 Personality disorders – cluster A, B and C

15.2.2.6.3 Psychotherapies

15.2.2.6.3.1 Psychodynamic therapies

15.2.2.6.3.2 Behavioural therapies

15.2.2.6.3.3 Humanistic therapies

15.2.2.7 Unit 7: Mental health and *Yoga*

### 15.3 **References:**

1. Weiten, Wayne (1995) themes and variations 3<sup>rd</sup> edition, New York Brooks/Cole Publishing company
2. Santrock, J.W. (2005) Psychology, 7<sup>th</sup> edition , New York, McGraw Hill publications
3. Barlow , D.H. and Durand, V.M. (2002 ) Abnormal Psychology, 3<sup>rd</sup> edition , United States, Wadsworth Thomson Learning

### 15.4 **Scheme Of Examination**

S.N	Subject	Theo-ry	Inter-nal Assmt	Viva-Voce	Total	Practi-cals	Inter-nal Assmt	Total Marks	Grand Total Marks
01.	Psychology & Basic Psychiatry	80	20	30	130	60	10	70	200

## **16. FASTING THERAPY AND DIETETICS (Duration: 12 months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

### **16.1 Goals and Objectives**

#### **16.1.1 Goal:**

The goal of teaching Fasting Therapy and Dietetics to undergraduate students is to provide them with comprehensive knowledge of diet management and Fasting therapy and utilisation of the same for therapeutic purposes.

#### **16.1.2 Objectives:**

##### **16.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 16.1.2.1.1 Describe definitions and historical highlights of fasting therapy through the centuries, including fasting employed in different religions;
- 16.1.2.1.2 Classify fasting according to duration, purpose, type, etc;
- 16.1.2.1.3 Define rules and regulations of fasting to be followed;
- 16.1.2.1.4 Understand the metabolism of fasting;
- 16.1.2.1.5 Understand contraindications and indications of fasting in order to efficiently use fasting as a therapy;
- 16.1.2.1.6 Understanding Calorie Restriction: Concept, Method, Prevailing basic- Clinical-applied evidence;

- 16.1.2.1.7 Understand the concept of dietetic principles in Naturopathy;
- 16.1.2.1.8 Understand food combinations and health, including dietary requirements for different age groups, including pregnant and lactating women;
- 16.1.2.1.9 Describe importance of various components of diet, such as dietary fiber, vitamins, minerals, etc;
- 16.1.2.1.10 Explain auxiliary concepts of dietetics such as food hygiene, etc.

#### **16.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 16.1.2.2.1 Utilise knowledge of fasting therapy and dietetics in managing various diseases;
- 16.1.2.2.2 Demonstrate usage of therapeutic diets and fasting therapy in promotive, preventive, curative and rehabilitative therapy.

#### **16.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of fasting therapy and dietetics and efficiently utilise the same for therapeutic purposes.

### **16.2 Fasting**

16.2.1 Definition

16.2.2 Historical highlights

- 16.2.2.1 Indian: According to Vedas, *Ayurveda*, Epics and other pioneer Naturopaths
- 16.2.2.2 Western
- 16.2.3 Evidence of fasting in animals and its benefits
- 16.2.4 Fasting in different religions
- 16.2.5 Classification of fasting and its effects, limitations, according to
  - 16.2.5.1 Duration (Short, long, intermittent, weekly)
  - 16.2.5.2 Purpose (Preventive, therapeutic, religious, political)
  - 16.2.5.3 Type (Dry, water, juice, monodiet)
- 16.2.6 Starvation – pathological features in different organ systems
- 16.2.7 Physiological changes of fasting in short, long, intermittent, dry, water, juice (lemon honey, tender coconut, sugarcane juice, alkaline juices, honey water etc.) and monodiet fasting.
- 16.2.8 Difference between hunger and starvation
- 16.2.9 Rules and regulations for administering fasting
- 16.2.10 Rules and regulations for selection of patient for fasting
- 16.2.11 Hygiene and auxiliaries of fasting
- 16.2.12 Sane fasting
- 16.2.13 Do's and don'ts of fasting
- 16.2.14 Metabolism of fasting
- 16.2.15 Preparation of individuals for fasting
  - 16.2.15.1 Psychological effects and barriers for fasting
  - 16.2.15.2 Crises during fasting therapy and its management
  - 16.2.15.3 Significance of enema during fasting and its physiology
  - 16.2.15.4 Significance of fasting in fever

16.2.15.5 Fasting for preservation of health

16.2.15.6 Contraindications and limitations of fasting

**16.2.16** Research updates on fasting



## 16.3 **Dietetics**

- 16.3.1 Concept of health in naturopathy
- 16.3.2 Dietetic principles in naturopathy
- 16.3.3 Concept of wholesome diet
- 16.3.4 Medical values of food
- 16.3.5 Natural qualities / properties / characters of foods in naturopathy / *Ayurveda* / modern nutrition
- 16.3.6 Natural food and health
  - 16.3.6.1 Importance of green vegetables, other vegetables, fruits and ingredients
  - 16.3.6.2 Chemical composition of different raw juices and their effects and uses
  - 16.3.6.3 Wheat grass, beetroot, cabbage, cucumber, garlic, papaya, mango, pineapple, pumpkins etc
  - 16.3.6.4 Comparison with raw and cooked food
  - 16.3.6.5 Sprouts, nutrition and method
- 16.3.7 Food combination and health
- 16.3.8 Naturopathic hospital dietetics and classification
- 16.3.9 Disease management for different diseases
- 16.3.10 Food allergies and diet
- 16.3.11 Seasonal changes
- 16.3.12 Dietary requirements for pregnancy, lactation and infancy
- 16.3.13 Food hygiene and health
- 16.3.14 Methods of cooking – nutrient losses and preservation
- 16.3.15 Dietary fiber and its therapeutic effects

16.3.16 Customs and traditions of eating

16.3.17 Emotional states and diet

#### 16.4 **Practical**

16.4.1 Visits to different diet departments of naturopathy and modern medicine hospitals

16.4.2 Menu planning using natural foods and raw diet in general

16.4.3 Demonstration of different sprouts

16.4.4 Preparation of low cost balanced diet for different population groups using natural foods

16.4.5 Canteen duties at different naturopathy hospitals

16.4.6 Visit to different nutrition centers like CFTRI, Mysore, NIN, Hyderabad etc.

16.4.7 Study of 20 fasting cases

16.4.8 Case studies of 10 with records

#### 16.5 **Textbooks**

16.5.1 Fasting for Healthy and Long Life – Carrington

16.5.2 Fasting Cure – Lakshman Sharma

16.5.3 Fasting - The Ultimate Diet - Allan Cott

16.5.4 Mucusless Diet Healing System - Arnold Ehret

16.5.5 The Fasting Cure (Classic Reprint) - Upton Sinclair

16.5.6 Fasting Can Save Your Life - Herbert M. Shelton

16.5.7 Davidson and Passamore Human Nutrition – Passamore

16.5.8 Clinical Dietetics and Nutrition – FP Antia

16.5.9 Normal Therapeutic Nutrition – Corinne Robinson

16.5.10 Essentials of Food and Nutrition – Swaminathan

16.5.11 Sprouts – JD Vaish *Yoga Samsthan*

16.5.12 Science and Art of Food and Nutrition – Herbert Shelton

16.5.13 Nutritive Values of Indian Foods – NIN (Hyd)

16.5.14 Publications of NIN, Hyderabad

### 16.6 **Scheme Of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Fasting Therapy and Dietetics	80	20	30	130	60	10	70	200

## **17. OBSTETRICS AND GYNECOLOGY (Duration: 12 Months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **17.1 Goals and Objectives**

#### **17.1.1 Goal:**

The goal of teaching Obstetrics and Gynecology to undergraduate students is to provide them with the comprehensive knowledge of anatomy, physiology and pathophysiology of the reproductive system and gain the ability to optimally manage common problems.

#### **17.1.2 Objectives:**

##### **17.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 17.1.2.1.1 Delineate the anatomy, physiology and pathophysiology of the reproductive system and the common conditions affecting it;
- 17.1.2.1.2 Detect normal pregnancy, labor, and puerperium;
- 17.1.2.1.3 Elucidate the leading causes of maternal and perinatal morbidity and mortality;
- 17.1.2.1.4 Understand the principles of contraception and various methods employed, methods of medical termination of pregnancy, sterilization and their complications;
- 17.1.2.1.5 Recognize the use, abuse and side effects of drugs in pregnancy, pre-menopausal and post-menopausal periods;

- 17.1.2.1.6 Explain the national programmes of maternal and child health and family welfare and their implementation;
- 17.1.2.1.7 Assess different gynecological diseases and describe principles of their management;
- 17.1.2.1.8 Explain the indications, techniques and complications of procedures like Caesarean section, laparotomy, abdominal and vaginal hysterectomy, and vacuum aspiration for Medical Termination of Pregnancy (MTP).

**17.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 17.1.2.2.1 Examine a pregnant women, recognize high risk pregnancies and make appropriate referrals;
- 17.1.2.2.2 Recognise complications of delivery and provide postnatal care;
- 17.1.2.2.3 Recognize congenital anomalies of newborn;
- 17.1.2.2.4 Advise a couple on the use of various available contraceptive devices;
- 17.1.2.2.5 Perform pelvic examination, diagnose and manage common gynaecological problems including early detection of genital malignancies;
- 17.1.2.2.6 Interpret data of investigations like biochemical, histopathological, radiological, ultrasound etc

### **17.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of Obstetrics and Gynaecology to manage related ailments and educate masses on family planning norms.

## **17.2 Theory**

### **17.2.1 Obstetrics**

#### 17.2.1.1 Basic Anatomy and Physiology

17.2.1.1.1 Anatomy and Physiology of female reproductive organs and pelvis

17.2.1.1.2 Maturation and fertilization of ovum

17.2.1.1.3 Development of placenta

17.2.1.1.4 Embryology of uterus

#### 17.2.1.2 Physiology of pregnancy

17.2.1.2.1 Maternal changes due to pregnancy

17.2.1.2.2 Diagnosis of pregnancy

17.2.1.2.3 Differential diagnosis of pregnancy

17.2.1.2.4 Foetus in normal pregnancy

17.2.1.2.5 Antenatal care

#### 17.2.1.3 Physiology of labor

17.2.1.3.1 Causation and stages of labor

17.2.1.3.2 Mechanism of labor

17.2.1.3.3 Conduct of normal labor

#### 17.2.1.4 Physiology puerperium

17.2.1.4.1 Phenomena of normal puerperium

- 17.2.1.4.2 Care of puerperium
- 17.2.1.4.3 Care of new born child
- 17.2.1.5 Pathology of pregnancy
  - 17.2.1.5.1 Hyperemesis gravidarum
  - 17.2.1.5.2 Venereal diseases
  - 17.2.1.5.3 Anemia in pregnancy
  - 17.2.1.5.4 Diseases of the urinary system
  - 17.2.1.5.5 Diabetes in pregnancy
  - 17.2.1.5.6 Diseases and abnormalities of fetal membranes and placenta
  - 17.2.1.5.7 Abortion
  - 17.2.1.5.8 Ectopic pregnancy
  - 17.2.1.5.9 Ante-partum hemorrhage
  - 17.2.1.5.10 Placenta previa
- 17.2.1.6 Pathology of labor
  - 17.2.1.6.1 Occipito-posterior position
  - 17.2.1.6.2 Breech presentation
  - 17.2.1.6.3 Prolapse of the cord, compound presentation
  - 17.2.1.6.4 Multiple pregnancy
  - 17.2.1.6.5 Contracted pelvis
  - 17.2.1.6.6 Management of labor in contracted pelvis
  - 17.2.1.6.7 Complications of 3<sup>rd</sup> stage of labor
- 17.2.1.7 Affection of new-born
  - 17.2.1.7.1 Asphyxia neonatorum
  - 17.2.1.7.2 Pre-term baby
  - 17.2.1.7.3 Congenital malformations

17.2.1.8 Obstetrical operations

17.2.1.8.1 Forceps

17.2.1.8.2 Caesarean section

17.2.1.8.3 Induction of abortion and labor

17.2.1.9 Pathology of Puerperium – Puerperal infections

17.2.1.10 Miscellaneous:

17.2.1.10.1 Perinatal mortality and maternal mortality

17.2.1.10.2 Post-dated pregnancy

17.2.1.10.3 Placenta insufficiency

17.2.1.10.4 Control of contraception

17.2.1.10.5 Medical termination of pregnancy

17.2.1.10.6 Pre-term labor

17.2.1.10.7 Ultrasonogram in Obstetrics

17.2.1.11 Applied aspects in Obstetrics:

17.2.1.11.1 *Yoga* and Naturopathy for Healthy parenthood

17.2.1.11.2 Antenatal and postnatal care through *Yogic* methods

17.2.1.11.3 Antenatal and postnatal care through Naturopathic modalities

17.2.1.11.4 Antenatal and postnatal care through general exercises

17.2.1.11.5 Antenatal and postnatal care through Hydrotherapy

17.2.1.11.6 Natural diet during pregnancy and lactation



## **17.2.2 Gynecology**

### 17.2.2.1 Anatomy of the female pelvic organs

17.2.2.1.1 External genitalia

17.2.2.1.2 Internal genitalia

17.2.2.1.3 Female urethra

17.2.2.1.4 Urinary bladder

17.2.2.1.5 Pelvic ureter

17.2.2.1.6 Rectum and Anal canal

17.2.2.1.7 Pelvic muscles

17.2.2.1.8 Pelvic fascia and cellular tissue

### 17.2.2.2 Blood vessels, lymphatic drainage and innervations of pelvic organs

17.2.2.2.1 Pelvic blood vessels

17.2.2.2.2 Pelvic lymphatics

17.2.2.2.3 Pelvic nerves

### 17.2.2.3 Puberty and Menopause

### 17.2.2.4 Neuroendocrinology in relation to reproduction

### 17.2.2.5 Menstruation

### 17.2.2.6 Examination of a gynecological patient and the diagnostic aids

17.2.2.6.1 History

17.2.2.6.2 Examination

17.2.2.6.3 Ancillary aids

17.2.2.6.4 Cytology

17.2.2.6.5 Colonoscopy

17.2.2.7 Pelvic infection

17.2.2.7.1 Defense of the genital tract

17.2.2.7.2 Acute pelvic infection

17.2.2.7.3 Chronic pelvic infection

17.2.2.7.4 Genital tuberculosis

17.2.2.8 Sexually transmitted diseases

17.2.2.9 Infections of the individual pelvic organs

17.2.2.9.1 Vulva

17.2.2.9.2 Bartholin's gland

17.2.2.9.3 Vagina

17.2.2.9.4 Cervix

17.2.2.9.5 Endometrium

17.2.2.9.6 Fallopian tube

17.2.2.9.7 Ovary

17.2.2.9.8 Parametrium

17.2.2.10 Dysmenorrhea and other disorders of menstrual cycles

17.2.2.10.1 Dysmenorrhea

17.2.2.10.2 Dysfunctional uterine bleeding

17.2.2.11 Displacement of the uterus

17.2.2.11.1 Retroversion

17.2.2.11.2 Prolapse

17.2.2.11.3 Chronic inversion

17.2.2.12 Infertility

17.2.2.12.1 Causes

17.2.2.12.2 Investigations

- 17.2.2.12.3 Treatment
- 17.2.2.12.4 Assisted reproductive techniques
- 17.2.2.12.5 Counseling techniques
- 17.2.2.13 Benign lesions of the vulva and vagina
  - 17.2.2.13.1 Vulval epithelial disorders
  - 17.2.2.13.2 Vulval ulcers
  - 17.2.2.13.3 Vulval and vaginal cysts
- 17.2.2.14 Benign lesions of the cervix
- 17.2.2.15 Benign lesions of the uterus
  - 17.2.2.15.1 Fibroid
  - 17.2.2.15.2 Polyps
- 17.2.2.16 Benign lesions of the ovary
- 17.2.2.17 Ovarian neoplasm
- 17.2.2.18 Endometriosis and adenomyosis
- 17.2.2.19 Premalignant lesions
  - 17.2.2.19.1 Vulva
  - 17.2.2.19.2 Vagina
  - 17.2.2.19.3 Cervix
  - 17.2.2.19.4 Endometrium

- 17.2.2.20 Genital malignancy
  - 17.2.2.20.1 Cervical
  - 17.2.2.20.2 Endometrial
  - 17.2.2.20.3 Gestational trophoblastic neoplasia
  - 17.2.2.20.4 Ovarian
- 17.2.2.21 Urinary problems in gynecology
  - 17.2.2.21.1 Anatomy of the urethra-vesical unit
  - 17.2.2.21.2 Genuine stress incontinence
  - 17.2.2.21.3 Overflow incontinence
  - 17.2.2.21.4 Retention of urine
  - 17.2.2.21.5 Urinary tract infections
- 17.2.2.22 Genital fistulae
  - 17.2.2.22.1 Genito-urinary
  - 17.2.2.22.2 Recto-vaginal
- 17.2.2.23 Amenorrhea
  - 17.2.2.23.1 Physiological
  - 17.2.2.23.2 Primary
  - 17.2.2.23.3 Secondary
- 17.2.2.24 Contraception
  - 17.2.2.24.1 Barrier methods
  - 17.2.2.24.2 Natural
  - 17.2.2.24.3 IUCD
  - 17.2.2.24.4 Steroidal
  - 17.2.2.24.5 Emergency
  - 17.2.2.24.6 Sterilization

- 17.2.2.25 Special problems
  - 17.2.2.25.1 Abnormal vaginal discharge
  - 17.2.2.25.2 Pruritis vulvae
  - 17.2.2.25.3 Pelvic pain
  - 17.2.2.25.4 Postmenopausal bleeding
  - 17.2.2.25.5 Low backache
  - 17.2.2.25.6 Breast in gynecology
  - 17.2.2.25.7 Vaginismus
  - 17.2.2.25.8 Dyspareunia
  - 17.2.2.25.9 Hirsutism
  - 17.2.2.25.10 Galactorrhoea
- 17.2.2.26 Operative gynecology
  - 17.2.2.26.1 Postoperative care
  - 17.2.2.26.2 Dilation of cervix
  - 17.2.2.26.3 Dilation and curettage
  - 17.2.2.26.4 Dilation of and insufflation
  - 17.2.2.26.5 Hysterosalpingography
  - 17.2.2.26.6 Cervical biopsy
  - 17.2.2.26.7 Cryosurgery
  - 17.2.2.26.8 Perineoplasty
  - 17.2.2.26.9 Amputation of cervix
  - 17.2.2.26.10 Abdominal hysterectomy
  - 17.2.2.26.11 Vaginal hysterectomy
- 17.2.2.27 Endoscopic surgery in gynecology
  - 17.2.2.27.1 Laparoscopy

17.2.2.27.2 Hysteroscopy

17.2.2.28 Applied aspects in Gynecology:

17.2.2.28.1 Role of Naturopathy and *Yoga* in Gynecology

17.2.2.28.2 Water treatments for gynecological disorders.

17.3 **Practical**

17.3.1 History taking of antenatal and gynecological cases

17.3.2 Demonstration of physical examination of antenatal and postnatal gynecological cases

17.3.3 Demonstration of conductive labor, normal delivery and use of minor instruments during delivery.

17.3.4 Demonstrations of instruments like Sim's speculum, Cusco's bivalve self training vaginal speculum, Cervical dilators, Anterior vaginal wall retractor, Uterine curette

17.3.5 Specimens

17.3.6 X ray, US, and CT plates

17.3.7 Case-history writing of antenatal and gynecological cases

17.3.8 Demonstration of underwater delivery and painless delivery using acupuncture desired.

17.4 **Textbooks**

17.4.1 Clinical Obstetrics – Mudaliar and Menon

17.4.2 Textbook of Obstetrics and Gynecology – CS Dawn

17.4.3 Shaw's Gynecology

17.4.4 Textbook of Obstetrics and Gynecology - Dutta

### 17.5 **Scheme Of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Obstetrics and Gynaecology	80	20	30	130	60	10	70	200

## **18. YOGA THERAPY (Duration: 12 Months)**

**Total hours: 225 (Theory: 125 Practical: 100)**

### **18.1 Goals and Objectives**

#### **18.1.1 Goal**

The goal of teaching *Yoga* Therapy to undergraduate students is to provide them with comprehensive knowledge of *Yoga* and the physiological effects of various *yogic* practices and utilisation of the same for therapeutic purposes.

#### **18.1.2 Objectives:**

##### **18.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 18.1.2.1.1 Describe the physiological effects of various *yogic* practices like *kriyas*, *asanas*, *pranayamas*, *mudras*, *bandhas*, *drishtis*, Guided relaxation and Meditation;
- 18.1.2.1.2 Define rules and regulations of *Yoga* to be followed;
- 18.1.2.1.3 Understand the therapeutic aspects of *Yoga* as applied to different disease conditions;
- 18.1.2.1.4 Understand contraindications and indications of *yogic* practices in order to efficiently use *Yoga* as a therapy;
- 18.1.2.1.5 Understand the concept of health and disease in *yogic* lore and role of stress in disease causation and management of the same with *Yoga* ;
- 18.1.2.1.6 Understand importance of food according to *Yoga*;
- 18.1.2.1.7 Delineate the importance of *Yoga* and mental health;



### **18.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

- 18.1.2.2.1 Utilise knowledge of *Yoga* therapy in managing various diseases;
- 18.1.2.2.2 Demonstrate usage of therapeutic aspect of *Yoga* in promotive, preventive, curative and rehabilitative therapy.
- 18.1.2.2.3 Institute remedial measures in *Yoga* for various disease conditions.

### **18.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of *Yoga* and efficiently utilize the same for therapeutic purposes.

## **18.2 Theory**

- 18.2.1 Introduction to *Yogic* Therapy / Basis of *yogic* Therapy
- 18.2.2 Role of *Asanas* in curing various diseases
- 18.2.3 Specific importance of *Pranayama* in curing various diseases
- 18.2.4 Vital role of *Bandhas*, *Mudras*, *Drishtis*, in curing various diseases
- 18.2.5 Role of *Shat kriyas* in curing various diseases
- 18.2.6 Role of general exercises in health and diseases
- 18.2.7 *Sudarshan Kriya* and other modern variants
- 18.2.8 The effects of various *Yogic* practices on different systems (skeletal system, endocrine system, nervous system, digestive system, respiratory system, excretory system, cardiovascular system, muscular system, reproductive system)

**18.2.9** Research methods in *yogic* therapy, statistical analysis etc.

**18.2.10** *Yoga* therapy for

- 18.2.10.1 Cardiovascular diseases
- 18.2.10.2 Psychiatric disorders
- 18.2.10.3 Musculoskeletal disorders
- 18.2.10.4 Nervous system disorders
- 18.2.10.5 Gastrointestinal disorders
- 18.2.10.6 Hormonal diseases
- 18.2.10.7 Respiratory diseases
- 18.2.10.8 Metabolic diseases
- 18.2.10.9 Ophthalmologic disorders
- 18.2.10.10 Pediatric disorders
- 18.2.10.11 ENT Disorders
- 18.2.10.12 OBG disorders

**18.2.11** Meditation and its applications on psychosomatic disorders

**18.2.12** *Yoga* and relaxation techniques

- 18.2.12.1 QRT – Quick Relaxation Technique
- 18.2.12.2 IRT – Instant Relaxation Technique
- 18.2.12.3 DRT – Deep Relaxation Technique

**18.2.13** Teaching methods of *Yoga* to public, students and patients. Model lesson planning and adoption of *Yoga* in education system, limitations, *vidhi* and *nishedha* (right and wrong)

**18.2.14** Advanced techniques of *Yoga* therapy (CM, PET, MSRT, MIRT, MEMT, VISAK, ANAMS, and SMET etc.)

**18.2.15** Subtle Energy Medicine

**18.2.16** *Yoga* and Mental Health: Total integration of personality, correct mental behavior and attitude, hormonal relationship of body and mind, self-content tranquilizing effect, psychology of spiritual growth and spiritual values, reasoning and judgment, pure consciousness, mode of living and disciplined life.

**18.2.17** *Drishtis*

**18.2.18** Stress management through *Yoga*

**18.2.19** Applied Psychology

18.2.19.1 Historical perspective, identifying disorders

18.2.19.1.1 Anxiety disorders

18.2.19.1.2 Dissociative disorders

18.2.19.1.3 Somatoform disorders

18.2.19.1.4 Sexual disorders

18.2.19.1.5 Mood disorders

18.2.19.1.6 Personality disorders

18.2.19.1.7 Schizophrenia

18.2.19.2 Therapy for psychological disorders: psychotherapy, therapy of interpersonal relations, behavior therapy

**18.2.20** Lesson planning and teaching methods in *Yoga*

### **18.3 Practical**

First three years' portions and:

**18.3.1** LSP

**18.3.2** QRT

**18.3.3** IRT

**18.3.4** DRT

- 18.3.5 TM
- 18.3.6 CM
- 18.3.7 SKY
- 18.3.8 SMET
- 18.3.9 PET
- 18.3.10 MSRT
- 18.3.11 MIRT
- 18.3.12 MEMT
- 18.3.13 VISAK
- 18.3.14 ANAMS.

#### 18.4 **Reference Books**

- 18.4.1 *Yogic Therapy* – Vinekar
- 18.4.2 *Yogic Therapy* – Garde
- 18.4.3 *Treatment of Common Diseases through Yoga* – Swami Satyananda Saraswati
- 18.4.4 *Seminar on Yoga, Science and Man* – CCRYN, Delhi
- 18.4.5 *Yoga for Healing* – PS Venkateswaran
- 18.4.6 *Handbook of Behavior Modification and Therapy* – Plenum Press
- 18.4.7 *Stress Management Research Papers* – VK *Yoga*, Bangalore
- 18.4.8 All Bihar School of *Yoga* publications

### 18.5 Scheme Of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Yoga Therapy	80	20	30	130	60	10	70	200

## **19. HYDROTHERAPY AND MUD THERAPY**

**Total hours: 275 (Theory: 175 Practical: 100)**

### **19.1 Goals and Objectives**

#### **19.1.1 Goal:**

The goal of teaching Hydrotherapy and Mud Therapy to undergraduate students is to provide them with comprehensive knowledge of treating diseases using water and mud, and the physiological effects of various kinds of such applications, and utilisation of the same for therapeutic purposes.

#### **19.1.2 Objectives:**

##### **19.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 19.1.2.1.1 Describe the properties and chemical composition of water and mud used for therapeutic purposes, physiology of the skin, production of heat and body temperature regulation, which are essential as a foundation for hydrotherapy.
- 19.1.2.1.2 Illustrate physiological effects of hot and cold water upon the different systems of the body and applications to reflex areas ;
- 19.1.2.1.3 Explain action and reaction mechanisms and physiology, with their effects and uses
- 19.1.2.1.4 Demonstrate use of water in preservation, acute diseases, chronic diseases;
- 19.1.2.1.5 Show in-depth knowledge of general principles of hydrotherapy, therapeutic applications of water, along with therapeutic actions, indications and contra-indications; and classification of mud,

storing of mud, modes of mud treatment, cosmetic uses of mud and research updates in hydrotherapy and mud therapy;

19.1.2.1.6 Demonstrate techniques and procedures of various types of hydriatic applications;

**19.1.2.2 Skills:**

After the completion of the course, the student shall be able to:

19.1.2.2.1 Utilise knowledge of hydrotherapy and mud therapy in managing various diseases;

19.1.2.2.2 Demonstrate usage of therapeutic aspect of hydrotherapy and mud therapy treatments in promotive, preventive, curative and rehabilitative therapy.

19.1.2.2.3 Institute and evaluate remedial measures in hydrotherapy for various disease conditions in clinical as well as research settings.

**19.1.2.3 Integration**

At the completion of training, the student should be able to integrate knowledge of hydrotherapy in various diseases and efficiently utilise the same for therapeutic purposes.

**19.2 Hydrotherapy And Mud Therapy (Duration: 12 Months)**

**19.2.1** Introduction and History

**19.2.2** Physical properties and chemical composition of water

**19.2.3** Physiological basis of Hydrotherapy: The skin and its anatomical construction, functions of skin, temperature sense

- 19.2.4 Production of heat and its distribution in the body, regulation of the body temperature, conditions that increase and decrease heat production in the body, body heat and body temperature
- 19.2.5 Importance of water to human body
- 19.2.6 Physiological effects of water on different systems of the body
  - 19.2.6.1 General and physiological aspects of heat upon: Skin, Respiration, Circulation, Nervous system, Heat and its production-dissipation etc, Tactile and temperature sense
  - 19.2.6.2 General and physiological effects of cold upon: Skin, Respiration, Circulation, Nervous system, GIT, body temperature and its maintenance, circulatory system
- 19.2.7 Reflex areas of the body, results of application of hot and cold over reflex areas
- 19.2.8 Actions and reaction, incomplete reaction, conditions that encourage reaction, internal reaction, thermic reaction, modified thermic reaction
- 19.2.9 Place of water in preservation
- 19.2.10 Place of water in acute diseases
- 19.2.11 Place of water in chronic diseases
- 19.2.12 Magnesium sulphate – use in Hydrotherapy
- 19.2.13 General principles of Hydrotherapy
  - 19.2.13.1 General rules of hydrotherapy
  - 19.2.13.2 Therapeutic significance of reaction
  - 19.2.13.3 Adaptation of individual cases
  - 19.2.13.4 Exaggeration of symptoms under treatment, the untoward effects and how to avoid them



19.2.13.5 General indications and contra-indications

**19.2.14 Therapeutic actions and use of Hydrotherapy**

19.2.14.1 Classification of Hydriatic effects, general principles – excitation and depression

19.2.14.2 Primary excitant effects – when to apply and when not to

apply 19.2.14.2.1 Local hemostatic effects – hydriatic heart tonics

19.2.14.2.2 Cardiac effects – Hydriatic heart tonics

19.2.14.2.3 Uterine excitations, emanegogic effects

19.2.14.2.4 Vesical excitations

19.2.14.2.5 Intestinal excitation, peristaltic effects

19.2.14.3 Secondary excitant effects

19.2.14.3.1 Restorative effects

19.2.14.3.2 Tonic effects of cold water, physiological effects of cold water, cold water vs. medical tonics, application in the following: anemia, neurasthenia, rheumatism, diabetes mellitus, valvular heart diseases

19.2.14.3.3 Calorific effects

19.2.14.3.4 Diaphoretic effects

19.2.14.3.5 Importance of attention to the skin in chronic diseases – alternative and qualitative effect – hot baths in Bright's diseases, sweating baths in Dropsy and Obesity. Depurative or Eliminative effects, Toxemia in Rheumatism

19.2.14.3.6 Expectorant effects

19.2.14.3.7 Diuretic effects – Bright's Disease, Uremia - eclampsia

19.2.14.3.8 Atomic dyspepsia, hyperacidity

19.2.14.3.9 Revulsive and derivative effects, fluxion, revulsive methods for combating superficial anemia and for relief of deep congestion method adopted to anemia of deep rooted organs revulsion on analgesic method

19.2.14.4 Resolvent effects

19.2.14.4.1 Sedative effects – general sedatives – local sedatives:

19.2.14.4.1.1 Sedatives of circulatory system – antiphlogistic effects, inflammation, pneumonia, pleurisy, other acute disorders

19.2.14.4.1.2 Nerve sedatives, hypnotic, calmative, analgesic, anesthetic, antispasmodic, insomnia, chorea, spastic paralysis, exophthalmia, goiter, mania, epilepsy and various painful conditions

19.2.14.4.1.3 Antithermic and antipyretic effects, relation to heat production and heat elimination to antipyretic methods, principles that govern the application of hydriatic measures for the reduction of temperature in fevers, methods that may be efficiently employed in various morbid conditions accompanied by rise in temperature – suggestions, effects, indications and contraindications

19.2.14.4.1.4 Secretory and sedative effects prophylactic uses - Cold bathing in infancy and early childhood, cold bathing for adults, cold baths for women, cold baths in old age - precautions

**19.2.15** The techniques of Hydrotherapy

19.2.15.1 Water Baths

19.2.15.1.1 Plain water bath

- 19.2.15.1.2 Cold hip bath
- 19.2.15.1.3 Kellogg's and Kuhne's sitz bath
- 19.2.15.1.4 Shallow bath – for males and females
- 19.2.15.1.5 Arm and foot bath
- 19.2.15.1.6 Graduated bath
- 19.2.15.1.7 Natural bath
- 19.2.15.1.8 Non-revulsive bath
- 19.2.15.1.9 Immersion bath
- 19.2.15.1.10 Cold plunge
- 19.2.15.1.11 Whirlpool bath
- 19.2.15.1.12 Aeration bath
- 19.2.15.1.13 Vichy spray massage
- 19.2.15.1.14 Rapid bath
- 19.2.15.1.15 Brand bath
- 19.2.15.1.16 Fever bath
- 19.2.15.1.17 River bathing
- 19.2.15.1.18 Sea bathing
- 19.2.15.2 Various baths and air baths
  - 19.2.15.2.1 Russian bath
  - 19.2.15.2.2 Turkish bath
  - 19.2.15.2.3 Steam bath
  - 19.2.15.2.4 Local steam bath
  - 19.2.15.2.5 Steam inhalation
  - 19.2.15.2.6 Hot air bath
  - 19.2.15.2.7 Local hot air bath

- 19.2.15.2.8 Super-hot air bath
- 19.2.15.2.9 Cold air bath
- 19.2.15.2.10 Indoor and outdoor bath
- 19.2.15.3 Douches
  - 19.2.15.3.1 Cold Douche
  - 19.2.15.3.2 Hot Douche
  - 19.2.15.3.3 Neutral Douche
  - 19.2.15.3.4 Alternative Douche
  - 19.2.15.3.5 Underwater Douche
  - 19.2.15.3.6 Contrast Douche
  - 19.2.15.3.7 Horizontal Jet
  - 19.2.15.3.8 Cephalic Douche
  - 19.2.15.3.9 Lumbar Douche
  - 19.2.15.3.10 Fan Douche
  - 19.2.15.3.11 Rain Douche or Shower Douche
  - 19.2.15.3.12 Hepatic Douche
  - 19.2.15.3.13 Circular Douche and semi-circular Douche
  - 19.2.15.3.14 Cerebrospinal Douche
  - 19.2.15.3.15 Plantar Douche

19.2.15.3.16 Percussion Douche

19.2.15.3.17 Scotch Douche

19.2.15.4 Packs and compresses

19.2.15.5 Procedures that increase oxidation

19.2.15.6 Measures that encourage general and local metabolic activity

19.2.15.7 Procedures that increase general blood movement and local  
blood supply

19.2.15.8 Measures that increase heat production

19.2.15.9 Measures that increase the elimination of heat

19.2.15.10 Measures that combat bacterial development of blood

19.2.15.11 Measures that increase/lessen heat elimination

19.2.15.12 Hydratic incompatibility

19.2.15.13 Adoption of hydratic prescription of individual disease

19.2.15.14 Hydrotherapy as a means of rehabilitation and health promotion

19.2.15.15 Emergency treatments in Hydrotherapy

## **19.2.16 Mud Therapy**

19.2.16.1 Introduction to Mud therapy

19.2.16.2 Classification of Mud for therapeutic use

19.2.16.3 Precautions for storing mud

19.2.16.4 Methods of treatment of mud

19.2.16.4.1 Applications

19.2.16.4.2 Packing

19.2.16.4.3 Hot poultices

19.2.16.5 Effect of Mud on different systems of body

19.2.16.6 Types of mud therapy applications

19.2.16.6.1 Natural mud bath

- 19.2.16.6.2 Full and partial mud packs
- 19.2.16.6.3 Mud plaster
- 19.2.16.6.4 Thermal bath
- 19.2.16.6.5 Dry pack
- 19.2.16.6.6 Sand pack and sand baths
- 19.2.16.7 Cosmetic uses of mud
- 19.2.16.8 Research updates

### 19.3 **Practical**

- 19.3.1 Demonstration of various therapeutic effects, procedure and treatments in Hydrotherapy during clinical classes at the Hospital
- 19.3.2 At the end of the Final BNYS course, candidate should be in a position to give treatments independently
- 19.3.3 5 case documentation of all hydriatic applications
- 19.3.4 Clinical dissertation on case studies with minimum sample size of 20 patients on one general and two local applications

### 19.4 **Textbooks**

- 19.4.1 Baths – SJ Singh
- 19.4.2 My Water Cure – Sebastian Kneipp
- 19.4.3 Rational Hydrotherapy – JH Kellogg
- 19.4.4 Healing Clay –Michael Abserra
- 19.4.5 Our Earth Our Cure – Raymond Dextroit

### 19.5 **References**

- 19.5.1 Handbook of Hydrotherapy – Shew Joel

19.5.2 Hydrotherapy in Practice – Davis BC & Harrison RA

19.5.3 Medical Hydrology – Sidney Licht

19.6 **Scheme Of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Hydrotherapy and Mud Therapy	80	20	30	130	60	10	70	200

## **20. PHYSICAL MEDICINE & REHABILITATION (Duration: 12 Months)**

**Total hours: 250 (Theory: 150 Practical: 100)**

### **20.1 Goals and Objectives**

#### **20.1.1 Goal:**

The goal of teaching Physical Medicine and Rehabilitation to undergraduate students is to provide them with the knowledge and skills needed for utilisation of Physical medicine for therapeutic, rehabilitative purposes.

#### **20.1.2 Objectives:**

##### **20.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 1.1.1.1.1 Define principles of basic physics that act as a foundation for physical medicine
- 1.1.1.1.2 Describe exercise therapy in detail, including starting positions, movements and their types, muscle strength, joint movement, relaxation, posture, co-ordination, gait, walking aids, neuromuscular facilitation, suspension therapy and their therapeutic applications, including allied modalities like heat treatments and cryotherapy;
- 1.1.1.1.3 Understand electrotherapy in terms of fundamentals, principles, laws of electricity and magnetism, practical and theoretical aspects of electrotherapeutic applications, such as faradic and galvanic currents, high frequency currents, laser, ultrasound, radiation therapy (IR &UV), TENS and IFT.



### **1.1.1.2 Skills:**

After the completion of the course, the student shall be able to:

- 1.1.1.1.1 Demonstrate usage of therapeutic applications of physical medicine in promotive, preventive, curative and rehabilitative therapy, focusing on rehabilitation.
- 1.1.1.1.2 Institute remedial measures in *Yoga* for various disease conditions.

### **1.1.1.2 Integration**

At the completion of training, the student should be able to integrate knowledge of various treatments used in Physical Medicine and efficiently utilise the same for rehabilitative and therapeutic purposes.

## **20.2 Theory**

### **20.2.1 Exercise therapy**

#### 20.2.1.1 Basic Physics in Exercise Therapy

- 20.2.1.1.1 Mechanics: Force, gravity, line of gravity, center of gravity in human body, base, equilibrium, axes and planes
- 20.2.1.1.2 Mechanical Principles: lever, order of lever, examples in human body, pendulum, spring

#### 20.2.1.2 Introduction to exercise therapy

20.2.1.3 Starting positions: Fundamental starting positions, derived positions, muscle work for all the fundamental starting positions

#### 20.2.1.4 Classification of movements in detail

- 20.2.1.4.1 Voluntary movements

- 20.2.1.4.2 Involuntary movements
- 20.2.1.5 Active movements
- 20.2.1.6 Passive movements
- 20.2.1.7 Muscle strength: Anatomy and physiology of muscle tissue, causes of muscle weakness/paralysis, types of muscle work and contractions, range of muscle work, muscle assessment, Principles of muscle strengthening/reeducation, early reeducation of paralyzed muscles
- 20.2.1.8 Joint movement: Classification of joint movements causes for restriction of joint movement, prevention of restriction of joints range of movement, principles of mobilization of joint in increasing the range of motion. Technique of mobilization of stiff joint.
- 20.2.1.9 Relaxation: Techniques of relaxation, Principles of obtaining relaxation in various positions
- 20.2.1.10 Posture: types, factors responsible for good posture, factors for poor development of posture
- 20.2.1.11 Coordination exercises: Definition of coordinated movements, in coordinated movements, Principles of coordinated movements, technique of coordination exercise
- 20.2.1.12 Gait: Analysis of normal gait with muscles work, various pathological gaits
- 20.2.1.13 Crutch gait: introduction, crutch measurement, various types of crutch gait in detail
- 20.2.1.14 Neuromuscular facilitation techniques, functional reeducation

- 20.2.1.15 Suspension therapy: Principles of suspension, types of suspension therapy, effects and uses of suspension therapy with their application either to mobilize a joint to increase joint range of motion or increase muscle power, explaining the full details of the components used for suspension therapy
- 20.2.1.16 Myofascial Release Therapy and related therapies used in Sports Medicine
- 20.2.1.17 Therapeutic applications

## 20.2.2 Electrotherapy

- 20.2.2.1 Electrical fundamentals
  - 20.2.2.1.1 Physical principles
  - 20.2.2.1.2 Structure and properties of matter
  - 20.2.2.1.3 Molecular atom, proton, neutron, electron, ion etc.
- 20.2.2.2 Electrical energy
  - 20.2.2.2.1 Nature of electricity current
  - 20.2.2.2.2 Static electricity
  - 20.2.2.2.3 Electric potentials generated by cell
- 20.2.2.3 Ohm's Law
- 20.2.2.4 Joule's Law
- 20.2.2.5 Magnetic energy
  - 20.2.2.5.1 Nature and property of a magnet
  - 20.2.2.5.2 magnetic induction
  - 20.2.2.5.3 Shaw rule
  - 20.2.2.5.4 Maxwell's corkscrew rule

20.2.2.6 Low frequency currents

20.2.2.6.1 Nature and principles of production of muscles stimulating currents

20.2.2.6.2 Types of low frequency currents used for treatment

20.2.2.6.3 Therapeutic electric stimulation

20.2.2.6.4 Ionotophoresis

20.2.2.6.5 Phonophoresis

- 20.2.2.7 Preparation for electrotherapy
  - 20.2.2.7.1 Preparation of apparatus
- 20.2.2.8 Patient treatment technique
  - 20.2.2.8.1 Stimulating muscles of extremity, back and face through the motor points
- 20.2.2.9 Faradic and Galvanic currents
- 20.2.2.10 High frequency current treatments
  - 20.2.2.18.1 Physics of high frequency currents
  - 20.2.2.18.2 Principles
  - 20.2.2.18.3 Biophysics of heat physiology and cold.
  - 20.2.2.18.4 Production, physiological and therapeutic effects and uses.
  - 20.2.2.18.5 Technique of treatment, dangers and precautions, contraindications of:
    - 20.2.2.18.5.1 Ultrasonic therapy
- 20.2.2.11 Principles of radiation therapy
  - 20.2.2.11.1 Physics of radiation therapy
  - 20.2.2.11.2 Laws governing radiation: Production, physiological and therapeutic effects, uses, techniques of treatment, dangers and precautions, contraindications etc. of:
    - 20.2.2.11.2.1 IRR therapy
    - 20.2.2.11.2.2 UV therapy
  - 20.2.2.11.3 Basic principles of TENS and IFT
  - 20.2.2.11.4 Laser Therapy

20.2.2.12 Wax therapy

20.2.2.12.1 Physics of wax therapy

20.2.2.12.2 Physiological and therapeutic effects and uses

20.2.2.12.3 Techniques of application

**20.3 Practical Electrotherapy**

**20.3.1 Interrupted/modified DC**

20.3.1.1 Stimulation of muscles directly

20.3.1.2 Diagnostic tests:

20.3.1.2.1 FG test

20.3.1.2.2 SD curve

20.3.1.2.3 Fatigue test

20.3.1.3 Uses of surged Faradism and interrupted Galvanism in various peripheral nerve lesions

20.3.1.3.1 Neuropraxia

20.3.1.3.2 Axonotmesis

20.3.1.3.3 Neurotmesis

**20.3.2 High Frequency current treatment**

20.3.2.1 UV radiation: Setting up of apparatus selection of lamps technique of application of UVR for various conditions like test dose, general body bath, acne vulgaris, alopecia areata and totalis, ulcers, psoriasis, rickets and general debility patients.

20.3.2.2 Ultrasonics: Setting up of apparatus, selection of dose, and technique of application of various conditions and to various parts of the body.

20.3.2.3 Laser – setting up apparatus including selection of method, technique, preparation of patient, checking contraindications, application for various conditions and parts of the body.

## 20.4 **Practical Exercise Therapy**

- 20.4.1 Demonstration and practice of active and passive movements
- 20.4.2 Demonstration and practice of putting suspension to shoulder joint and elbow joint in upper limbs, hip and knee joints in lower limbs for all movements. Demonstration of total suspension.
- 20.4.3 Muscle strength: Demonstration and practice of strengthening, reeducation of weak/paralyzed muscles of both upper and lower extremity, individual group muscles, abdominal muscle exercises
- 20.4.4 Joint movement: Demonstration and practice of techniques to improve joint range of motion of hip joint, knee joint, ankle and foot, shoulder, elbow joint, radio- ulnar joint, wrist, etc
- 20.4.5 Demonstration and practice of free exercise to improve joint range of motion (Small joint, Eg: Hand, fingers, toes, etc). Demonstration and practice of all crawling exercises, faulty posture, correcting techniques etc.
- 20.4.6 Demonstration of various pathological gaits.
- 20.4.7 Measurement of crutches, walking aids, strengthening muscles, crutch balance, demonstration and practice of all crutch gaits.
- 20.4.8 Breathing exercises: Demonstration and practice of diaphragmatic breathing, localized expansion exercises.
- 20.4.9 Passive stretching: Techniques of passive stretching to sternomastoid muscle, shoulder abductors, elbow flexors, supinator, wrist and finger flexors in upper limbs, passive stretching to hip flexors, adductors, iliotibial band, tensor fascia lata, quadriceps, knee flexors, tendoachilles, etc



## 20.5 **Reference Books**

20.5.1 Principles of Exercise therapy – Dina Gardiner

20.5.2 Tidy's Physiotherapy

20.5.3 Cash's Textbook of Physiotherapy

20.5.4 Clayton's Electrotherapy

## 20.6 **Scheme of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Physical Medicine and Rehabilitation	80	20	30	130	60	10	70	200

## **21. FIRST AID AND EMERGENCY MEDICINE (Duration: 12 Months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **21.1 Goals and Objectives**

#### **21.1.1 Goal:**

The goal of teaching First Aid and Emergency Medicine to undergraduate students is to provide them with the skills and knowledge required to manage medical emergencies efficiently.

#### **20.1.3 Objectives:**

##### **20.1.3.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 20.1.3.1.1 Illustrate working knowledge about Golden hour
- 20.1.3.1.2 Describe quick assessment and recognition of emergency conditions;
- 20.1.3.1.3 Demonstrate specific first aid measures and emergency treatments used for handling emergency cases before and after diagnosis of the condition;

##### **20.1.3.2 Skills:**

After the completion of the course, the student shall be able to:

- 20.1.3.2.1 Demonstrate usage of first aid procedures in various emergency situations
- 20.1.3.2.2 Describe assessment of emergencies and treatment of the same with suitable procedures.
- 20.1.3.2.3 Possess the knowledge and skills to perform Basic Life Support procedures in the Golden Hour.

20.1.3.2.4 Able to assess the severity of an emergency condition so as to act in accordance and take necessary steps to prevent further complications.

### **20.1.3.3 Integration**

At the completion of training, the student should be able to effectively use his/her knowledge of assessment and management of medical emergencies in his/her professional practice.

## **21.2 First Aid**

- 21.2.1 General principles of first aid-definition, principles, responsibilities and golden rules
- 21.2.2 Resuscitation techniques-basic life support, mouth to mouth ventilation, artificial ventilation, Sylvester method.
- 21.2.3 Unconsciousness and general principles of treatment, recovery position
- 21.2.4 Transportation and handling of patient
- 21.2.5 Hemorrhage and bleeding
- 21.2.6 Shock
- 21.2.7 Wounds
- 21.2.8 Bandages ,dressing and slings
- 21.2.9 Fractures, sprains and strains
- 21.2.10 Poisoning
- 21.2.11 Asphyxia, Aspiration, drowning, suffocation and strangulation
- 21.2.12 Road accidents
- 21.2.13 Effect of temperature, sunburn, hypothermia, frost bite, heat exhaustion, heat stroke

- 21.2.14 Burns and scalds, electrical injuries
- 21.2.15 Head injury, chest injury, blast injury, crush injury
- 21.2.16 Sports injuries
- 21.2.17 Epilepsy-febrile convulsions
- 21.2.18 Syncope
- 21.2.19 Dog bite, snake bite, scorpion bite and bee sting
- 21.2.20 Emergencies in diasthetic patients and cardiac patient

### **21.3 Recognition, Evaluation Of Clinical Emergencies**

#### **21.3.1 CVS**

- 21.3.1.1 Acute myocardial infarction
- 21.3.1.2 Cardiogenic shock
- 21.3.1.3 Cardiac arrhythmias
- 21.3.1.4 Cardiac arrest
- 21.3.1.5 Hypertensive emergencies
- 21.3.1.6 Pulmonary embolism
- 21.3.1.7 Dissection of aortic aneurysm
- 21.3.1.8 Cardiac tamponade
- 21.3.1.9 DVT

#### **21.3.2 Respiratory System**

- 21.3.2.1 Hemoptysis
- 21.3.2.2 Status asthmaticus
- 21.3.2.3 Spontaneous pneumothorax
- 21.3.2.4 Acute respiratory failure
- 21.3.2.5 Massive pulmonary collapse

21.3.2.6 Acute laryngeal obstruction

21.3.2.7 ARDS

21.3.2.8 Pneumonia

21.3.2.9 Massive pleural effusion

### 21.3.3 Gastrointestinal System

21.3.3.1 Acute vomiting

21.3.3.2 Perforation of Peptic Ulcer

21.3.3.3 Hematemesis

21.3.3.4 Hepatic Pre coma and coma

21.3.3.5 Acute pancreatitis

21.3.3.6 Acute pain in abdomen

21.3.3.7 Obstruction of intestine

### 21.3.4 Nervous System

21.3.4.1 Unconscious patient

21.3.4.2 Cerebrovascular catastrophes

21.3.4.3 Convulsions

21.3.4.4 Status epilepticus

21.3.4.5 TIA

21.3.4.6 Spinal cord injuries

21.3.4.7 Brain death

21.3.4.8 Head injury

21.3.4.9 Acute ascending polyneuritis

### 21.3.5 Renal System

21.3.5.1 Acute renal failure

21.3.5.2 Renal colic

21.3.5.3 Hematuria

21.3.5.4 Hyperkalaemia

21.3.5.5 Hypokalaemia

21.3.5.6 Hyponatremia

### 21.3.6 Endocrine and Metabolism

21.3.6.1 Thyroid crisis

21.3.6.2 Adrenal crisis

21.3.6.3 Diabetic ketoacidosis and coma

21.3.6.4 Hypoglycemia

21.3.6.5 Tetany

21.3.6.6 Hypercalcemia

### 21.3.7 Miscellaneous Emergencies

21.3.7.1 Syncope

21.3.7.2 Acute peripheral circulatory failure

21.3.7.3 Anaphylaxis

21.3.7.4 Hypothermia

21.3.7.5 Hyperpyrexia

21.3.7.6 Poisoning

21.3.7.7 Drug overdose

#### 21.4 **Practical**

- 21.4.1 History taking and physical examination of cases
- 21.4.2 Case sheet writing in different general cases (25)
- 21.4.3 Demonstration of equipment and instruments used for investigation in modern diagnostics
- 21.4.4 Demonstration tour of an ultra-modern super specialty hospital to see the latest techniques management of emergency conditions

#### 21.5 **Textbooks**

- 21.5.1 Hutchison's Clinical Methods
- 21.5.2 Manual of Clinical Methods – PS Shankar
- 21.5.3 First Aid – Red Cross Society
- 21.5.4 First Aid – St. John Ambulance Association
- 21.5.5 First Aid – LC Gupta
- 21.5.6 Bailey and Love's Short Practice of Surgery
- 21.5.7 Harrison's Principle of Internal Medicine
- 21.5.8 Davidson's Principle and Practice of Medicine
- 21.5.9 Medical Emergency, Diagnosis and Management

21.6 **Scheme of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	First Aid and Emergency Medicine	80	20	30	130	60	10	70	200



## **22. CLINICAL NATUROPATHY (Duration: 12 months)**

**Total hours: 300 (Theory: 200 Practical: 100)**

### **20.2 Goals and Objectives**

#### **20.2.1 Goal:**

The goal of teaching Clinical Naturopathy to undergraduate students is to train them to provide well integrated clinical service in Naturopathy.

#### **19.1.3 Objectives:**

##### **19.1.3.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 19.1.3.1.1 Illustrate decision making in Naturopathy ;
- 2.24.3.1.2 Understand the basic principles of screening and prevention of disease;
- 2.24.3.1.3 Comprehend the scope of practice- patterns of use, fields of practice, regulations, limitations;
- 2.24.3.1.4 Understand the concept of healing and disease crises and management of the same.
- 2.24.3.1.5 Understand the pathogenesis of the disease in Naturopathy basis and preventive measures of the same;
- 2.24.3.1.6 Create a specific module of therapy for the particular patient with varied presentations.

##### **2.24.3.2 Skills:**

After the completion of the course, the student shall be able to:

- 2.24.3.2.1 Apply his /her knowledge of clinical Naturopathy in managing various diseases;

2.24.3.2.2 Demonstrate usage of therapeutic aspect of clinical Naturopathy in curative and rehabilitative therapy;

2.24.3.2.3 Utilize his/ her knowledge of clinical Naturopathy for prevention of disease and promotion of health;

### **2.24.3.3 Integration**

At the completion of training, the student should be able to integrate knowledge of clinical Naturopathy and efficiently utilise the same for therapeutic purposes.

## **2.2 Theory**

### **2.2.1 Good Clinical Practice**

#### **2.2.1.1 Guidelines and Standards**

### **2.2.2 Decision-making in Naturopathy**

### **2.2.3 Screening and Prevention of Disease**

#### **2.2.3.1 Basic principles of screening**

### **2.2.4 Scope of practice**

#### **2.2.4.1 Patterns of use**

#### **2.2.4.2 Fields of practice**

#### **2.2.4.3 Regulations**

#### **2.2.4.4 Limitations**

### **2.2.5 Cardinal manifestations and presentation of disease**

**2.2.6 Naturopathic prescription-making and algorithmic line of management for the following diseases:**

Abscess, Acid-Peptic Disease, Acne, AIDS, Aging, Allergies, Alopecia, Alzheimer's disease, Anal fissures, Anemia, Anorexia nervosa, Anxiety disorders, Appendicitis, Arthritis – OA & RA, Asthma, ADD/ADHD, Back pain, Bad breath, Bedsore, Bladder infection, Bronchitis, Bruise, Bursitis, Cancer - Breast cancer, Cervical cancer, Colorectal cancer, Leukemia, Lung cancer, Prostate cancer, Skin cancer, Stomach cancer, Uterine cancer; Dental caries, Cardiovascular disease, Cerebrovascular disease, Chlamydia, Chloasma (Age spots), Chronic fatigue syndrome, Cirrhosis, Common cold, Colic, Colitis, Nasal congestion, Conjunctivitis, Constipation, Menstrual cramps, Crohn's disease, Cuts (cuts, wounds and scratches), Cyst, Cystitis, Dandruff, Deep venous thrombosis, Clinical depression, Dermatitis, Diabetes, Diarrhea, Diverticulitis, Dizziness, Duodenal ulcer, Dysmenorrhea, Dyspepsia, Diabetes mellitus, Earache, Earwax blockage, Eczema, Edema, Emphysema, Endometriosis, Epilepsy, Erectile dysfunction, External otitis, Fainting, Farsightedness, Fatigue, Fever, Fibromyalgia, Flatulence, Flu, Folliculitis, Food poisoning, Foot odor, Gallstones, Gas, Gastritis, Gastroenteritis, GERD, Gingivitis, Goiter, Gout, Headache, Heatstroke, Hemorrhoids, Hepatitis, Hernia, Herpes (genital), Obesity, Oligomenorrhea, Oral cancer, Ovarian cyst, Parkinson's disease, PID, Phlebitis, PMS, Postnasal drip, PTSD, Rashes (hives), Raynaud's disease, Sciatica, SAD, Seizure disorder, Sinusitis, Snoring, Sore throat, Scoliosis, Sprains, Acute Abdomen.

#### **22.2.7** Pathophysiology

#### **22.2.8** Management of pains

##### **22.2.8.1** Pain sensory systems

##### **22.2.8.2** Chronic pain

- 22.2.8.3 Types of pain
  - 22.2.8.3.1 Chronic discomfort and palpitation
  - 22.2.8.3.2 Abdominal pain
  - 22.2.8.3.3 Headache
  - 22.2.8.3.4 Back, neck pain
- 22.2.9 Fever, hyperthermia
- 22.2.10 Fever, rashes
- 22.2.11 Fever of unknown origin
- 22.2.12 Hypothermia & frostbite
- 22.2.13 Syncope, faintness, dizziness, vertigo
- 22.2.14 Weakness, disorders of movements and imbalance
- 22.2.15 Numbness, tingling and sensory loss
- 22.2.16 Aphasia, memory loss and other focal cerebral disorders
- 22.2.17 Sleep disorders
- 22.2.18 Dyspnea, cough
- 22.2.19 Edema
- 22.2.20 Dysphasia, nausea, vomiting and indigestion
- 22.2.21 Diarrhea, constipation
- 22.2.22 Weight loss
- 22.2.23 Jaundice, abdominal swelling
- 22.2.24 Sexual dysfunction
- 22.2.25 Healing crisis and Disease crisis
- 22.2.26 Approach to the patient in Naturopathic medicine with:

- 22.2.26.1 Skin disease
  - 22.2.26.2 Cardiovascular disease
  - 22.2.26.3 Disease of respiratory system
  - 22.2.26.4 Gastrointestinal disorders
  - 22.2.26.5 Liver and pancreatic disease
  - 22.2.26.6 Articular and musculoskeletal disorder
  - 22.2.26.7 Neurological disease
  - 22.2.26.8 Renal disorders
  - 22.2.26.9 Endocrinal disorders
  - 22.2.26.10 Menstrual disorders
  - 22.2.26.11 Peripheral neuropathy
- 22.2.27 Dictum of cure in Naturopathic medicine
- 22.2.27.1 Identify and remove the root cause
  - 22.2.27.2 Eliminate the toxins
  - 22.2.27.3 Supplement of the vital energy or nerve energy
- 22.2.28 Important modes and methods for natural rejuvenation

Note: Apart from the above-listed conditions, other clinical conditions may be discussed but the above-listed conditions are mandatory.

### 22.3 **Practical**

- 22.3.1 Case-history taking, documentation and complete management protocol of at least 30 cases.
- 22.3.2 Clinical dissertation on any one disease involving multiple patients.

22.4 **Textbooks:**

22.4.1 Clinical Naturopathy: An Evidence-Based Guide to Practice-Jerome Sarris, Jon Wardle

22.4.2 Clinical Naturopathic Medicine - Leah Hechtman

22.4.3 The Clinician's Handbook of Natural Medicine - Joseph E. Pizzorno Jr.

22.4.4 Fasting-The Ultimate Diet - Allan Cott

22.4.5 Mucusless Diet Healing System - Arnold Ehret

22.4.6 The Fasting Cure (Classic Reprint) - Upton Sinclair

22.4.7 Fasting Can Save Your Life - Herbert M. Shelton

22.5 **Scheme of Examination**

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Clinical Naturopathy	80	20	30	130	60	10	70	200

## **23. RESEARCH METHODOLOGY & RECENT ADVANCES**

**(Duration 12 months)**

**Total hours: 150 (Theory: 100 Practical: 50)**

### **23.1 Goals and Objectives**

#### **23.1.1 Goal:**

The goal of teaching Research Methodology and Recent advances to undergraduate students is to provide them with the latest updated scientific, knowledge in the field of Naturopathy and *Yoga* and introduce them to research methodology.

#### **23.1.2 Objectives:**

##### **23.1.2.1 Knowledge:**

After the completion of the course, the student shall be able to:

- 2.24.4.1.1 Describe research methodology under process, materials and methods, design of a study, literature review, ethics, sampling, measurement tools, data organisation, statistics, data analysis, reliability and validity, etc, and implement this knowledge in practically designing, conducting, evaluating and publishing a study.
- 2.24.4.1.2 Illustrate statistics and probability theory;
- 2.24.4.1.3 Use technological aids for preparing research reports;
- 2.24.4.1.4 Demonstrate knowledge about inter-disciplinary research.

##### **2.24.4.2 Skills:**

After the completion of the course, the student shall be able to:

- 2.24.4.2.1 Prepare a research study, conduct, evaluate and publish it;

- 2.24.4.2.2 Interpret research findings and analyse whether data is significant or not;

### **2.24.4.3 Integration**

At the completion of training, the student should be able to integrate knowledge of clinical Naturopathy and *Yoga* with skills in research methodology to conduct and publish research studies in the field, to help shift the basis of Naturopathy and *Yoga* to an evidence-based science.

## **23.2 Research Methodology (50 hours)**

- 23.2.1 The research process. Methodology and methods.
- 23.2.2 The design of a study.
- 23.2.3 Literature review.
- 23.2.4 Ethics of research.
- 23.2.5 Types of common designs. Their advantages and disadvantages.
- 23.2.6 Sampling.
- 23.2.7 The experimental and quasi-experimental methods. Correlation studies.
- 23.2.8 Measurement tools: Observations, questionnaires and others.
- 23.2.9 Data organization in Excel and SPSS.
- 23.2.10 Descriptive statistics. Measures of central tendency, measures of dispersion.  
Correlation coefficients.
- 23.2.11 Graphical representations of data. Simple graphs, the box and whiskers plot.
- 23.2.12 Reliability. The different ways of measuring reliability.
- 23.2.13 Validity. Types of validity.



23.3 **Inferential Statistics and Probability Theory (20 hours)**

- 23.3.1 Inferential statistics – populations and samples.
- 23.3.2 Elementary concepts in probability theory
- 23.3.3 The normal distribution. Z-values and probability
- 23.3.4 Calculating probabilities when population parameters are known

23.4 **Research Reports (10 hours)**

- 23.4.1 Microsoft word, excel and power point
- 23.4.2 Reading research reports
- 23.4.3 Writing research reports
- 23.4.4 Presentations

23.5 **Other streams (20 hours)**

- 23.5.1 Inter-Disciplinary Research
- 23.5.2 Introduction to research in Management studies
- 23.5.3 Introduction to research in Education, History, and Anthropology.
- 23.5.4 Introduction to research in Social studies and Humanity.
- 23.5.5 Introduction to research in Linguistics
- 23.5.6 Introduction to research in Jurisprudence.
- 23.5.7 Introduction to research in Science and technology

23.6 **Practical**

- 23.6.1 Dissertation on any one research study (basic or clinical with sample size of minimum 10). Presentation of dissertation.
- 23.6.2 Research paper interpretation and presentation
- 23.6.3 Single case study from hospital

23.7 **Text Books:**

- 23.7.1 Kothari, C.R.: Research Methodology, Methods and Techniques(VishwaPrakashan, New Delhi, 1985)
- 23.7.2 Telles, S.: Research Methods (Swami Vivekananda YogaPrakashan, Bangalore)

23.8 **Reference:**

- 23.8.1 Robin Monro: *Yoga research bibliography scientific studies on Yoga and meditation*(Yoga Biomedical Trust, England 1989)
- 23.8.2 Michael H. Cohen: *Complementary and Alternative Medicine: Legal Boundaries and regulatory Perspectives* (Paperback - Aug 19, 1997)
- 23.8.3 Jerrold H. Zar: *Biostatistical Analysis person education.*
- 23.8.4 Russell A. Jones: *Research Methods in the Social and behavioral science* (Sinauer Associates, Saunderland's Massachusetts)
- 23.8.5 A.K. Singh: *Tests, Measurements and Research Methods in Behavioral Sciences* (BharatiBhavan Publishers)
- 23.8.6 J.N.S. Matthews: *An Introduction to randomized controlled clinical trials* (Arnold, London)
- 23.8.7 J.S.P. Lumley: *Research:- Some Ground Rules* W. Benjamin (Oxford University Press)
- 23.8.8 Herman J. Ader: *Research Methodology in the life, behavioral and social Sciences* Gideon J. Mellebeegh (SAGE Publications).

### 23.9 Scheme of Examination

S.No	Subject	Theory	Internal Assmt	Viva-Voce	Total	Practicals	Internal Assmt	Total Marks	Grand Total Marks
01.	Research Methodology	80	20	30	130	60	10	70	200

## **SECTION V**

### **TEACHING OF MEDICAL ETHICS IN BNYS COURSE**

#### **1. Introduction**

Medical ethics is a systematic effort to work within the ethos of medicine, which has traditionally been service to sick.

There is now a shift from the traditional individual patient doctor relationship of medical care. With the advances in science and technology and the needs of patients, their families and the community, there is an increased concern with the health of the society. There is a shift to greater accountability to the society. Doctors and other health professionals are confronted with many ethical problems. It is, therefore, necessary to be prepared to deal with these problems.

In keeping with its goal to improve quality of education, Rajiv Gandhi University of Health Sciences recommends introduction of medical ethics in the regular teaching of BNYS course beginning from first year and continuing till the end of internship.

#### **2. Objectives**

The objectives of teaching medical ethics should be to enable the students develop the students to develop the ability to:

1. Identify underlying ethical issues and problems in medical practice
2. Consider the alternatives under the given circumstances, and
3. Make decisions based on acceptable moral concepts and also traditions and practices

#### **3. Course contents (Syllabus)**

- a. Introduction to medical ethics
  - What are Ethics
  - What are values and norms
  - Relationship between being ethical and human fulfillment
  - How to form a value system in one's personal and professional life
  - **Heteronomous Ethics and Autonomous Ethics**
  - Freedom and Personal Responsibility
- b. Definition of Medical Ethics
  - Difference between medical ethics and bioethics

- Major principles of Medical Ethics:
- Beneficence = Fraternity
- Justice = Equality
- Self-determination (autonomy) = Liberty

c. Perspectives of Medical Ethics

- The Hippocratic Oath
- The Declaration of Helsinki
- The WHO Declaration of Geneva
- International Code of Medical Ethics (1983)
- Medical Council of India Code of Ethics

d. Ethics of the Individual

- Patient as a person
- Right to be respected
- Truth and confidentiality
- Autonomy of decision
- Concept of disease, health and healing
- Right to health
- Ethics of behavior modification
- Physician-patient relationship
- Organ donation

e. Ethics of Human Life

- What is human life?
- Criteria for distinguishing human and non-human
- Reasons for respecting human life
- Beginning of human life
- Conception, contraception

- Abortion
  - Prenatal sex-determination
  - In vitro Fertilization (IVF)
  - Artificial Insemination by Husband (AIH)
  - Artificial Insemination by Donor (AID)
  - Surrogate motherhood
  - Semen Intra fallopian Transfer (SIFT)
  - Gamete Intra fallopian Transfer (GIFT)
  - Zygote Intra fallopian Transfer (ZIFT)
  - Genetic Engineering
- f. Family and Society in Medical Ethics
- Ethics of human sexuality
  - Family planning perspectives
  - Prolongation of life
  - Advanced life directives – The Living Will
  - Euthanasia
  - Cancer and Terminal Care
- g. Death and Dying
- Use of life-support systems
  - Death awareness
  - The moment of death
  - Prolongation of life
  - Ordinary and extraordinary life support
  - Advanced life directives
  - Euthanasia – passive and active
  - Suicide – the ethical outlook

- The right to die with dignity

h.

#### Professional Ethics

- Code of conduct
- Contract and confidentiality
- Charging of fees, Fee-splitting
- Prescription of drugs
- Over-investigating the patient
- Low-cost drugs, vitamins and tonics
- Allocation of resources in health care

i. Research Ethics

- Animal and experimental research/humanness
- Human experimentation
- Human volunteer research – Informed
- Consent Drug Trials

j. Ethical Work-up of Cases

- Gathering all scientific factors
- Gathering all human factors
- Gathering all value factors
- Identifying areas of value – conflict
- Setting of priorities
- Working out criteria towards decisions

#### **4. Teaching/Learning Experience**

Classroom teaching would focus on professional relationship, patient-doctor relationship, issues at the beginning and end of life, reproductive technologies, resource allocation and health policy. It will also deal with values, ethical concepts and principles. Clinical ethics must be taught as part of bedside teaching. Group discussions, case studies, problem analyzing and problem solving exercises may also be employed.

The teacher involved in teaching ethics should show how the ethical principles are applied on a day-to-day and patient to patient basis by demonstrating by example, how to identify and resolve a particular problem, increasing the awareness and knowledge of students of students the value dimensions of interactions with patients, colleagues, relations and public.

Fostering the development of skills of analysis, decision making and judgment. Making the students aware of the need to respect the rights of the patient as also duties and responsibilities of the doctor

## 5. Evaluation

All major subjects should have at least one short answer question on Medical Ethics appropriate for the subject introduced in the University question paper, and a few questions may be asked in the viva voce examination, eg., basic principles of informed consent, confidentiality, etc.

## 6. Recommended Reading

- a. Francis CM, Medical Ethics, II Ed, 2004, Jaypee Brothers, New Delhi, Rs. 150/-
- b. Ethical Guidelines for Biomedical Research on Human Subjects, Indian Council of Medical Research, New Delhi. 2000.



**DIFFERENT METHODS RECOMMENDED FOR INTERNAL ASSESSMENT**

National Institute of Naturopathy (NIN), Pune, has given some examples of methods of Internal assessment of students, which may be followed by the colleges. They are:

1. Credit for preparation and presentation of seminars by students
2. Preparation of clinical case for presentation
3. Clinical case study/problem solving exercises
4. Participation in project for health care in the community
5. Proficiency in conduction a small research project or assignment
6. Multiple choice questions (MCQ) test after completion of a chapter/system

Each time shall be objectively assessed and recorded. Some of the items can be assigned as home work/vacation work.

**A COMPREHENSIVE LIST OF SKILLS RECOMMENDED AS DESIRABLE FOR BACHELOR OF NATUROPATHY AND YOGIC SCIENCES (BNYS) GRADUATE**

1. Clinical evaluation
  - a. To be able to take a proper and detailed history
  - b. To perform a complete and thorough physical examination and elicit clinical signs
  - c. To be able to properly use the stethoscope, blood pressure apparatus, otoscope, thermometer, nasal speculum, etc
  - d. To be able to perform internal examination-per rectum (PR), per-vaginum (PV), etc.
  - e. To arrive at a proper clinical diagnosis
2. Bedside diagnostic tests
  - a. To do and interpret hemoglobin (Hb), total count (TC), erythrocyte sedimentation rate (ESR), blood smear for parasites, urine examination/albumin/sugar/ketones/microscopy;
  - b. Stool exam for ova and cysts;
  - c. To do gram's stain and Ziehl-Neelsen stain for AFB;
  - d. To do skin smear for leprae bacilli;
  - e. To do and examine a wet film vaginal smear for Trichomonas;
  - f. To do a skin scraping and potassium hydroxide (KOH) stain for fungal infections;
  - g. To perform and read Mantoux test.
3. Ability to carry out procedures
  - a. To conduct CPR (Cardiopulmonary resuscitation) and First Aid in newborns, children and adults
  - b. To administer enema
4. Paediatrics
  - a. To assess newborns and recognize abnormalities and IU retardation
  - b. To teach infant feeding to mothers

- c. To monitor growth by the use of 'road to health chart' and to recognize development retardation
- d. To assess dehydration and prepare and administer Oral Rehydration Therapy (ORT)
- e. To recognize ARI clinically

#### 5. Community Health

- a. To be able to supervise and motivate community and para-professionals for corporate efforts for health care
- b. To be able to carry on managerial responsibilities, e.g., Management of stores, indenting, stock keeping and accounting
- c. Planning and management of health camps
- d. Implementation of national health programmes
- e. To effect proper sanitation measures in the community, e.g., disposal of infected garbage, chlorination of drinking water
- f. To identify and institute control measures for epidemics including its proper data collecting and reporting

#### 6. Management of emergencies

- a. To manage acute anaphylactic shock
- b. To manage peripheral vascular failure and shock
- c. To manage acute pulmonary edema and LVF
- d. Emergency management of drowning, poisoning and seizures
- e. Emergency management of bronchial asthma and status asthmaticus
- f. Emergency management of hyperpyrexia
- g. Emergency management of comatose patients regarding airways, positioning prevention of aspiration and injuries
- h. Assess and administer emergency management of burns

# **School of Education**



## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Education**

### **Ordinances, Regulations & Syllabus**

**For**

### **Bachelor of Education (B.Ed.) Two Year Programme Annual Pattern**

**(w.e.f. session 2021-22)**

**Revised and Approved in the year 2021**

**(Board of Studies; 28.06.2021)**

## ***Programme Educational Objectives (PEOs)***

- PEO 1** To enable the prospective teachers to understand the nature purpose and Philosophy of School Education.
- PEO 2** To acquire knowledge and develop an understanding of various aspects of school management.
- PEO 3** To change the behavior, attitude and values through which learners can make responsible and accountable agents of society
- PEO 4** To provide a rich programme of curricular and extra- curricular activities for overall development of learner's personalities.
- PEO 5** To prepare prospective teachers to understand psychological and sociological aspects of child's development.
- PEO 6** To enable the learners to gain in-depth conceptual knowledge in the area of education at primary and secondary levels
- PEO 7** To prepare up-coming teachers to understand child's behavior under different condition.
- PEO 8** To make familiar student- teachers to various teaching methodologies prevailing across the world.
- PEO 9** To sensitize student- teachers about various social and educational issues.
- PEO 10** To enable them to be more creative in their outlook as teachers and to be positive in their attitude and approach.
- PEO 11** To develop competencies and skills required for becoming a reflective and humane teacher.
- PEO 12** To sensitize them towards the promotion of social cohesion National integration and International understanding
- PEO 13** To develop communication skills, train them to use modern information and communication technology for school purposes
- PEO 14** To train them in conducting action research in educational situation and to improve the pedagogical practices in their subjects.

### ***Programme Specific Objectives (PSO's)***

**PSO 1** Problem Solving Skills – Learners will be able to develop reflective and analytical skills and understanding of critical issues of education.

**PSO 2** Professional Skills – Learners will be able to build skills and abilities of communication, reflection, art, aesthetics, and self-expression.

**PSO 3** Successful Career – Learners will exhibit contemporary knowledge in education and will be competent to work in private and government institutions.

**PSO 4** The Teacher and Society – Learners will be able to develop understanding about child's pedagogy, school management and community involvement.

### ***Programme Outcome Objectives (POO's)***

**POO 1** Teaching knowledge: To be able to use learner centered teaching methods and to assess children's learning ability using different pathways.

**POO 2** Problem analysis: To enable the prospective teachers to deal with both the personal and academic problems of students.

**POO 3** Design/ development of solutions: To be able to find and develop the solution of problems of learners related to teaching field.

**POO 4** Conduct investigations of complex problems: Being able to understand and investigate complex problems and find out their solutions.

**POO 5** Modern tool usage: To be able to adopt modern techniques for teaching skill development.

**POO 6** The teacher and society: To be able to engage with self, child, community and school to establish close connections between different curricular areas.

**POO 7** Environment and sustainability: To develop the knowledge, skills, values, attitudes and behavior among students to understand and care for their environment.

**POO 8** Ethics: To be able to develop possible ethical boundaries and values perceived by learners in teaching institutions.

**POO 9** Individual and team work: Student-teacher will be able to share insights, work together productively and efficiently to reach their goal and attain a positive outcome.

**POO 10** Communication: To be able to develop a strong sense of wellbeing and effective communicators and to communicate effectively, verbally as well as in writing.

**POO 11** Project management and finance: Being able to develop projects related to curriculum and study the financial needs and find the ways to meet them.

**POO 12** Life-long learning: Being able to demonstrate reading, writing, listening and speaking skills and also develop an ability to reflect on their own understanding.

## *Course Structure*

The present B.Ed. syllabus for two-year programme has been designed on the current guidelines of NCTE & UGC with the view to make the student-teachers reflective practitioners. The programme is comprised of three broad inter-related curricular areas: -

- (A) : Perspectives in Education: Core Courses (CC)
- (B) : Curriculum and Pedagogic Studies: Pedagogy Courses (PC)
- (C) : Engagement with the Field/Practicum (EF)

Transaction of the courses is to be done using a variety of approaches, such as tasks and assignments, projects, group discussion, seminar, interactions with community in multiple socio-cultural environments.

### **Group (A): Perspectives in Education- Core Courses (CC)**

These courses are intended to provide a conceptual understanding of relevant concepts and processes in teacher education and also situate them in the broader perspective of education and development.

#### **CC 1: Contemporary India and Education**

This course deals with conceptual understanding about issues of diversity, inequality and marginalization in Indian society, the implications for education with analysis of significant policy debates in Indian education.

#### **CC 2: Philosophical & Sociological Perspectives of Education**

This course deals with philosophical and sociological issues and provides an opportunity to understand and reflect on the vision of education as well as cultural context within which education operates.

#### **CC 3: Growing up as a Learner**

This course deals with individual development, nature and process of learning and an understanding of how learning and cognition are closely inter-related throughout individual development process.

#### **CC 4: Teacher, Teaching and Technology**

This course deals with rules and expectations of teachers in the form of accountability and code of ethics and the nature and various aspects of the teaching process in view of the professional development of the teacher.

#### **CC 5: Creating an Inclusive School**

This course deals with understanding of the cultures, policies and practices that need to be addressed in order to create an inclusive school and identify & utilize existing resources for promoting inclusive practices.

#### **CC 6: Gender, School and Society**

This course deals with meaning and experience of being a boy or a girl across different social groups, regions and time-periods. It also deals with gender inequalities through a variety of institutions such as the family, caste, religion, culture, the media and popular culture, law and the state.

#### **CC 7: Knowledge, Language and Curriculum**

This course deals with meaning, nature and sources of knowledge, to develop the ability of reading, comprehension and writing skills & to understand concepts and principles of curriculum development.



## **Group (B): Curriculum and Pedagogic Studies- Pedagogy Courses (PC)**

These courses pertain mainly to help student-teachers become effective teachers. For this, it offers the student-teachers not only reorganize one's previous understanding of one's subject of specialization but also the pedagogy as the integration of knowledge about the learner, the discipline and the societal context of learning, so that they may try out evolving a few learning situations and carry them out both in simulated as well as real situations.

### **PC 1 & PC 2: Pedagogy of School Subjects - I & II – Optional Courses**

These courses intend to enable student-teachers to recognize the nature of knowledge in various subject areas i.e. Sciences (Physical/Biological/Mathematics), Social Sciences, Languages (Hindi/English/Sanskrit), Commerce, Home Science, Computer Science and will help in developing & understanding of the pedagogical requirements in various teaching-learning situations. Each student-teacher will choose two School Subjects on the bases of his/her Graduation Stream.

### **PC 3: Assessment for Learning**

This course intends to lead to an understanding and appreciation of the relevance of assessment the how and why of it, as well as develop necessary competence in involving appropriate assessment modes in line with learning objectives. It also clarifies the significant shift in emphasis of the terms 'assessment for learning' as against 'assessment of learning.

### **PC 4: Optional Courses – any one of the following**

- I. Educational Administration and Management
- II. Guidance and Counseling
- III. Environmental Education
- IV. Computer Education
- V. Health, Physical Education and Yoga
- VI. Life Style Management
- VII. Peace Education
- VIII. Value Education
- IX. Adult and Population Education
- X. School Leadership

## **Group (C): Engagement with the Field/Practicum (EF)**

### **EF 1: Task and Assignment**

Task and Assignments that run through all the courses CC 1-7 and PC 3-4.

### **EF 2: Practicum**

#### **(A): Preparation to Function as a Teacher (Teaching Skills)**

This is visualized as a shorter-duration initial experience (5 weeks) of student-teachers to train in lesson-planning based on constructivist approach, micro-teaching skills and playing the role of teacher in simulated condition as well as in real classroom situation. It will help him/her to prepare himself/herself as a teacher possessing teaching skills.

#### **(B): School Internship**

This is visualized as a longer-duration field experience (16 weeks) of student-teachers supported by relevant interactive exposures within the school. During this period he/she will teach in the school, observe and participate in the day-to-day functioning of school, prepare a Journal containing day-to-day report about all activities including evaluation tools, and conduct an Action Research Project based on any school problem. It will help him/her to become a professional teacher, possessing teaching-competence.

### **EF 3: Enhancing Professional Capacities: Optional Courses**

A part from conceptual and practical learning gained through Core Courses (CC) and Pedagogy Courses (PC), student-teachers need to develop professional competencies and to experience the fact that the teacher is much more than someone who teaches a subject. The teacher is potentially a participant in the wider education system and he/she may play not only a proactive role in the community life of the school but also as an agent of social development and social transformation. It includes a number of experiences that will enhance the capacity of student-teachers in various essential dimensions. Each student-teacher will choose any three EPC activities in each year i.e. three in first year & three in second year.

EPC 1: Strengthening Language Proficiency

EPC 2: Art and Aesthetics

EPC 3: Reading and Reflecting on Texts

EPC 4: Understanding of ICT

EPC 5: Scouting and Guiding

EPC 6: Working with Community

EPC 7: Basics of Research

EPC 8: Drama and Art in Education

EPC 9: Entrepreneurship Development

## **Papers in the First Year**

### **From Group (A):**

Four compulsory papers as-

1. Contemporary India and Education
2. Philosophical & Sociological Perspectives of Education
3. Growing up as a Learner
4. Teacher Teaching Technology

### **From Group (B):**

Two Papers as PC 1 & 2 (Pedagogy of School Subjects - I & II)

(PC 1 & PC 2) These courses intend to enable student-teachers to recognize the nature of knowledge in various subject areas i.e. Sciences (Physical/Biological/Mathematics), Social Sciences, Languages (Hindi/English/Sanskrit), Commerce, Home Science, Computer Science and will help in developing & understanding of the pedagogical requirements in various teaching-learning situations. Each student-teacher will choose two School Subjects on the bases of his/her Graduation Stream.

### **From Group (C):**

#### **EF 1: Task and Assignment**

Task and Assignments that run through all the courses CC 1-4 and PC 1 & 2.

#### **EF 2: Practicum (A): Preparation to Function as a Teacher (Teaching Skills)**

#### **EF 3: Enhancing Professional Capacities: Optional Courses**

Each student-teacher will choose any three EPC activities in first year.

## **Papers in the Second Year**

### **From Group (A):**

Three compulsory papers as-

1. Creating an Inclusive School.
2. Gender, School and Society.
3. Knowledge, Language and Curriculum.

### **From Group (B):**

Two Papers as PC-3 (Assessment for Learning) & PC-4 (Optional Courses)

### **From Group (C):**

#### **EF 1: Task and Assignment**

Task and Assignments that run through all the courses CC 5-7 and PC 3 & 4.

#### **EF 2: Practicum (B): School Internship**

#### **EF 3: Enhancing Professional Capacities: Optional Courses**

Each student-teacher will choose any three EPC activities in second year.

**B.Ed. SYLLABUS FRAMEWORK**  
(Based on NCTE Regulations 2014)

**B.Ed. FIRST YEAR**

<b>Course Code</b>	<b>Title of the Course</b>	<b>Credits</b>	<b>Hours</b>	<b>Marks (External +Internal)</b>
<b>Perspectives of Education – Core Courses</b>				
E 101	CC 1: Contemporary India and Education	4	96	80+20
E 102	CC 2: Philosophical and Sociological Perspectives of Education	4	96	80+20
E 103	CC 3: Growing up as a Learner	4	96	80+20
E 104	CC 4: Teacher, Teaching and Technology	4	96	80+20
<b>Pedagogical Courses- Optional*</b>				
E 201 to 210	PC 1& 2: Pedagogy of School Subjects (Any two from the Table No. 1)	8 (4+4)	192(96+96)	80+20 80+20
<b>Engagement with the Field/Practicum</b>				
E 701	EF 2(A): Preparation to Function as a Teacher	4	8 weeks	80+20
E 702	Viva- Voce Examination based on 1. Task and Assignments that run through all the courses CC 1-4 and PC 1 & 2 2 EPC Activities of First Year*	2	4 weeks	80+20
<b>TOTAL</b>		<b>30</b>	<b>576 Hours + 12 Weeks</b>	<b>800</b>

## B.Ed. Second Year

Course Code	Title of the Course	Credits	Hours	Marks (External +Internal)
<b>Perspectives of Education – Core Courses</b>				
E 301	CC 5: Creating an Inclusive School	3	72	40+10
E 302	CC 6: Gender, School and Society	3	72	40+10
E 303	CC 7: Knowledge, Language and Curriculum	3	72	40+10
<b>Pedagogical Courses</b>				
E 401	PC 3 Assessment for Learning	4	96	80+20
E 501 to 506	PC 4 (Optional Courses)* (Any one from the Table No. 2)	3	72	40+10
<b>Engagement with the Field/Practicum</b>				
E 703	EF 2(B): School Internship*	8	16 weeks	160+40
E 704	Viva- Voce Examination based on 1. Task and Assignments that run through all the courses CC 5-7 and PC 3 & 4 2 EPC Activities of Second Year*	2	4 weeks	80+20
<b>TOTAL</b>		<b>26</b>	<b>432 Hours + 20 weeks</b>	<b>600</b>

**Note: 1 Credit = 24 Hours (Theory), 1 Credit = 2 Weeks (Practical)**

**Table No. 1**  
**PC 1 & 2: Pedagogical Courses- Optional**

These courses intend to enable student-teachers to recognize the nature of knowledge in various subject areas i.e. Sciences (Physical/Biological/Mathematics), Social Sciences, Languages (Hindi/English/Sanskrit), Commerce, Home Science, Computer Science and will help in developing & understanding of the pedagogical requirements in various teaching-learning situations. Each student-teacher will choose two school subjects on the bases of his/her Graduation Stream.

S. No.	Paper Code	Paper Name
1.	E 201	Pedagogy of Hindi
2.	E 202	Pedagogy of English
3.	E 203	Pedagogy of Sanskrit
4.	E 204	Pedagogy of Social Sciences
5.	E 205	Pedagogy of Mathematics
6.	E 206	Pedagogy of Physical Science
7.	E 207	Pedagogy of Biological Sciences
8.	E 208	Pedagogy of Computer Science
9.	E 209	Pedagogy of Home Science
10.	E 210	Pedagogy of Commerce

**Table No. 2**  
**PC-4: Optional Courses**

Each student-teacher will choose one paper from the following list.

S. No.	Paper Code	Paper Name
1.	E 501	Educational Administration and Management
2.	E 502	Guidance and Counseling
3.	E 503	Environmental Education
4.	E 504	Computer Education
5.	E 505	Health, Physical Education & Yoga
6.	E 506	Life Style Management
7.	E 507	Peace Education
8.	E 508	Value Education
9.	E 509	Adult and Population Education
10.	E 510	School Leadership

### *Ordinance and Regulations*

#### **A. Duration Of Course**

1. Bachelor of Education (B.Ed.) course shall be a two-year full time professional pre-service teacher education programme with two year divided in yearly course and the examination shall be held at the end of each year.
2. First year shall be from 25<sup>th</sup> August to 30<sup>th</sup> April and the stretch of the second year shall be from 25<sup>th</sup> July to 20<sup>th</sup> April. At the end of each year the candidates shall be required to present themselves for examination.
3. It shall be a full-time course including Theory, Practice in teaching, internship, field work, professional development and other prescribed activities.

#### **B. Total Intake**

Total intake of B.Ed. course in the School of Education, Shobhit University, Gangoh shall be 100 as per NCTE norms.

#### **C. Eligibility Criteria**

The eligibility requirement for the admission of the candidates to B.Ed. course shall be in accordance with the eligibility criteria determine by NCTE/ U.P. Govt. Order issued from time to time.

#### **D. Procedure of Admission**

1. Admission to B.Ed. course shall be made in accordance with N.C.T.E rules and notifications issued from time to time.
2. Reservation of seats shall be as per N.C.T.E notifications.

#### **E. Academic Session**

First year of Bachelor of Education (B.Ed.) programme shall be Eight months long 25<sup>th</sup> August to 30<sup>th</sup> April excluding year-end examination and ten days winter break. Second year of Bachelor of Education (B.Ed.) programme shall be eight and half month long (25<sup>th</sup> July to 30<sup>th</sup> April).

## **F. Classification of Successful Candidates**

1. No candidate shall be declared to be passed B.Ed. examination unless he/she secures 40% marks in aggregate of all the theory courses and 50% marks in practically separately for each academic session.
2. The division shall be determined on the aggregate of marks of all the courses prescribed for the degree separately in theory and practical in both the years as under:

<b>Division in theory &amp; Practical separately</b>	<b>Percentage of marks</b>
First division	60% or above
Second division	50% or above but below 60%
Third division in theory only	40% or above but below 50%

Note: The student will be awarded divisions separately in Theory & Practical Examination.

## **G. Examination: Rules And Regulations**

1. Students who have completed their course for the Bachelor of Education (B.Ed.) First yearly but have failed to appear/ pass the yearly examination will be allowed to re-appear in the subsequent First yearly examination. Those who fail to appear/ pass in any paper in the second yearly may be permitted to appear at the next year' examination without further attendance at lectures if their applications for permission meet with the approval of the Head of the School of Education and the Dean, Faculty of Education.
2. Candidates allowed to appear at the Bachelor of Education (B.Ed.) yearly examination under this ordinance as exempted candidates shall be required to pay the examination fee as prescribed by the University.
3. There shall be a Yearly-End examination and each student has to appear in all papers/ including Theory, Practical's, and Practice in teaching, internship, field work, and professional development.
4. Those candidates who pass a yearly examination can appear for improvement in only one theory paper of a yearly at the next Back Paper/ Regular examination of that yearly and not thereafter. However, the improvement facility will not be given in all the papers prescribed in the course.
5. Students of following categories shall be 'Eligible for Back Paper (EBP)'. An EBP candidate shall be promoted to next yearly. The back paper facility in a yearly provides promotion to the next yearly and another opportunity to obtain a minimum of the pass marks assigned for an individual paper or in the aggregate.
6. The candidates who fail to secure an aggregate of 50% of the maximum marks for a yearly but have obtained 40% of the maximum marks assigned to each of their papers may appear in all the papers as exempted candidate or may appear in only one theory paper of his choice as EBP candidate to secure a minimum in the aggregate.
7. The candidates who secure an aggregate of 50% of the maximum marks for a yearly but fail to secure a minimum of 40% of the maximum marks in one out of four papers prescribed for the yearly papers or in case where there are more than four papers prescribed for the yearly, the candidates who have failed in two theory papers or have failed in one theory paper shall be declared 'EBP'. Such candidates will appear only in their unclear papers.
8. A candidate with two out of three or three out of four unclear papers in his/ her first yearly examination shall be declared 'Failed' but will be promoted to the second yearly but not beyond till he/ she becomes a candidate under 3 or 4 by appearing as an exempted candidate in the next Back paper/ Regular examination of that yearly and not thereafter. Such a promotion from third to fourth yearly shall also be
9. The back paper facility will not be given to a candidate if the number of his unclear papers in all of his previous yearly examinations exceeds three.



10. The examination for the degree of the bachelor of education shall include: Theory of Examination, practice in teaching examination and practical examination, internship and professional development activities.
11. The students shall be required to complete their practice- in- teaching work, the prescribed Practical work, internship, field work, and other activities as per regular schedule of the department and the institution.

If candidate after completing the required percentage of attendance fails to appear in theory or in practical or both, he /she will be considered as ex-student in both theory as well as practical without attending further regular classes in the first or second year respectively.

12. A candidate shall be required to offer the course as prescribed in the syllabus. The theory courses shall carry 100 or 50 maximum marks in both the years. The practical course (E 701) EF 2(A): Preparation to function as a Teacher & E 702 Viva- Voce Examination based on 1. Task and Assignments that run through all the courses CC 1-4 and PC 1 & 2 will be of 200 marks in the first year, out of these 40 marks will be evaluated internally by the subject supervisors respectively and the remaining 160 marks by the board of examiners. In the same way, the practical course (E 703) EF 2(B): School Internship & E 704 Viva- Voce Examination based on 1. Task and Assignments that run through all the courses CC 5-7 and PC 3 & 4 will be of 300 marks in the second year, out of those 60 marks will be evaluated internally by the subject supervisors respectively and the remaining 240 marks by the board of examiners.
13. For a pass, a candidate is required to be obtain at least 40% marks in each paper with a minimum of 40% marks in external and internal assessment separately and 40% in the total aggregate in theory, 50% marks in external and internal assessment in practical separately and 50% in the total aggregate in practical in each year.
14. A candidate who has passed the B.Ed. first year examination may reappear in maximum two theory paper(s) of first year along with the second year examination in the immediately following year and in that case better performance in each such paper will be counted for working out the result.
15. A candidate who has passed the B.Ed. second year examination may reappear in maximum two theory paper of second year in the immediately following year and in that case better performance in each such paper will be counted for working out the result.
16. Candidates are given only one chance to reappear at the same examination for the purpose of improvement of performance in the immediately following year.

<b>Year</b>	<b>Marks</b>
First Year	800 (600 Theory + 200 Practical)
Second Year	600 (300 Theory + 300 Practical)
<b>Total</b>	<b>1400</b>

17. If a candidate fails in one or two paper of the first year examination, he/she may appear at the second year B.Ed. examination along with the one or two the failing paper(s) of the first year examination simultaneously. In case, he/she does not pass the failing paper(s) of the first year examination even at this chance, he/she will be required to reappear at the first year examination in full.

18. In the same way, if a candidate fails in one or two paper(s) of second year examination, he/she will have to appear in one/two paper(s) of the second year in the immediately following year .in case, he/she will be required to appear at the second year examination in full.
19. Each theory paper shall carry 100/50 marks which are allocated in the proportion of 80: 20 for year-end theory examination.
20. The division of marks in two year of Bachelor of Education (B.Ed.) programme shall be as follows:
  - Theory Papers 900 marks
  - Practice in Teaching Examination with 500 marks.
21. The medium of the written exam shall be Hindi or English only.

## H. Awards of Degree

The degree, Bachelor of Education (B.Ed.) shall be awarded by Shobhit University, Gangoh to candidates who have pursued a regular course of study in the university and have fulfilled all the conditions and have passed the prescribed examinations.

## I. Evaluation Scheme

The performance of the candidates appearing in B.Ed. examination will be evaluated as follows:

1. The evaluation of B.Ed. pupil teacher will be done in 1400 marks the division will be awarded separately in theory out of 900 marks and in practical out of 500 marks.
2. The theory part in all the papers **Perspectives in Education: Core Courses (CC) & Curriculum and Pedagogic Studies: Pedagogy Courses (PC)** will be evaluated through a system of external examination (80%) and internal Assessment (20%). The internal assessment will be based on Sessional Examinations (10%), Assignments (5%) & Attendance (5%) for each paper. The External Examination will be through the routine annual university examination, based on 03 essay type questions (48 marks), 04 short questions (16 marks) and 08 very short answer type questions (16 marks).
3. During the first-year evaluation procedure for the practical as follows:
  - (a) Evaluation procedure for paper **(E 701)-EF 2: Practicum (A): Preparation to Function as a Teacher**, a board of two examiners comprising one as Internal Examiner of concerned department & second one as External Examiner from any other University. Examiners will assess student separately and average of total sum of marks will be his\her final score in teaching skill out of 80 external marks and internal marks 20 marks will be given by two subject supervisors.
  - (b) For evaluation procedure paper **(E 702)-Viva- Voce Examination** of 80 marks will be conducted by the board of examiners & internal 20 marks given by respective supervisors.
4. During the second year, evaluation procedure for the practical will be as follows:
  - (a) Evaluation procedure for paper **(E 703)- EF 2(B): School Internship**, a board of two examiners comprising one as Internal Examiner of concerned department & second one as External Examiner from any other University, will assess the journal ,the portfolio and the final presentation of teaching of students through PPT or OHP separately and average of total sum of marks will be her final score in teaching competence out of 160 external marks and internal 40 marks will be given by the subject supervisors .it will be divide as follows:
    - i. The Journal of 50 marks (10+40).
    - ii. The Portfolio of 50 marks (10+40).
    - iii. Final presentation through PPT/OHP of each school subject 100 marks (20+80).
  - (b) Evaluation procedure for paper **(E 704)-Viva- Voce Examination** of 80 marks will be conduct by the board of examiners and internal 20 marks will be given by the respective supervisors.

## **5. Continuous and Comprehensive Evaluation (C.C.E)**

(a) In each paper the continuous internal assessment system would have a weightage of 20% marks, while the yearly end examination shall have a weightage of 80% marks.

(b) The weightage of components in continuous internal assessment system will be as under:

- Sessional Examination	10 %
- Assignment and Presentation	05 %
- Attendance	05 %

(c) It shall be the duty of the teacher/teachers to conduct Continuous and comprehensive Evaluation. In case more than one teacher is sharing the teaching work in a paper, each teacher shall evaluate independently but total weightage should be 20 %.

## **J. Attendance**

The B.Ed. program shall be of duration of two academic years, which can be completed in a maximum of three year. The minimum attendance of student teacher shall have to be 75% for all course work and 90% for Practicum/School Internship.

## **B.Ed. I Year Syllabus**

### **Core Course (CC-1)**

#### **CONTEMPORARY INDIA & EDUCATION (E-101)**

#### **CO: COURSE OUTCOMES**

**CO-1** Understand that development of education is influenced by socio-political forces of the time.

**CO-2** Acquire the knowledge of features of education in ancient, medieval and pre-independent period in India with their strengths and weaknesses.

**CO-3** Understand the contribution of various Committees and Commissions on education set up from time to time in the economic development of India.

**CO-4** Appreciate the developments of Indian Education in the Post Independent Period

#### **Course Contents**

##### **Unit - I: Education in India**

- ❖ Vedic Period, Buddhist Period and Medieval Period

##### **Unit - II: Policy Framework of Education in Pre-Independent Period**

- ❖ Macaulay's, Minutes (1835), Wood Dispatch (1854), Hunter Commission (1882) and Indianisation of Education, National Education Movement, Lord Curzon Policy (1902), Gokhle Bill (1910), Sadler Commission (1917), Hartog Committee (1929), **Basic Education (1937)**, **Sargent Report (1944)**

##### **Unit - III: Policy Framework of Education in Post-Independent Period**

- ❖ University Education Commission (1948-49)
- ❖ Secondary Education Commission (1952-53)
- ❖ Indian Education Commission (1964-66) in the context of Industrialization
- ❖ National Policy of Education (1986) and its review (1992) in the context of Liberalization and Globalization of Indian Economy
- ❖ National Curriculum Framework (2005)
- ❖ **National Knowledge Commission (2007)**

##### **Unit - IV: Elementary Education**

- ❖ Universalization (Provision, Enrolment, Retention, Success), Wastage and Stagnation, Education for all (Sarva Shiksha Abhiyan), Minimum Level of Learning (MLL), **Review of Mid-Day Meal Programme**, Kasturba Balika Yojna, RTE (2009)

##### **Unit - V: Secondary Education**

- ❖ Expansion, differentiation of curricula between boys and girls, discrimination of curricula, Vocationalization of education

##### **Unit - VI: Current Issues**

- ❖ University autonomy, privatization of education, commercialization of education
- ❖ Education of marginalized groups-women, scheduled caste, **tribes, minorities**
- ❖ Medium of schooling- Three Language Formula
- ❖ Population Education.

### **Suggested Readings:**

- Aggarwal, J.C. (2013) Landmarks in the History of Modern Indian Education, Vikas Publishing House, New Delhi.
- Chauhan, C.P.S. (2013) Modern Indian Education: Policies, Progress and Problems. New Delhi: Kanishka Publishers and Distributors.
- Dash, M. (2004) Education in India: Problems and Perspectives. Atlantic Publishers, New Delhi
- Ghosh, S. C. (2007) The History of Education in Modern India: 1757-2007. Orient Black Swan Private Limited, New Delhi
- Kohli, V.K. (1996) Indian Education and its Problems. Vivek Publishers, Ambala. 51
- Kumar, Rajiv and Kumar, Narendra (2013) Higher Education in India. New Delhi: Atlantic Publishers

### **Core Course (CC-2)**

#### **PHILOSOPHICAL & SOCIOLOGICAL PERSPECTIVES OF EDUCATION (E-102)**

#### **CO: COURSE OUTCOMES**

**CO1-** Answer three basic questions-what ? why & How of the Education.

**CO2-** Develop an understanding of contribution of Indian & Western philosopher.

**CO3-** Build their own view about different Indian Religion and respect them.

**CO4-** Describe the role of Education in desirable social change and socio-economic development.

**CO5-** Transform one-self and society to empower people to assure responsibilities for creating sustainable future.

#### **Course Contents**

##### **Unit - I: Education and Knowledge**

- ❖ Education – meaning, nature and modes-Formal, Informal and Non-formal
- ❖ Purposes of education-individual development or **social transformation**
- ❖ Knowledge-meaning and ways of knowing
- ❖ Forms of knowledge-local & universal, concrete & abstract, theoretical & practical, contextual & textual, school & out-of-school

##### **Unit - II: Education and Philosophy**

- ❖ Philosophy of Education-meaning and significance in the context of aims of education, curriculum, **methods of teaching and discipline**
- ❖ Major schools of thoughts and their impact on education.
  - (i) Idealism, Naturalism, Realism, Pragmatism and Humanism.
  - (ii) Sankhya, Yog and Advaita philosophy

##### **Unit - III: Education and Society**

- ❖ Educational sociology – meaning, nature and socialization of the child
- ❖ Education as a means of social change and social welfare
- ❖ Education as a means of human resource development and **economical development.**
- ❖ Meaning of a new social order and modernization of education

##### **Unit - IV: Educational Thoughts: Indian & Western Thinkers**

- ❖ MK Gandhi, Tagore, Aurobindo, Vivekanand, J.Krishnamurthy & Giju Bhai
- ❖ Aristotle, Socrates, Plato, Rousseau, Dewey, Froebel & Montessori

## **Unit - V: Education and Values**

- ❖ Values – meaning, nature & types.
- ❖ Source of values – The Constitution of India, democracy, secularism, fundamental rights & duties, directive principles, constitutional provisions for education.
- ❖ Education for peace – issues of national and international conflicts, social injustice, communal conflicts harmony, individual alienation, **role of individuals in making peace away of life**

## **Unit - VI: Education for National Integration**

- ❖ National integration – meaning and need, role of teacher, institutions and cultural heritage, regional expectation and aspiration
- ❖ Role of celebration of Indian festivals

### **Suggested Readings:**

- Giddens, Anthony (1990). Sociology. Cambridge, UK: Polity Press.
- Gupta, Dipankar (1989). Social stratification. New Delhi, India: Oxford University Press.
- Horton, P.B. & Hunt, C.B. (1987). Sociology. Singapore: McGraw-Hill.
- Haralamboss, Michael (1989). Sociology, Themes and Perspectives. New Delhi, India: Oxford University Press.
- Kolenda, Pauline (1997). Caste in Contemporary India, Beyond Organic Solidarity. Jaipur, India: Rawat Publications.
- Kamat, A.R. (1985). Education and Social Change in India. Bombay, India: Somaiya Publication.

## **Core Course (CC-3)**

### **GROWING UP AS A LEARNER (E-103)**

#### **CO: COURSE OUTCOMES**

- CO1-** Acquire the basic principles of psychology of learners.
- CO2-** Understands learner characteristics and implications for teaching-learning.
- CO3-** Understand learner's mental health problems & choose appropriate strategies to cope with such problems.
- CO4-** Apply various psychological principles and approaches to learning.
- CO5-** Appreciate the role of psychology in the teaching-learning process.

#### **Course Contents**

### **Unit - I: Psychology and learner**

- ❖ Psychology – its meaning, nature and scope
- ❖ Educational psychology – meaning, scope and its relevance for teachers, teaching and learning.
- ❖ Individual differences – concept & types-mentally retarded, backward, delinquent, gifted, slow learner, **under-achievers, strategies to meet the differences**

### **Unit - II: Human Development**

- ❖ Concept & stages of development – infancy, childhood, adolescence
- ❖ Types of development- physical, cognitive social, emotional, moral with reference to Piaget.

### **Unit - III: Learning**

- ❖ Concept & theories of learning and its implications – Thorndike, Pavlov, Kohler, Skinner, Lewin

### **Unit - IV: Mental Health**

- ❖ Concepts and factors affecting mental health, ways of improving mental health
- ❖ Adjustment and ways for reducing maladjustment, defence mechanism

### **Unit - V: Personality**

- ❖ Concept, dimensions and theories of personality- psycho-analytic, trait, type
- ❖ Measurement of personality- projective techniques

### **Unit - VI: Intelligence and Creativity**

- ❖ Intelligence-meaning, nature and measurement
- ❖ Types of intelligence with reference to multiple intelligence and emotional intelligence, social intelligence
- ❖ Creativity – meaning, nature and measurement, techniques for fostering creativity

#### **Suggested Readings :**

- Aries, P. (1965). Centuries of Childhood-A social history of the family life. RandomHouse Inc. Chapter 1: The Ages of Life, Chapter 2: The Discovery of Childhood,
- Cole, M., Cole, S. R. and Lightfoot, C. (2004). The Development of Children. New York: Worth Publishers. Chapter 1: The study of Human Development.
- Harris, M. and Butterworth, G (2002) The two concepts of childhood ,Developmental Psychology: a student's handbook. New York: Taylor & Francis. Chapter 1: A Brief History of Developmental Psychology.
- Newman, B. M. and Newman, P.H. (2007). Theories of Human Development. London: Lawrence Erlbaum Associates, publishers. Chapter 1: Introduction.
- Saraswathi, T.S. (Ed.) (1999). Culture, Socialization and Human Development: Theory, Research and Applications in India. Sage publications.

### **Core Course (CC-4)**

#### **TEACHER, TEACHING AND TECHNOLOGY (E-104)**

#### **CO: COURSE OUTCOMES**

**CO1-** Acquire theoretical basis of educational technology and to develop awareness about recent developments in the areas of educational technology

**CO2-** Equip them with various technologies to apply for improving instructional practices

**CO3-** Develop teaching skill required for effective instructional and institutional management.

**CO4-** Manage teaching and learning effectively and efficiently.

**CO5-** Identify and implement instructional strategies in different situations.

#### **Course Contents**

#### **Unit - I: Technology and Teaching**

- ❖ Educational technology-meaning, concept and types-hardware, software, systems approach,

- ❖ Types of educational technology -teaching technology, instructional technology and behavioral technology, information communication technology
- ❖ Programmed instruction- concept, principles, assumptions and types – linear and branching
- ❖ **Development and validation of programmed instruction**

### **Unit - II: Task of Teaching**

- ❖ Phases of teaching and its operations-pre-active, inter-active & post-active
- ❖ Levels of teaching-memory, understanding and reflective

### **Unit III: Teaching Aids and Teaching**

- ❖ Teaching aids-meaning, need, types-projected, non-projected, electronic
- ❖ Multi-sensory teaching-meaning and importance
- ❖ Edgar Dale's Cone of experience
- ❖ Audio-visual equipment's-OHP Projector, audio-video recording instruments, radio, television, **computer, LCD projector**
- ❖ Use of teaching-learning technologies – Tele-conferencing (Face to Face Distance mode of Education), language laboratory, e-mail, internet, smart classes, **CAI, open educational resources (OER)**

### **Unit - IV: Management of Learning and Teaching**

- ❖ Planning
- ❖ Organizing
- ❖ Leading
- ❖ Controlling

### **Unit - V: Strategies of Teaching**

- ❖ Concept and classification, different teaching strategies - lecture, demonstration, heuristic, discovery, project, assignment, tutorial, group work, brain-storming, role playing, **team teaching**

### **Unit - VI: Modification of Teacher Behavior**

- ❖ Modification of teacher behavior-simulation teaching, t-group training, interaction- analysis, action research, micro teaching with special reference to components of various teaching skills like -Introduction, Reinforcement, Probing Question, Stimulus Variation, **Explaining, Black-Board Writing**

### **Unit - VII: Professional Development of Teachers**

- ❖ Teacher evaluation, teacher autonomy, teacher accountability, code of ethics for teachers
- ❖ Strategies for professional development of teachers

#### **Suggested Readings:**

- Aggarwal, J.C. (1995), Essentials of Educational Technology: Teaching Technology. New Delhi, Vikas Publishing House Pvt. Ltd.
- Mangal S.K. (1992), Fundamentals of Educational Technology. Ludhiana, M/S Prakash Brothers.
- Mangal S. K., Foundations of Educational Technology, Tandon Publications Ludhiana (2001).
- Nanda V. K., Modern Techniques of Teaching, Vol. I Educational Technology for Adults, Anmol, publications (1998)
- Sharma R. A, Technology of Teaching, Loyal Book Depot, Meerut International Publishing House Meerut, (1993)



## Pedagogy Courses

### हिन्दी शिक्षण (E-201)

#### CO: COURSE OUTCOMES

**CO1-** Understand about the nature and characteristics of a language and mother tongue and the use of language.

**CO2-** Practice the required skill and their- interlinks for mastering a language.

**CO3-** Understand the various approaches for planning for successful language teaching.

**CO4-** Understand the Approaches for teaching different aspects of language.

**CO5-** Understand the Aids and other similar available material that could be used for teaching language.

**CO6-** Practice the technique of obtaining feedback for self-evaluation and evaluation of student's success in learning and using the language.

#### Course Contents

##### यूनिट . 1 : भाषा का स्वरूप, प्रकृति एवं हिन्दी भाषा ।

- ❖ भाषा का अर्थ, प्रकृति एवं भाषा अधिगम के सिद्धान्त ।
- ❖ मातृभाषा और राष्ट्र भाषा के रूप में हिन्दी का महत्व ।
- ❖ मातृभाषा, राष्ट्रभाषा एवं विदेशी भाषा के रूप में हिन्दी शिक्षण
- ❖ हिन्दी शिक्षण के सामान्य उद्देश्य ।

##### यूनिट . 2 : हिन्दी का भाषा विज्ञान एवं उपयोगिता ।

- ❖ हिन्दी ध्वनि विज्ञान, उसके विभिन्न अंग ।
- ❖ हिन्दी रूप विज्ञान, वर्गीकरण एवं निर्माण प्रक्रिया ।
- ❖ हिन्दी वाक्य विज्ञान, प्रकार एवं प्रभावी निर्माण प्रक्रिया ।
- ❖ विराम चिह्न एवं उनका उचित प्रयोग ।

##### यूनिट . 3 : भाषायी कौशल—शिक्षण, उद्देश्य एवं प्रक्रिया ।

- ❖ श्रवण कौशल— अर्थ उद्देश्य एवं शिक्षण क्रियाएँ ।
- ❖ वचन कौशल—अर्थ, उद्देश्य एवं शिक्षण क्रियाएँ ।
- ❖ पठन कौशल— अर्थ, उद्देश्य एवं विकास हेतु उपाय ।
- ❖ लेखन कौशल— अर्थ, उद्देश्य एवं शिक्षण क्रियाएँ ।
- ❖ सूक्ष्म शिक्षण का स्वरूप एवं निम्न कौशलों के विकास हेतु सूक्ष्म पाठयोजना कानिर्माण—  
अ. प्रस्तावना कौशल ब. प्रश्न कौशल स. व्याख्या कौशल द. उद्दीपन परिवर्तन कौशल

##### यूनिट . 4 : हिन्दी साहित्य की विधाएँ एवं उनका शिक्षण

- ❖ पाठयोजना का अर्थ एवं उपयोगिता, इकाई योजना का निर्माण एवं उद्देश्य ।
- ❖ हिन्दी की निम्न विधाओं के शिक्षण का उद्देश्य, विधियाँ एवं पाठ नियोजन —अ. गद्य — गहन पाठ एवं द्रुत पाठ ब. पद्य स. व्याकरण द. रचना शिक्षण
- ❖ हिन्दी शिक्षण हेतु संरचनात्मक विधि की उपयोगिता ।

##### यूनिट . 5 : हिन्दी में दक्षता विकसित करने वाले घटक

- ❖ हिन्दी शिक्षण में सहायक शैक्षिक तकनीकी, आई0सी0टी0 एवं अन्य उपकरणों का प्रयोग । पत्रिकाएँ, अखबार, पुस्तकालय, भाषा प्रयोगशाला, कम्प्यूटर सहायक अनुदेशन, पावर पॉइन्ट, प्रस्तुतिकरण, मृदु पागम आदि ।
- ❖ निम्न पाठ्यक्रम सहगामी क्रियाएँ एवं उनका महत्व —परिचर्चा, वाद—विवाद, खेल, कार्यशाला, गोष्ठी, निबन्ध लेखन, स्वरचित कविता व कहानी प्रतियोगिता आदि ।

##### यूनिट . 6 : परीक्षण एवं मूल्यांकन

- ❖ हिन्दी में मूल्यांकन सतत एवं समग्र
- ❖ हिन्दी में अच्छे परीक्षण की विशेषताएँ एवं परीक्षण पदों का विकास (वस्तुनिष्ठ, लघुत्तरीय, निबन्धात्मक)
- ❖ हिन्दी में निष्पत्ति परीक्षण हेतु प्रश्न—पत्र का निर्माण
- ❖ उपचारात्मक एवं निदानात्मक शिक्षण

## PEDAGOGY OF ENGLISH (E 202)

### CO: COURSE OUTCOMES

- CO1-** Understand about the nature and characteristics of a language and mother tongue and the use of language.
- CO2-** Practice the required skill and their-interlinks for mastering a language.
- CO3-** Understand the various approaches for planning for successful language teaching.
- CO4-** Understand the Approaches for teaching different aspects of language.
- CO5-** Understand the Aids and other similar available material that could be used for teaching language.
- CO6-** Practice the technique of obtaining feedback for self-evaluation and evaluation of student's success in learning and using the language.

### Course Contents

#### Unit - I: Background to the Study of English

- ❖ Role of English in the present day; position of English in the Indian school curriculum in the context of the three-language formula
- ❖ English as a second Language
- ❖ Functions of language
- ❖ Linguistic principles
- ❖ Aims and objectives of teaching of English at Junior and **Secondary level**

#### Unit - II: Content and pedagogical analysis

- ❖ Teaching of prose, poetry, composition and grammar.
- ❖ Pedagogical analysis based on unit analysis, objectives, learning experience, chosen methods and material and composition and grammar.
- ❖ Preparation of micro lessons based on the following skills :  
Introduction. **Questioning. Explaining**, Illustration, Stimulus variation

#### Unit - III: Methods of Teaching and Skills of Teaching

- ❖ Various approaches of teaching English; structural approach, communicative approach, holistic approach
- ❖ Difference between and 'approach' and 'method', major methods of teaching English- Grammar-cum-translation method, direct method and bilingual method
- ❖ Structural approach: meaning of structure and pattern, principles of selection and gradation of structure, presentation and practice of structure
- ❖ Latest developments in the approach and methods of teaching English including the linguistic communicative approach, lesson planning
- ❖ Use of ICT in teaching-learning process of English with computer-aided methods like-Power Point, Multimedia, **Software, Webinars** etc.

#### Unit - IV: Teaching Aids

- ❖ Importance of instructional material and their effective use
- ❖ Use of following aids :

(i) Chalk board	(vii) Record-Player(lingua phones)
(ii) Flannel board	(viii) Radio
(iii) Pictures.	(ix) Television
(iv) Picture cut-out	(x) <b>Film and filmstrips</b>
(v) Charts	(xi) <b>Overhead Projector</b>
(vi) Tape-recorder.	(xii) <b>Language laboratory</b>

## Unit V : Evaluation

- ❖ Basic principles testing English, tools and techniques of evaluation
- ❖ The meaning and significance of comprehensive and continuous evaluation in English
- ❖ Development of good test items in English (objectives type, short answer type, essay type)
- ❖ Construction of an achievement test, diagnostic testing and remedial teaching in English

### संस्कृत- शिक्षण (E 203)

#### CO: COURSE OUTCOMES

- CO1-** Understand about the nature and characteristics of a language and mother tongue and the use of language
- CO2-** Practice the required skill and their-interlinks for mastering a language.
- CO3-** Understand the various approaches for planning for successful language teaching.
- CO4-** Understand the Approaches for teaching different aspects of language.
- CO5-** Understand the Aids and other similar available material that could be used for teaching language.
- CO6-** Practice the technique of obtaining feedback for self-evaluation and evaluation of student's success in learning and using the language.

#### CONTENT

यूनिट . 1 : भाषा – स्वरूप, प्रकृति एवं महत्व भाषा की उत्पत्ति, विकास एवं परिनिष्ठित परिभाषा।

- ❖ भाषा के विविध रूप।
- ❖ भारतीय भाषाओं में संस्कृत का स्थान एवं त्रिभाषा सूत्र की व्याख्यज्ञं
- ❖ भाषा की प्रकृति।
- ❖ सीखने के सिद्धान्त तथा वर्तमान परिप्रेक्ष्य में संस्कृत का सांस्कृतिक एवं साहित्यिक महत्व।

यूनिट 2 : संस्कृत में भाषागत कौशल एवं शिक्षण उद्देश्य।

- ❖ संस्कृत का प्रारम्भिक व्याकरण—पुरुष, वचन, शब्द रूप, धातुरूप सन्धि, समास, उपसर्ग प्रत्यय।
- ❖ संस्कृत भाषा की ध्वनियाँ उनके उच्चारण स्थान (च्वपदज वित्तजपबनसंजपवद) एवं सूत्र, आभ्यन्तर एवं बाह्य प्रयत्न, समय एवं काल से उत्पन्न ध्वनि—भेद।
- ❖ भाषायी कौशल – उच्चारण, वाचन श्रवण, बोध एवं अभिव्यञ्जन, सभी कौशलों के शिक्षण
- ❖ उद्देश्य, विधियाँ, कौशलों से सम्बन्धित दोष, कारण और उपचार।
- ❖ कौशलों में दक्षता प्राप्ति हेतु पाठ्येत्तर क्रियाएँ।

यूनिट 3 : संस्कृत साहित्य की विधाएँ एवं उनका शिक्षण।

- ❖ साहित्य की विभिन्न विधाएँ, अवर माध्यमिक एवं उच्च माध्यमिक स्तर पर उनके शिक्षण—उद्देश्य, ब्लूम द्वारा गया वर्गीकरण।

- ❖ संस्कृत शिक्षण की सामान्य विधियाँ।
- ❖ संस्कृत-गद्य, पद्य, व्याकरण, रचना, नाटक, द्रुतपाठ एवं निबन्ध-शिक्षण की विधियाँ एवं उद्देश्य।
- ❖ पाठ योजना के विभिन्न प्रकार एवं उनकी निर्माण-प्रक्रिया।
- ❖ संस्कृत, वर्तनी से सम्बन्धित छात्रों की सामान्य त्रुटियाँ, उनके कारण एवं निराकरण।

#### यूनिट 4 :संस्कृत पाठ्यक्रम एवं पाठ्य पुस्तकें।

- ❖ पाठ्यक्रम से तात्पर्य उसकी आवश्यकता, आधार, पाठ्यक्रम निर्माण के सिद्धान्त, पाठ्यक्रम निर्माण के समय ध्यान रखने योग्य सावधानियाँ।
- ❖ उत्तर प्रदेश में अवर एवं उच्च माध्यमिक स्तर के संस्कृत शिक्षण पाठ्यक्रम की समीक्षा एवं मूल्यांकन।
- ❖ पाठ्य पुस्तक का मूल प्रत्यय, पाठ्य पुस्तक निर्माण के सिद्धान्त, पाठ्य पुस्तक के मूल्यांकन एवं चयन की प्रक्रिया।
- ❖ संस्कृत पाठ्यक्रम व शिक्षण हेतु चयनित पाठ्य पुस्तकों का मूल्यांकन।
- ❖ उत्तर प्रदेश के विद्यालय
- ❖ अच्छी संस्कृत पाठ्य पुस्तक की विशेषताएँ।

#### यूनिट 5 :संस्कृत भाषा में मूल्यांकन।

- ❖ मूल्यांकन का प्रत्यय, आवश्यकता एवं परम्परागत एवं आधुनिक मूल्यांकन।
- ❖ परीक्षणों/मूल्यांकन की प्राचीन एवं नवीन विधियाँ।
- ❖ उद्देश्य केन्द्रित (द्वरमबजपअम ब्मदजतमक) परीक्षणों की निर्माण प्रक्रिया तथा परीक्षण रचना के समय ध्यान रखने योग्य सावधानियाँ।
- ❖ अच्छे परीक्षणों की विशेषताएँ।
- ❖ विभिन्न संस्कृत विद्याओं के मूल्यांकन हेतु परीक्षण एवं उनके प्रकार।

#### यूनिट 6 : संस्कृत शिक्षण में दक्षता के प्रभावी घटक।

- ❖ संस्कृत अध्यापक की विशेषताएँ।
- ❖ संस्कृत-कक्ष, शिक्षण सामग्री के प्रकार, तकनीकी उपकरण।
- ❖ संस्कृत शिक्षण में पाठ्य सहगामी क्रियाएँ।
- ❖ संस्कृत में निदानात्मक एवं उपचारात्मक शिक्षण।
- ❖ संस्कृत शिक्षण – गृह कार्य के प्रकार एवं महत्व।
- ❖ क्रियात्मक अनुसन्धान एवं संस्कृत शिक्षण में उसकी उपयोगिता।

### PEDAGOGY OF SOCIAL SCIENCES (E 204)

#### CO: COURSE OUTCOMES

- CO1-** Understand concept, meaning and scope of social sciences.
- CO2-** Get acquainted with appropriate methodology as applicable to social sciences
- CO3-** Prepare unit plan and lesson plan.
- CO4-** Acquire skill in teaching social sciences.
- CO5-** Acquire knowledge of various evaluation procedures and to device effective evaluation tools.
- CO6-** Acquire the ability to develop instructional support materials.

#### Course Contents

### **Unit - I: Nature and Scope of Social Sciences**

- ❖ Social sciences and social studies: Course subjects of social sciences - History, Civics, Geography and Economics, inter-relationship between them
- ❖ Rational for including these areas in school curriculum
- ❖ Instructional objectives of teaching social sciences at secondary level

### **Unit - II: Methodology for Social Science Pedagogy**

- ❖ Instructional strategies, methods of teaching social science
- ❖ Strategies for teaching social science in terms of specific methods like Lecture, Question-Answer, Group Discussion, Project and Source Methods, Socialized Recitation and **Supervised Study, Tutorials.**
- ❖ Micro teaching skills- Introduction, Reinforcement, Probing Questioning, Stimulus Variation, Explaining, Blackboard Writing etc.
- ❖ Selecting and using teaching aids: chalk boards, objects and specimen, histrionics, models, graphs, charts, maps, pictures, slides, films, filmstrips, audio-visual aids, projected aids: **slide projectors**, overhead projectors, **LCD projectors**
- ❖ Use of ICT in teaching-learning process of social science with computer-aided methods like- Power Point, Simulation, Softwares, Webinars etc.
- ❖ Content analysis, unit planning and lesson planning

### **Unit - III: Curriculum and Text-Books**

- ❖ Place of social studies in Secondary School curriculum
- ❖ Teacher and Curriculum planning, hidden curriculum, Evaluation of curriculum, Characteristics of good text-book, Evaluation of textbooks, analysis of textbooks from peace education and environmental education perspective, **gender bias in social science curriculum**

### **Unit - IV: Social Science Teacher and co-curricular activities**

- ❖ Qualities of social science teacher
- ❖ Professional development of social science teacher
- ❖ Principles of organizing co-curricular activities
- ❖ Formation and management of social science clubs
- ❖ Organizing seminars, debates, quiz, exhibition, competition, wall magazine, manuscript
- ❖ Using community resources
- ❖ Organizing field trips
- ❖ Social science room

### **Unit - V: Transaction mode and Evaluation**

- ❖ Objectives of evaluation in social science, developing a blueprint – objective, content, items
- ❖ Essay type, short answer type and objective type question in social sciences, their advantages and limitations, **framing different types of questions.**
- ❖ Construction of achievement test in social science
- ❖ Continuous evaluation using feedback for improvement of teaching and learning in social science
- ❖ Diagnostic testing and remedial teaching

## **PEDAGOGY OF MATHEMATICS (E 205)**

### **CO: COURSE OUTCOMES**

- CO1-** Understand and appreciate the uses and significance of mathematics in daily life.
- CO2-** Learn successfully various approaches of teaching mathematics and to use them judiciously.
- CO3-** Know the methods of planning instruction for the classroom.
- CO4-** Prepare curricular activities as per the needs
- CO5-** Appreciate and organize activities to develop aesthetics of mathematics.

### **Course Contents**

## **Unit I: Entering into the Discipline**

- ❖ Meaning and nature of mathematics, use and significance of mathematics
- ❖ Contribution of some great mathematicians - Aryabhata, Bhaskaracharya, Ramanujam, Euclid, Pythagoras, Rene Decarte.
- ❖ Aims and objectives of teaching mathematics at secondary and senior secondary levels
- ❖ Objectives of teaching mathematics in terms of behavior outcomes.

## **Unit II: Methodology for Mathematics Teaching**

- ❖ Methods of teaching: Inductive- Deductive, Analytic- Synthetic, Problem solving, Heuristics, Project & Laboratory Method.
- ❖ Techniques of teaching: Oral, Written, Drill, Home-Assignment, Supervised study, and programmed learning technique.
- ❖ Micro teaching skills-Introduction, Reinforcement, Probing Question, Stimulus variation, Explaining, Blackboard Writing etc.
- ❖ Use of ICT in teaching-learning process of mathematics with computer-aided methods like- Power Point, Multimedia, Simulation, Software's, Webinars etc.

## **Unit III: Developing Lesson Plan, Unit Plan and Material Aids**

- ❖ Lesson plan - meaning, purpose and Performance of lesson plan and its rationality
- ❖ Unit plan – meaning and purpose of unit plan
- ❖ Teaching –aids importance and classification
- ❖ Developing/preparing low cost improvised teaching aids, relevant to local ethos
- ❖ Application of computer in teaching of mathematics.

## **Unit IV: Development of Curriculum, Text Book and Activities of Mathematics**

- ❖ Principles and rationale of curriculum development, organizing the syllabi both logically and psychologically according to the age groups of children
- ❖ Planning activities and methods of developing the substitute/ alternative material to the prescribed syllabus for completing it in due course of time
- ❖ Organization of mathematics laboratory
- ❖ Text book of mathematics- qualities of a good text book of mathematics  
Using mathematics as a game for recreation; organizing quiz programmes, skill-development in answering puzzles riddles, magic squares, word search etc.
- ❖ Learning about the short cuts mentioned in Vedic mathematics
- ❖ Development of maths laboratory

## **Unit V: Evaluation in Mathematics**

- ❖ Meaning and needs of evaluation.
- ❖ Process of obtaining feedback and evaluation in mathematics in terms of cognitive affective and psychomotor behavioral development
- ❖ Comprehensive and continuous evaluation (C.C.E.) in mathematics
- ❖ Development of test item (short answer and objective type)
- ❖ Diagnostic testing and remedial teaching
- ❖ Preparation of an achievement test

## PEDAGOGY OF PHYSICAL SCIENCES (E 206)

### CO: COURSE OUTCOMES

- CO1-** Develop a broad understanding of the principles and procedures used in modern physical science education.
- CO2-** Enhance their essential skill for practicing modern physical science education
- CO3-** Develop their skills necessary for preparing international accessories.
- CO4-** Prepare acceptance lesson models which lay down this procedure to the acceptance for preparing designs for lesson.
- CO5-** Manage introduction activity in such a way that the vast majority of the learners attain most of the objectives.

### Course Contents

#### Unit - I: Concept, Nature and Importance

- ❖ Meaning and nature of physical science, path tracking discoveries and land mark development in science, impact of science on modern communities, globalization and science
- ❖ Justification for including science as a subject in school curriculum, eminent Indian and world Scientists - an introduction, **professions in the area of science**

#### Unit - II: Aims and Objectives of Teaching Physical Science

- ❖ General aims and objectives of teaching physical science at secondary and senior secondary school stage, instructional objectives with special emphasis on Bloom's taxonomy
- ❖ Concept of entering and terminal behavior, defining desired outcomes (statements of objectives) for different levels of education like primary, **upper primary**, secondary and senior secondary.

#### Unit - III: Methodology of Teaching Physical Science

- ❖ Methods - Lecture, Demonstration, Lecture-cum Demonstration, Heuristic, project, Laboratory, Problem Solving
- ❖ Techniques – Team-Teaching, **Computer Assistance Teaching**
- ❖ Excursion, science – museums, science – club, science – fair, science projects
- ❖ Micro teaching skills-Introduction, Reinforcement, Probing Question, Stimulus variation, Explaining, Black Board-Writing etc.
- ❖ Use of ICT in teaching-learning process of physical sciences with computer-aided methods like-Power Point, **Multimedia**, Simulation, Software, Webinars etc.

#### Unit - IV: Curriculum and Instructional Material Development

- ❖ Meaning, definition and principles of curriculum construction and its types
- ❖ Curriculum organization using procedure like concentric, topical, process and integrated approaches, adaptation of the curriculum according to the local needs and the availability of local resources.
- ❖ Development of physical science curriculum at different stages of school education e.g. primary, upper primary, secondary and senior secondary
- ❖ **Current trends in science curriculum.**
- ❖ Preparation, selection and use of teaching aids
- ❖ Curriculum accessories and support material - text books, journals, hand books, student's workbook, display slide, **laboratory materials.**

#### Unit - V: Content Analysis and Lesson Planning



- ❖ Content analysis, pedagogical analysis of content (Taking an example of any one topic of physical science). Following points should be followed for pedagogical analysis – Identification of minor and major concepts, Listing behavioral outcomes, Listing activity and experiments Listing evaluation procedure, **Developing unit plans and lesson plans**

### **Unit - VI: Evaluation in Physical Science Teaching**

- ❖ Evaluation: meaning and needs, formative and summative evaluation
- ❖ Process of development of tests for measuring specific outcomes - cognitive outcomes, affective outcomes and psychomotor outcomes.
- ❖ Diagnostic testing and remedial teaching
- ❖ Preparation of achievement test, **development of improvised apparatus**

## **PEDAGOGY OF BIOLOGICAL SCIENCES (E 207)**

### **CO: COURSE OUTCOMES**

**CO1-** Develop broad understanding of principles and knowledge used in biology science.

**CO2-** Develop their essential skills for practicing biological science.

**CO3-** Know various approaches and methods of teaching life science.

**CO4-** Lesson planning of biological science properly.

**CO5-** Prepare tools for evaluation in biological sciences.

### **Course Contents**

#### **Unit I: Nature, Concepts and Importance**

- ❖ History and nature of biological sciences
- ❖ Importance of biological science for environment, health and peace
- ❖ Interdisciplinary linkage of biological science and other school subjects
- ❖ Value of biological sciences in our lives
- ❖ **Four Indian eminent biologists and their discoveries**

#### **Unit II: Objectives of Teaching Biological Sciences**

- ❖ General aims and objectives of teaching biology difference between aims and objectives, Bloom's taxonomy of educational objectives
- ❖ Writing objectives in terms of learning outcomes (behavioral term) for different levels of school teaching VIII, IX and X classes-RCM approach of writing objectives

#### **Unit III: Exploring learning**

- ❖ Inductive and deductive approach, different methods and techniques of teaching biological sciences
- ❖ Teacher centered approaches-lecture, demonstration, lecture cum demonstration
- ❖ Child centered approach-project method, **heuristic problem solving, assignment**
- ❖ Use of ICT in teaching-learning process of biological sciences with computer-aided methods like-Power Point, Simulation, Softwares, Webinars etc.
- ❖ Micro-teaching skills- Introduction, Explaining, **Probing questioning**, Illustration, Stimulus variation, Blackboard writing etc.
- ❖ Analysis of content, preparing unit plan, lesson plan



#### **Unit IV: Learner Centered School Curriculum**

- ❖ Principles of development of biological science curriculum, trends in biological sciences curriculum.
- ❖ Analysis of text books and biology syllabi of NCERT and U.P. State VIII, IX and X classes.
- ❖ Importance and type of teaching aids, use of audiovisual aids and improvised apparatus in teaching biology, biology laboratory
- ❖ Biology museum, biology club, field trips, aquarium herbarium and **vivarium exhibition**

#### **Unit V: Concept of Evaluation and Measurement**

- ❖ Meaning and nature of evaluation and measurement
- ❖ Tools and techniques of evaluation in biological science
- ❖ Characteristics of a good test-reliability, validity, **usability and norms of a test**
- ❖ Essay type, short answer and objective type tests, their merits and demerits
- ❖ Concept of formative, summative and diagnostic test
- ❖ Construction of achievement test
- ❖ Diagnostic testing and **remedial teaching**

### **PEDAGOGY OF COMPUTER SCIENCE (E 208)**

#### **CO: COURSE OUTCOMES**

- CO1-** Develop a broad understanding of the principles and procedures used in computer science education.
- CO2-** Develop their skills necessary for preparing international accessories
- CO3-** Know the methods of planning instruction for the classroom
- CO4-** Learn successfully various methods of teaching computer science and use them judiciously.
- CO5-** Manage introduction activity in such a way that the vast majority of the learner attains most of the objectives

#### **Course Contents**

##### **Unit - I: Historical Perspectives, Aims and Objectives of Computer Science**

- ❖ Historical development of computer (hardware and software)
- ❖ Present status of computer science as a school subject.
- ❖ Significance of teaching computer science at secondary/senior secondary schools
- ❖ Aims and objectives of teaching computer science-
- ❖ Classification of educational objectives (Bloom's taxonomy)
- ❖ **Statement of specific objectives in behavioral terms**

##### **Unit - II: Development of Curriculum in Computer Science**

- ❖ Principles and rationale of curriculum development, organizing the syllabi both logically and psychologically according to the age groups of children.
- ❖ Organization of Computer Science Laboratory.
- ❖ Text book of Computer Science - qualities of a good text book of Computer Science.

##### **Unit - III: Methods of Teaching Computer Science**

- ❖ Lecture method, demonstration-cum-discussion method, personalized instruction method
- ❖ CAI technique, Hands on experience, Video Technology, Power Point Presentation, Software, **Webinars** etc.

- ❖ Co-operative learning approach, **systems approach**, multimedia approach
- ❖ Micro teaching Skills-Introduction, **Reinforcement**, Probing Question, Stimulusvariation, Explaining, Blackboard-Writing etc.

#### **Unit - IV: Unit Planning, Lesson Planning and Teaching Aids**

- ❖ Meaning and definition of unit plan and lesson plan
- ❖ Importance and steps of planning a lesson.
- ❖ Need, Importance, preparation and using of teaching aids in computer science
- ❖ Organization of computer laboratory

#### **Unit - V: Basic Processes in Computer Science**

- ❖ Basic programming
- ❖ Data representation
- ❖ Computer organization
- ❖ Operating environment
- ❖ **Computer network**

#### **Unit - VI: Evaluation in Computer Science**

- ❖ Meaning and importance of evaluation.
- ❖ Comprehensive and continuous evaluation (CCE) in computer science
- ❖ Development of test items objective type, short answer type, essay type
- ❖ Preparation of an achievement test
- ❖ Analysis and interpretation of test results
- ❖ **Diagnostic testing and remedial teaching**

### **PEDAGOGY OF HOME SCIENCE (E 209)**

#### **CO: COURSE OUTCOMES**

**CO1-** Understand the nature and scope of Home Science

**CO2-** Acquaint with the objectives of teaching Home Science in secondary and higher secondary schools.

**CO3-** Acquire skills in planning a lesson with reference to methods and instructional materials and processing it effectively.

**CO4-** Understand the various methods and techniques that can be employed in the teaching of Home Science.

**CO5-** Develop a practical understanding of the technology of teaching Home Science and giving them practice in the use of various aids relating to the technology of teaching.

#### **Course Contents**

##### **Unit - I: Concepts**

- ❖ The concept of home science: meaning and components; place of home science in secondary education
- ❖ Job opportunities in home science

- ❖ Aims and objectives of teaching of home Science
- ❖ Correlation of home science with other school subjects

## Unit II : Pedagogical Analysis

- ❖ Foods, nutrition and health
- ❖ Child care
- ❖ Fiber and fabric
- ❖ Home management-importance of planning, principles of budget making
- ❖ Hygiene and sanitation

## Unit III: Methods of Teaching

- ❖ Method of teaching as applied to home science
  - Teacher centered methods-lecture, demonstration
  - Child centered method-laboratory, project, assignment, discussion
- ❖ Micro-teaching skills-Introduction, Explaining, Probing Questioning, Illustration, Stimulus variation, Blackboard writing, etc.
- ❖ Use of ICT in teaching-learning process of home science with computer-aided methods like- Power Point, Multimedia, Simulation, Software, Webinars etc.

## Unit IV: Equipments of Teaching

- ❖ Development and designing of curriculum
- ❖ Teaching aids-classification and importance
- ❖ Concept of Unit and lesson plan, preparation of unit and lesson plan
- ❖ Development of text books
- ❖ Planning of space and equipment for home science laboratory

## Unit V: Evaluation

- ❖ Evaluation in home science-meaning and importance of evaluation
- ❖ Characteristics of a good evaluation device
- ❖ Comprehensive and continuous evaluation
- ❖ Evaluation devices-written, oral, observation, practical work, assignment
- ❖ Diagnostic testing and remedial teaching

## PEDAGOGY OF COMMERCE (E-210)

### CO: COURSE OUTCOMES

**CO1-** Acquire knowledge of the terms and concepts used in the pedagogical analysis of Commerce and Accountancy

**CO2-** Understand lesson planning and evaluation aspects in teaching Commerce and Accountancy

**CO3-** Apply the knowledge in analyzing higher secondary Commerce and Accountancy contents in terms of the techniques and aids for the purpose of teaching Commerce and Accountancy

**CO4-** Develop skills in the preparation of lesson plan and construction of evaluation tools using the suitable techniques

**CO5-** Develop interests in learning recent developments in Commerce and Accountancy

**CO6-** Develop a desirable positive attitude towards the teaching of Commerce and Accountancy.

## Course Contents

### Unit I: Concept, Aims and Objectives of Commerce Teaching

- ❖ Meaning and scope of commerce as a subject, **place of commerce in Indian school**
- ❖ Meaning of Commerce education and historical development of commerce education in India
- ❖ Aims of commerce education
- ❖ Objectives of commerce education at High school and Intermediate levels (vocational & academic)
- ❖ Instructional objectives - meaning, importance and specification of instructional objectives in behavioural terms (with respect to Bloom's Taxonomy)

### Unit II: Methods of Commerce Teaching

- ❖ Lecture and discussion methods, Project method, Problem solving method, Approaches of book-keeping teaching (journal approach, ledger approach, cash-book & equation approach) Plans of commercial practice teaching (**rotation**, office model, **battery and co-operative plan**).
- ❖ Micro teaching Skills-Introduction, Reinforcement, Probing Question, Stimulus variation, Explaining, Blackboard-Writing, etc.
- ❖ Use of ICT in teaching-learning process of commerce with computer-aided methods like-Power Point, Simulation, Software, Webinars etc.

### Unit III: Techniques and Teaching Aids

- ❖ Techniques of commerce teaching-questioning and demonstration
- ❖ Text book of commerce teaching
- ❖ Commerce room
- ❖ Teaching aids in commerce
- ❖ **Co-curricular activities in commerce**

### Unit IV: Curriculum, Correlation with other Subjects, Commerce Teacher and Lesson Planning

- ❖ Curriculum in commerce (i) principles of curriculum construction (ii) critical evaluation of High School syllabus
- ❖ Correlation of commerce with other subjects (i) need and importance (ii) correlation with math, geography and economics
- ❖ Commerce teaching (i) profile of a good commerce teacher (ii) professional growth of a commerce teacher
- ❖ Lesson Planning-meaning, need, **importance and types**
- ❖ Unit and resource planning

### Unit V: Evaluation in Commerce

- ❖ Concept, scope and importance of evaluation
- ❖ Tools and techniques of evaluation and **characteristics of a good test**
- ❖ Construction and administration of an achievement test
- ❖ Diagnostic testing and remedial teaching

## (Teaching Skills) Practical Work

### EF 2(A): Preparation to Function as a Teacher (E-701)

During the first year, the teacher-preparation programme will offer the training amounting to a maximum of 8 weeks. This will include:

- ❖ **Two week workshop on Lesson-Planning** based on constructivist approach (Covering different aspects like theory of lesson-planning, questioning, Defective Questions, Developing Question, How to put Question, How to receive Answers, Discipline, Role of Eye-control, etc.).
- ❖ **Two week workshop on 'Micro-Teaching'** (at least 5 teaching skills will be mastered in each Pedagogy course like-Introduction, Reinforcement, Probing Question, Stimulus Variation, Explaining etc. ).
- ❖ **Two week Practice-Teaching in Simulated condition** in each Pedagogy course. During this phase every student-teacher will **teach at least 6 lessons**. These lessons will be observed by subject-supervisors
- ❖ **Two week Practice-Teaching in Real-Class room situation in a school**. For it, the student-teachers will be attached to a particular school as 'School Attachment', where they will deliver their lessons. During this phase every student-teacher will **teach at least 20 lessons**. These lessons will be observed by peers as well as by subject-supervisors daily, which will provide them feedback for the modification of their behavior.

This shorter period is to provide the student-teachers adequate exposure to have a 'feel' of dealing with teaching-learning. It will help him/her to develop the basic teaching skill required to deal with students effectively in classroom.

**(E-702 & 704)**

**Viva- Voce Examination based**

**On**

**Task and Assignments that run through all the courses CC 1-7 and PC 1 to 42 EPC Activities**

### **EPC 1: Strengthening Language Proficiency**

Language is the medium for comprehending ideas, for reflection and thinking, as well as for expression and communication. Enhancing one's capacity in language proficiency is thus a vital need of student-teachers irrespective of the subject area that they are going to teach.

**Objectives: To enable student-teachers to-**

- Strengthen the ability to read correctly
- Strengthen the ability to pronunciation
- Strengthen the ability to write correctly
- Strengthen the ability to communicate correctly

### **Activities**

One or two workshops on Language proficiency course on Hindi and English of 7-10 day each may be organized. It may course the following content –

- हिन्दी भाषा (1) वर्ण-स्वर व व्यंजन ध्वनि, मात्राएं (2) शब्द – पर्यायवाची व विलोम शब्द (3) शब्द रचना-सन्धि, समास, उपसर्ग, प्रत्यय (4) रूप विचार- संज्ञा, सर्वनाम, विशेषण, क्रिया क्रियाविशेषण, आदि (5) वाक्य विचार-विराम चिन्ह, आदि (6) रचना-पत्र, प्रार्थना पत्र, निबन्ध कहानी आदि ।

English Language – (i) Alphabet-Vowel & Consonant sounds (ii) word-synonym & Antonym (iii) Word Formation (iv) Parts of Speech – Noun, Pronoun, Adjective, Verb, Adverb, etc. (v) Sentence-Punctuation & Analysis (vi) Composition-Letter, Application, Essays, Story, etc.

## **EPC 2: Art and Aesthetics**

The need to integrate arts education in the formal schooling of our students is to retain our unique cultural identity in all its diversity and richness. The National curriculum Framework (2005) reminds us that the school curriculum must integrate various domains of knowledge with a deep relationship between head, heart & hand so that the curriculum encompasses all and is not separated from the co-curricular or extra-curricular.

### **Objectives: To help student-teachers to-**

- Gain direct experiences
- Develop motor skill
- Make students believe in the dignity of labor
- To nurture children's creativity and aesthetic sensibilities.

### **Activities**

An artist may be invited to organize a workshop on Art & Aesthetics. The student-teachers may be asked to prepare at least 5-items of different categories-

- Paper meshing
- Pot Decoration
- Wall hanging
- Paper cutting
- Flower making
- Candle Making
- Stitching
- Knitting
- Embroidery
- Soft toys making
- Paper framing
- Weaving or printing of textiles
- Making of poster
- Making of Rangoli
- Making of Puppets etc.

## **EPC 3: Reading and Reflecting on Texts**

This course will serve as a foundation to enable student-teachers to read and respond to a variety of texts in different ways depending on the purposes of reading, like-personal or creative or critical or all of these.

### **Objectives: To enable student-teachers to-**

- Develop study – habits
- Develop skill of reading & writing
- Develop skill of summarization
- Develop skill of note-taking.

### **Activities**

Student-teachers are expected to sit in the library regularly and to review at least 10-books of different categories in about 500 words each. These may be as follows –

- Review of text books related to core courses
- Review of reference Book related to core courses
- Review of Text Books related to Pedagogy courses
- Review of Reference to Book related to Pedagogy courses.
- Review of Policy Documents, Autobiography, Commission Reports, etc.
- Review of studies about school, historical books and other educational miscellaneous books.

## **EPC 4: Understanding of ICT**

Preparing teachers to use technology in a classroom is an important step of ICT enabled education in the country. This course will focus on moving beyond computer literacy and ICT aided learning, to help student-teachers interpret and adapt ICTs in the teaching-learning process.

**Objectives: To enable student-teachers to-**

- ❖ Have a basic familiarity with computers
- ❖ Understand & appreciate ICT as an effective learning tool for learners
- ❖ Understand ICT as an enormous functional support to teachers.

**Activities A workshop on ICT for 10-15 days may be organized or a provision of one period/week may be made daily in the time-table to learn and to practice in computer labs. Student-teacher sare expected to learn the following:**

- ❖ Use of radio and audio media in script writing, story-telling, etc.
- ❖ Use of TV & video in education
- ❖ Use of newspaper in education
- ❖ Functional knowledge of operating computers- word processing, power point, excel, etc.
- ❖ Effective browsing of the internet for selecting relevant information.
- ❖ Downloading relevant material
- ❖ Competencies in developing software
- ❖ Developing PPT slide show for classroom use
- ❖ Use of available software or CDs with LCD projection for subject learning interactions
- ❖ Generating demonstrations using computer software.

## **EPC 5: Working with Community**

This programme gives opportunity to attach with and to solve the problems of the community to make the student-teachers sensitive and aware about the society.

**Objectives: To enable student-teachers to-**

- ❖ Develop social-sensitivity among student-teachers
- ❖ Develop sympathy with the poor and the people below-poverty-line.
- ❖ Develop awareness about the environment.
- ❖ To have the positive attitude toward the neglected class.

**Activities:**

This can be achieved by organizing a number of programme for the welfare of the community, like –

- ❖ To educate the dropouts and adults (Literate India)
- ❖ To educate the people of slum areas to take the nutritious diet. (Quit Mal-nutritious).
- ❖ To make the people learn the importance of small family norm (chota pariwar sukhi pariwar)
- ❖ To make the people learn the importance of the girls-child & its education for the Familyand the society (Beti Bachao Beti Padhao)
- ❖ To motivate the people to grow more plants (Green India)
- ❖ To motivate the people to keep the city and the public places clean (Clean India)
- ❖ To motivate the people to save river and ponds (Clean Water)

## **EPC 6: Basics of Research**

This programme will enable the student teacher to know the basic research methodology, to identify the school based research problem and to solve them scientifically. In the course

student teacher will do the research and write the report using the following points:-

- ❖ Identification of an educational problem.
- ❖ Formulation of various solutions.
- ❖ Selection of the most probable solution
- ❖ Developing a tool for data collection
- ❖ Data collection
- ❖ Data analysis
- ❖ Reporting findings

### **EPC 7: Drama and Art in Education**

Real education implies reflection, introspection and action, with a deep relationship between the Head, Heart and Hand. Drama and art helps the student teacher to understand the self and to realize it as a form of self-expression and for enhancing creativity.

Following activities can be organized under the course: (any two)

- ❖ Script writing
- ❖ Street play
- ❖ Visit to an art gallery
- ❖ Visiting/Organizing exhibitions
- ❖ Visiting/Organizing cultural fests
- ❖ Report on the folk life
- ❖ Interview with experts from the field like artists, actors, singers, writers, poets, painters, musicians, dancer, etc
- ❖ Appreciation of a film/drama/novel/folk drama, etc.
- ❖ Use of Music/ Arts in Education

### **EPC 8: Entrepreneurship Development**

Education system plays a critical role in the economic advancement of nation, since it is the primary developer of human resource. Entrepreneurship education and training is about the development of professional skills and qualities of the student teachers so that they can gain knowledge and understand the ways in which the economy works. This evolves approaches to the development of creativity, problem solving, decision making, team working, leadership and other individual skills. It also identifies the role of the entrepreneur in the society and various requirements of self-employment.

**Following activities shall be organized under the course: (any one)**

**Field work:-**

- ❖ Educational Market Survey for needs analysis
- ❖ Interview of Educational Book Publisher/Entrepreneurs
- ❖ Visit to Vocational Institute
- ❖ Survey of the usability of an existing /self-developed educational product
- ❖ Write an essay on „Entrepreneurship“



**B.Ed. II Year Syllabus**  
**Core Course (CC-5)**

**CREATING AN INCLUSIVE SCHOOL (E-301)**

**CO: COURSE OUTCOMES**

**CO1-** Understand inclusive education- concept and nature.

**CO2-** Understand the global and national commitments towards the education of children with diverse needs

**CO3-** Prepare conducive teaching learning environment in inclusive schools.

**CO4-** Identify and utilize existing resources for promoting inclusive practice

**Course Contents**

**Unit - I: Introduction to Inclusive Education**

- ❖ Definition, concept needs and importance of inclusive education
- ❖ Historical perspectives on education of children with diverse needs
- ❖ Difference between special education, integrated education and inclusive education
- ❖ Policies and legislations for inclusive education and rehabilitation, **government scheme and provisions**

**Unit - II: Children with Diverse Needs**

- ❖ Definition and characteristics of children with diverse needs
- ❖ Sensory (hearing, visual and physically challenged)
- ❖ Intellectual (gifted, talented and mentally challenged)
- ❖ Developmental disabilities (autism, cerebral palsy, learning disabilities)
- ❖ Social and emotional problems
- ❖ Scholastic backwardness, under achievement, slow learners
- ❖ Children with special health problems
- ❖ Environmental / ecological difficulties
- ❖ Children belonging to other marginal groups
- ❖ **Role of teachers for meeting the diverse needs of learners**

**Unit - III: Inclusive Education and its Practices**

- ❖ Inclusive instructional design and collaborative instruction for inclusion.
- ❖ Differentiating instruction – peer tutoring and peer mediated instruction and interventions, co-operative learning and co-operative teaching assignments, self- regulated learning
- ❖ Inclusive instruction strategies at school level- remedial help, team teaching, co-teaching, student assistance teams, buddy system, circle of friends, **Parent involvement**
- ❖ E-learning, **web based learning** and inclusive education

**Unit - IV: Inclusive Schools**

- ❖ Infrastructural facilities for an inclusive school
- ❖ An ideal inclusive school
- ❖ Role of inclusive school in modern times.
- ❖ Inclusive classroom managements

**Unit - V: Teachers Role in Inclusive Education**

- ❖ Qualities of an inclusive teacher
- ❖ Teachers role in shaping inclusive class room
- ❖ Inclusive teacher educator in facilitating inclusive education
- ❖ Guidance and counseling for inclusive teachers, students and principals
- ❖ **Training programme for inclusive teachers**

### **Suggested Readings:**

- Baquer, A. & Sharma, A. (1997) .Disability: Challenges Vs. responses, Can Pub.
- Bartlett, L. D., Weisentein, G.R. (2003) Successful inclusion for educational leaders, Prentice Hall, New Jersey.
- Bhargava, M. (1994), Introduction to exceptional Children, Sterling Publishers.
- Dessent, T. (1987). Making ordinary school special. Jessica Kingsley Pub.
- Gargiulo, R. M. (1997). Special education in contemporary society: an introduction to exceptionality, Wadsworth, Belmont

## **Core Course (CC-6)**

### **GENDER, SCHOOL AND SOCIETY (E-302)**

#### **CO: COURSE OUTCOMES**

**CO1-** Sensitize the future teachers towards basic understanding of various key concepts of gender studies.

**CO2-** Learn about gender issues in school, curriculum and textual materials across disciplines, pedagogical process and its interaction with class, caste, religion and region.

**CO3-** Help them understand the contribution of women in social, economic & political development of the society.

**CO4-** Apply the conceptual tools learn regarding gender & sexuality to understand issues related to sexual harassment at the workplace and child sexual abuse.

#### **Course Contents**

#### **UNIT - I: Gender Issues: Key Concepts**

- ❖ Gender, sex, sexuality, patriarchy, masculinity and feminism – in cross cultural perspectives
- ❖ Gender bias, gender stereotyping and empowerment
- ❖ Equity and equality in relation with caste, class, religion, ethnicity, **disability and region**

#### **UNIT - II: Gender Inequality in the Schools**

- ❖ In the structure of knowledge.
- ❖ In the development of curriculum, gender and hidden curriculum.
- ❖ Gender in text and context (text books inter-sectionality with other disciplines, classroom processes including pedagogy)
- ❖ In the class room
- ❖ In the management of school
- ❖ **Teachers as agent of change**

#### **UNIT - III: Women in Indian Society**

- ❖ Situational analysis of women in India society (focus on sex ratio pattern, education, health, work participation violence against women)
- ❖ Women's access to and participation in formal and non-formal education (gender bias in enrolment, curriculum content, dropouts)

- ❖ Participation of women in planning and decision making
- ❖ Human right and **empowerment of women**

#### **UNIT - IV: Theories on Gender and Education: In Indian Context**

- ❖ Socialization theory
- ❖ Gender difference theory
- ❖ Structural theory
- ❖ Deconstructive theory

#### **UNIT - V: Gender, Sexuality, Sexual Harassment and Abuse**

- ❖ Linkage and differences between reproductive rights and sexual rights.
- ❖ Development of sexuality, including primary influences in the lives of children (such as gender, body image, role models)
- ❖ Sites of conflict : social and **emotional**
- ❖ Understanding the importance of addressing sexual harassment in family, neighborhood **and other formal and informal institutions.**
- ❖ Agencies perpetuating violence : family, school, **work place and media (print and electronic)**
- ❖ Institutions redressing sexual harassment and abuse.

#### **Suggested Readings:**

- Ambasht, et al (1971). Developmental Needs of Tribal People, NCERT
- Bhattacharjee, Nandini (1999). Through the looking-glass: Gender Socialisation in a Primary School in T. S. Saraswathi (ed.) Culture, Socialization and Human
- Development: Theory, Research and Applications in India. Sage: New Delhi.
- Frostig, M, and Maslow, P. (1973). Learning Problems in the Classroom: Prevention and Remediation. Grune & Stratton: New York.
- Geetha, V . (2007). Gender. Stree: Calcutta.
- Ghai, A. (2005). Inclusive education: A myth or reality In Rajni Kumar, Anil Sethi

### **Core Course (CC-7)**

## **KNOWLEDGE, LANGUAGE & CURRICULUM (E-303)**

#### **CO: COURSE OUTCOMES**

**CO1-** To examine the Epistemological basic of education

**CO2-** To understand the concept and principles of curriculum development

**CO3-** To understand the formulation of new curriculum

**CO4-** To develop the ability to read & comprehend

**CO5-** To develop writing skill

#### **Course Contents**

#### **Unit – I: Knowledge**

- ❖ Epistemology – meaning, philosophical basic of knowledge according to Indian and Western philosophy
- ❖ Knowledge – nature and sources, validity of knowledge

- ❖ Differences between knowledge and skill, teaching and training, knowledge and information, reason and belief
- ❖ Chronological review on knowledge generation, myth based faith and logical based knowledge, various structures of society and **knowledge patterns and their relationship**

### **Unit - II: Language and Reading Comprehension**

- ❖ Need and importance
- ❖ Types of reading : skimming and scanning
- ❖ Strategies for effective reading, mechanism for reading, loud reading, **silent reading**
- ❖ Schema theory of reading

### **Unit - III: Developing Writing skills**

- ❖ Need and importance
- ❖ Making reading writing connection
- ❖ Process and strategies of writing for children, mechanism of writing, **note making**, summarizing
- ❖ **Analyzing children's writing**

### **Unit - IV: Curriculum and Development**

- ❖ Meaning and concept of curriculum syllabus and units
- ❖ Curriculum development – meaning, concept stages in the process of curriculum development
- ❖ Fusion Intervention & Inter-subject co-relation

### **Unit - V: Determinants of Curriculum**

- ❖ Philosophical Foundation of curriculum development in view of different schools of philosophy
- ❖ Social and political forces, cultures and cultural roots of curriculum, sociology of curriculum
- ❖ Model of curriculum development : Hilda Taba's Model
- ❖ Core curriculum, activity curriculum, **interdisciplinary curriculum**

#### **Suggested Readings:**

- Apple, Michael W. (1979). Ideology and Curriculum; Routledge and K. Paul.
- Connelly, F. Michael (Editor) (2008); The Sage Handbook of Curriculum and Instruction; Sage Publications India Pvt. Ltd.; New Delhi.
- Muijs, Daniel and Reynolds, David (2005) Effective Teaching: Evidence and practice Second Edition; Sage Publication; London.
- Mukunda, Kamala V. (2009) What Did You Ask At School Today: A Handbook of Child Learning; Harper Collins Publishers; NOIDA
- National Curriculum Framework for School Education (2005); NCERT; New Delhi;

### **PC 3: ASSESSMENT FOR LEARNING (E-401)**

#### **CO: COURSE OUTCOMES**

**CO1-** Become cognizant of key concepts such as measurement & evaluation, assessment, test examination, formative & summative evaluation etc

**CO2-** Be exposed to different kinds of assessment that aid student learning.

**CO3-** Have an idea of new trends in evaluation.

**CO4-** Learn the different characteristics of standardized test-Reliability, validity, Norms, etc.

**CO5-** Relate & use statistics in educational setting

### Course Structure

#### Unit - I: Assessment and Evaluation

- ❖ Concept of measurement and evaluation, test assessment, examination, formative & summative evaluation, open book examination, grading, cumulative grade point average (CGPA), **choice-based credit system (CBCS)**
- ❖ Purposes of assessment in a 'constructivist' paradigm, distinction between Assessment for Learning & 'Assessment of Learning'
- ❖ **Feedback for furthering learning, progress and profile of learner**

#### Unit - II: Assessment tools

- ❖ Quantitative and qualitative Tools.
- ❖ Constructing an achievement test- blue-print, **item-analysis, try out**
- ❖ Standardization of test – objectivity, reliability validity, **norms**

#### Unit - III: Techniques of Test Conduct

- ❖ Importance of establishment of rapport with the students
- ❖ Security of tests and testing material
- ❖ Arranging the seat and distribution of question for minimum pillage and copying
- ❖ Technique of avoiding guessing in answering objective questions
- ❖ Introducing flexibility in examination
- ❖ **Improving quality and range of questions including school-based credits**
- ❖ **Role of ICT in Examination**

#### Unit - IV: Data and Measures of Central tendency

- ❖ Data: meaning and types, frequency distribution, graphic representation, percentage
- ❖ Central Tendency – Mean, Median, Mode.

#### Unit - V: Measures of Variability and Correlation

- ❖ Range, quartile deviation, mean deviation, standard deviation, percentile
- ❖ Rank- order method, **Pearson's correlation**

#### Unit - VI: Normal Probability Curve

- ❖ Meaning, characteristics and use of NPC

#### Suggested Readings:

- Cohen, Louis; Manion, Lawrence and Morrison, Keith(2004); A Guide to Teaching Practice- Fifth Edition; Routledge Falmer-Taylor and Francis Group; London.
- Ebel Robert L., (1991). Essentials of Educational Measurement, Prentice Hall of India.
- Gunter, Mary Alice et.al(2007)., Instruction: A Model's Approach- Fifth Edition; Pearson Education Inc.; Boston.
- Kubiszyn Tom. (2003). Educational Testing and Measurement, John Wiley.
- Linn, Robert L. and Gronlund, Norman E. (2000). Measurement and Assessment in Teaching; Pearson Education Inc.

**PC 4: (OPTIONAL COURSE-ANY ONE)**

**EDUCATIONAL ADMINISTRATION AND MANAGEMENT**

**(E-501)**

**CO: COURSE OUTCOMES**

**CO1-** Acquaint the student teaches with the concept and concerns of educational administration.

**CO2-** Develop an understanding of the role of the headmaster and the teacher in school management.

**CO3-** Enable the students to understand to concept at importance of communication and its possible barriers in educational administration.

**CO4-** Enable the student teacher to critically analyse the administrative scenario in relation to the functioning of the other secondary schools of the area.

**CO5-** Acquaint the student teacher with the scientific practices of educational management and keep him to apply it in work situation

**Course Contents**

**Unit - I: Concept of Educational Administration**

- ❖ Concept of educational management human beings as inputs, process and product inputs
- ❖ Nature, objectives and scope of educational administration

**Unit - II: Basic Functions of Administration**

- ❖ Planning, organizing, directing and controlling
- ❖ Maintenance of discipline, control management
- ❖ Co-ordination and growth development
- ❖ Supervision and inspection, defects in the present supervision and inspection.
- ❖ Scope of educational supervision, types of supervision, providing guidance, leadership function, crisis in management, decision making

**Unit - III: Communication in Educational Administration**

- ❖ Role of communication in effective management and administration
- ❖ Methods of communication
- ❖ Barriers of communication in educational administration
- ❖ Overcoming barriers to communication and effective communication in educational administration

**Unit - IV: Management of Schools**

- ❖ Role of headmaster in planning of school activities approaches to management- manpower approach, cost benefit approach, social demand approach, and social justice approach
- ❖ Involvement of other functionaries and agencies in the preparation of a plan
- ❖ Delegation of authority and accountability
- ❖ Role of the headmaster in monitoring, supervision and evaluation
- ❖ Role of headmaster in motivating the staff, in resolution of interpersonal conflicts
- ❖ Role of the headmaster in creating resources and managing financial matters
- ❖ Optimum use of available resources for growth and development of the school
- ❖ Staff development programmes.
- ❖ Role of teachers in school management and administration

**Unit - V: Educational Administration in the State**

- ❖ The administrative structure in the field of education in the state
- ❖ Control of school education in the stage a critical analysis

- ❖ Functions of the state government in relation to secondary and higher secondary schools
- ❖ Functions of the board of secondary education in controlling secondary schools
- ❖ Problems of secondary school administration in government schools

## **GUIDANCE AND COUNSELLING (E-502)**

### **CO: COURSE OUTCOMES**

**CO1-** Develop an understanding of the need and importance of career information for the pupils.

**CO2-** Identify their role and function in locating, collecting, evaluating and disseminating career information for the use of pupils.

**CO3-** Develop an understanding of how one's ability, interests and aptitudes are related to world of work.

**CO4-** Know about the importance of developing the right attitude and values at every stage of education.

### **Course Contents**

#### **Unit - I: Meaning and concept of Guidance**

- ❖ Concepts, need and importance of guidance
- ❖ Principles of guidance, procedure of guidance (steps)
- ❖ Types-educational, vocational and personal
- ❖ Counselling-need functions and types
- ❖ Observation, interview and sociometry as techniques of guidance

#### **Unit - II: Meaning and concept Counseling**

- ❖ Concepts, need and importance of counseling
- ❖ Principles of counseling, counseling process and role
- ❖ Directive, non-directive and elective counseling
- ❖ Lectures, discussions and dramatic as techniques of counseling

#### **Unit - III: Meaning and concept Career Information**

- ❖ Meaning of career and career information components of career information.
- ❖ Occupational information, information about education and opportunity and personal-social information.
- ❖ Aims to study career information at different levels
- ❖ Career information: sources, method of collection, classification and filling-up of information and evaluation of the information

#### **Unit - IV: Career Information and Training**

- ❖ Information about education and training opportunities of primary, elementary and secondary levels of school

#### **Unit - V: Career Information and School**

- ❖ Personal-social information at every school level

## ENVIRONMENTAL EDUCATION (E-503)

### CO: COURSE OUTCOMES

**CO1-** Enable the student teacher understands about the concept of environmental education.

**CO2-** Develop in the student teacher a sense of awareness about the environmental pollution, and possible hazards and its causes and remedies.

**CO3-** Develop a sense of responsibility towards conservation of environment, bio-diversity and sustainable development.

**CO4-** Develop reasonable understanding about the role of school and education in fostering the idea and learning to live in harmony with nature

**CO5-** Enable the students to understand about the various measures available to conserve the environment for sustaining the development.

### Course Contents

#### Unit - I: Basic Concept and Nature of Environment

- ❖ Meaning, scope and nature of environment, natural and man-made environment
- ❖ Ecosystem-structure, function and components.
- ❖ Energy flow in ecosystem-food chains, food webs and ecological pyramids.
- ❖ Introduction and characteristic feature of-forest, grass land, desert and aquatic ecosystem.

#### Unit - II: Natural Resources and Associated Problems

- ❖ Forest resources – use and overexploitation. Deforestation-cause, effects and remedy
- ❖ Water resources- use and overexploitation of surface and ground water, rain water harvesting and watershed management.
- ❖ Mineral resources-use, exploitation and conservation, effect of mining on man and environment
- ❖ Food resources- world food problems-changes caused by agriculture and overgrazing, effect of modern agriculture, fertilizers, pesticides, water logging and salinity.
- ❖ Energy resources- growing energy need renewable and non-renewable energy sources, conservation and alternate energy sources

#### Unit - III: Biodiversity and its conservation

- ❖ Meaning and values of biodiversity, India as a mega diversity nation
- ❖ Threats to biodiversity-habitat loss, poaching of wild life, man wildlife conflicts
- ❖ Conservation of genetic diversity, an important environment priority: learning to live in harmony with nature

#### Unit - IV: Environment Issues and Its Preventive Measures

- ❖ Causes and effects of environmental hazard, global and local environmental pollution and its remedies, Air, Water, Soil, Marine, Noise, Thermal and Nuclear Pollution
- ❖ Climate change- Global Warming, Acid Rain, Ozone layer depletion, Polar Melting.
- ❖ Natural disasters-Flood, Earthquake, Cyclone and Landslides.

#### Unit - V: Environment Management

- ❖ Salient features of environmental awareness through education, programmes of environmental education for secondary school children
- ❖ Programmes of environmental education for attitude changes among the children
- ❖ Environmental ethics and values
- ❖ Environmental acts, rule and regulations
- ❖ National efforts-Ministry of Forest and Environment, government plans, action and policies
- ❖ Role of school in environmental conservation and sustainable development



## COMPUTER EDUCATION (E-504)

### CO: COURSE OUTCOMES

**CO1-** Acquire knowledge of computers, its accessories and software

**CO2-** Understand features of MS Office and their operations

**CO3-** Apply the knowledge gained in respect of to process various data of students as well as simple library financial transaction of the school.

**CO4-** Appreciate the value of CAI/CML packages on optional subjects and use them in class room instruction.

**CO5-** Acquire skill in accessing World Wide Web and Internet and global accessing of information. integrate technology in to classroom teaching learning strategies

### Course Contents

#### Unit I: Meaning, Definition and Historical Perspectives of Computer

- ❖ Meaning and definition of computer
- ❖ Historical perspective
- ❖ Computer generations and its classification
- ❖ Block diagram of a computer Peripherals, and working of a computer

#### Unit II: Computer Hardware

- ❖ Input devices: keyboard, mouse, joystick, touch screen, touch pad, magnetic ink character reader, optical mark reader, bar code reader, scanner, web camera etc.
- ❖ Output devices: monitor printers (line, serial, dot matrix, inkjet, and laser).
- ❖ Primary storage devices: RAM ROM and its types.
- ❖ Secondary storage devices: FDD, HDD, CD, DVD, Pen Drive (USB)

#### Unit III: Binary Arithmetic and Data Representations:

- ❖ Decimal and binary number system
- ❖ Representation of characters
- ❖ Integers and fractions in computers
- ❖ Films point representation and floating point representation

#### Unit IV: Computer Programmes

- ❖ MS-WINDOWS
- ❖ MS-WORD
- ❖ SPREADSHEET
- ❖ POWER POINT
- ❖ INTERNET

#### Unit V: Computers in Education

- Computer application in educational institutions-
  - o Co-curricular activities
    - ⌋ Academic activities
    - ⌋ Administrative activities
  - o Examination work
  - o Research activities
  - o Library
  - o Class room teaching

## HEALTH, PHYSICAL EDUCATION & YOG (E-505)

### CO: COURSE OUTCOMES

**CO1-** Understand the concept of wholistic health and its various dimension and determinants of health.

**CO2-** Acquaint them to school health programme & its importance.

**CO3-** Sensitize the student teacher towards physical fitness & its importance.

**CO4-** Acquire the skills for assessment of physical fitness.

**CO5-** Introduce them to the philosophical bases of Yoga.

**CO6-** Understand the process of stress management through Yoga education.

### Course Contents

#### Unit - I: Health

- ❖ Introduction, definition and meaning of health
- ❖ Dimension of health
- ❖ Determinants of health
- ❖ Importance of balance diet
- ❖ School health programme and role of teacher in development of health

#### Unit - II: Physical Education

- ❖ Introduction, definition and meaning of physical education
- ❖ Objectives of physical education.
- ❖ Scope of physical education and allied areas in physical education
- ❖ Need and importance of physical education in different level of school

#### Unit - III: Physical Fitness

- ❖ Definition, meaning type and factors of physical fitness
- ❖ Factors affecting physical fitness
- ❖ Benefits of physical fitness
- ❖ Importance of physical activities at school level
- ❖ Assessment of physical fitness

#### Unit - IV: Concept of Yoga and Ashtang Yoga

- ❖ Yoga meaning concept and importance
- ❖ Mis-concept of yoga
- ❖ Eight disciplines of Yog-Ashtang Yoga
- ❖ Precautions to keep in mind while performing Yogasan
- ❖ Different types of Yogassans & their techniques of practicing

#### Unit - V: Meditation, Pranayam and Stress Management

- ❖ Pranayam: meaning, nature and relationship with mind
- ❖ Different types of Pranayam; kapalbhati; Bhastrika Pranayam, Surya Bhedan Pranayam, Chandrabhedan Pranayam, Anulomvilom Pranayam
- ❖ Meditation: nature, procedure and importance
- ❖ Stress: meaning, reasons, role of Yog in stress management

## LIFE STYLE MANAGEMENT (E-506)

### CO: COURSE OUTCOMES

**CO1-** Understand the theoretical foundations of Life Skills Education

**CO2-** Apply Life Skills in various spheres.

**CO3-** Ability to contribute as youth workers specialized in the area of Life Skills Education.

**CO4-** Develop the spirit of social responsibility in students.

**CO5-** Develop social and emotional well-being in students.

### Course Contents

#### Unit - I: Introduction

- ❖ Life Skills: Concept, need and importance of Life Skills for human beings.
- ❖ Life Skills Education: Concept, need and importance of Life Skills Education for teachers.
- ❖ Difference between Livelihood Skills and Life Skills.
- ❖ Core Life Skills prescribed by World Health Organization.
- ❖ Key Issues and Concerns of Adolescent students in emerging Indian context.

#### Unit - II: Process and Methods Enhancing the Life Skills

- ❖ Classroom Discussions
- ❖ Brainstorming and Role plays
- ❖ Demonstration and Guided Practice
- ❖ Audio and Visual activities, e.g. Arts, Music, Theatre, Dance
- ❖ Small Groups discussions followed by a presentation of group reports.
- ❖ Educational Games and Simulation
- ❖ Case Studies, Storytelling, Debates
- ❖ Decision making and mapping of using problem trees.

#### Unit - III: Core Life Skills (I)

- ❖ Skills of Self-awareness and Empathy: Concept, Importance for Teachers in particular, Integration with the teaching learning process, learning to live together with other living beings. acceptance of diversity in perspectives of different societies and cultures. Acceptance and importance of all living being as along ecological and psychological social structures.
- ❖ Skills of Coping with Stress and Emotion: Concept, importance for Teachers in particular and Integration with the teaching learning process.

#### Unit - IV: Core Life Skills (II)

- ❖ Skills of Critical thinking and Creative thinking: Concept, importance for Educationists, Integration with the teaching learning process.
- ❖ Skills of Problem Solving and Decision making: Concept, importance for Educationists, Integration within the teaching -learning process.

#### Unit – V: Core Life Skills (III)

- ❖ Skill of Effective Communication: Concept, importance for Human beings and Educationists, Integration within the teaching learning process.
- ❖ Skills of Building Interpersonal relationships: Concept, Importance for Teachers in particular and Integration with the teaching- learning process.

## PEACE EDUCATION (E-507)

### CO: COURSE OUTCOMES

**CO1-** To understand the concept of Peace Education

**CO2-** To understand the importance of peace education in personality development

**CO3-** Apply the culture of peace needed to achieve and sustain a global culture of peace and values.

**CO4-** Develop develop personal initiative and resources for the pursuit and promotion of peace by inculcating change to culture of peace

**CO5-** To analyze the need for Peace Education to foster National and International understanding.

**CO5-** To aware of the scale and variety of conflicts affecting contemporary life and learn

### Course Contents

#### Unit – I: Peace Education: Concept and Scope

- ❖ Meaning of Peace: Umbrella term of all positive values to build a positive personality
- ❖ Meaning, Nature and Concepts of Peace Education
- ❖ Aims and Objectives of Peace Education
- ❖ Status of peace education in the curriculum and its relevance in present global scenario
- ❖ Different sources of peace: Philosophical, Religious, Social, Secular and Psychological.
- ❖ Classification of Peace: Individual and social; positive and negative peace
- ❖ Method of Peace in Mind: Learning Positive Lessons from Negative Experiences
- ❖ Peace as a concomitant result of Human values.

#### Unit – II: Integrating Peace Education in the Present Curriculum

- ❖ Integrating Peace Education in Curriculum: Subject context, subject perspectives, Teaching Methods, Co- curricular activities, Staff development, class- room management, School Management
- ❖ Practical steps to build Culture of Peace in schools: Simulations Classroom Discussions, Book Clubs, Experience-Sharing Sessions
- ❖ Developing Attitude of Culture of Peace and Peace-Making: Mutual Respect, Tolerance, Patience, Seeking Spirit and Realistic, Objective Thinking through Accountability
- ❖ Educating for a Culture of Peace: Learning mutual respect, dutyconsciousness, leadership skills through unilateral ethics, introspection and mutual learning through duty-consciousness.

#### Unit – III: Violence for Peace and conflict Resolution

- ❖ Peace, Violence and conflict: conflict and violence—in life, media—a normal part of life; importance of not considering it a crisis but managing them to maintain peace
- ❖ Conflict Management: Maintaining Normalcy in Conflict; Managing Conflicts through dialogue and discussion, cooperation; peace education in managing conflicts in family and student life
- ❖ Non-Violent Activism: Speech, Behaviour and Action with others based on non-violence

takes the justification of acting violently away from others; role of peace education in learning nonviolence

- ❖ Peace Education: Agencies Role of community, school and family in the development of values for Peaceful Co-existence

#### **Unit – IV: Global Issues and Peace Movements**

- ❖ Human Rights as a Duty: Learning to give human rights to others.
- ❖ Preservation of Ecology, population control, Economic Exploration: Limited Use as Duty-Conscious citizen; not indiscriminate use as rights-conscious citizens.
- ❖ Challenge Not Deprivation: Problems of life are challenges not situations of deprivation
- ❖ Role of World Organizations in Promoting Peace Education: Case Study of UNESCO's Culture of Peace Program in global scenarios and suggestions

### **VALUE EDUCATION (E-508)**

#### **CO: COURSE OUTCOMES**

**CO1-** To understand the need and importance of value-education for Human Rights as a duty

**CO2-** Analyze the nature of values, moral values, moral education as a duty based as they are on the golden rule of religious education

**CO3-** Ability to make the student teachers with the basis of duty-conscious ethics and morality based on a rational understanding

**CO4-** Develop the golden rule of religious education and its related moral training

**CO5-** Draw lessons from principles of life and converting them into moral learning towards moral education.

#### **Course Contents**

##### **Unit - I: Value Education in a Pluralistic World (Multi-Cultural, Multi-Religious and MultiEthnic)**

- ❖ Value Education Concept, Nature, Source & Perspectives (Rational, Philosophical, Socio-Cultural, Religious and Psychological).
- ❖ Fundamental Human values-Truth, Peace, Non-violence, Righteous Conduct.
- ❖ Connected Terminology: Realism, Accountability, Duty, Virtue, Dharma, Ethics, Religion, Morality, Values,
- ❖ Typologies: Intrinsic and Extrinsic Values.
- ❖ Duty Approach to Ethics: Deontology, Justice as a Duty
- ❖ Learning through Examples:
- ❖ Indian Pluralism: Mutual Respect, Tolerance and Dialogue in Islam, Buddhism, Christianity, Jainism, Sikhism and Hinduism.
- ❖ Greco-Roman and Chinese Cultural values: Open-Mindedness, Free thinking, Cooperation, etc.
- ❖ Secular Values: Facing Challenges Positively through examples of Super-Achievers (life history and quotes)
- ❖ Commonalities of all religious at Philosophical levels.

- ❖ Diversities of religion at politics of religion

### **Unit - II: Development of the Individual**

- ❖ Personality Development and Character building education: through unilateral ethics
- ❖ Development of right attitude, aptitudes and interest: through higher thinking, contemplation and patience
- ❖ Yoga, meditation and self-control; introspection on one's strengths and weakness, wrong speech, habits and actions.
- ❖ Positive approach to life – in words and deeds: through positive thinking and positive living
- ❖ Self-discipline Leading to Duty-Consciousness: Politeness, Punctuality & Righteous Conduct
- ❖ The importance of Affective domain in Education in Compassion, Love and Kindness

### **Unit - III: Response to Value Crisis and Impact of Modern Education & Media on Values**

- ❖ Value Crisis: Values Crisis Concept, Conflicts as Challenge Vs. Hindrance
- ❖ Strategies of Response: Lawrence Kohlberg and Carol Gilligan
- ❖ Arnold Toynbee's Challenge-Response Mechanism: Case Study of the Life of Dr. Abdul Kalam
- ❖ Gandhian Formula: "Be the Change you wish to see in the world"
- ❖ Positive Response: "Seek to Change Yourself; Do Not Complain about Others"

### **Unit - IV: Values: The ideal of Human Unity and Peace**

- ❖ Human Rights, Rationale and Evolution, UDHR and its Articles( particularly 1, 3, 7, 10, 18, 19)
- ❖ UDHR and Duties: Article 26, Receiving Rights subject to performing duties
- ❖ Human Rights Education: Meaning, Objectives, Strategies and Role of Education towards duty-consciousness
- ❖ National Human Rights Commission and its role
- ❖ Role of the Indian Constitution: The Right of Children to Free and Compulsory Education Act, 2009 in context of human Rights and Human Duties Article 51A
- ❖ Peace Education: Meaning, objectives, Role of Education in promoting Peace based on unilateral ethics of 'in giving we receive'
- ❖ Education, Strategies for imparting Peace Education through imparting of dutyconsciousness

## **ADULT AND POPULATION EDUCATION (E-509)**

### **CO: COURSE OUTCOMES**

**CO1-** To develop an understanding of the meaning and concept of Adult Education

**CO2-** Apply the different methods and evaluation techniques of adult learning.

**CO3-** Analyze the problems and difficulties coming in the way of achieving full literacy in the country

**CO4-** To understand population becomes stable when difference between birth and death rates.

**CO5-** Develop among themselves a healthy, rational and scientific attitude towards the natural phenomena of birth and death.

### **Course Contents**

### **Unit - I: Adult and Continuing Education**

- ❖ Meaning, Concept and Scope of Adult and Continuing Education.
- ❖ Need and Importance of Adult Education for the development of an Individual for Social Change.
- ❖ Adult Education in Independent India: Objectives Target, efforts, achievements and causes for slow progress.
- ❖ National Literacy Mission - Aims, objectives and strategies.

### **Unit - II: Teaching - Learning process in Adults**

- ❖ Androgogy- Nature and Scope. Basic difference between Pedagogy and Androgogy.
- ❖ Agencies and Organizations: Local, State and Central level, their problems.
- ❖ Adult Learner — Characteristics, problems and motivation.
- ❖ Adult teaching — Different methods, Role of Mass media.
- ❖ Evaluation Techniques for Adult Learning.
- ❖ Adult Education, lifelong learning and continuing Education
- ❖ Adult Education and Continuing education
- ❖ Lifelong learning- A component of adult education
- ❖ Lifelong learning in IT age- Exploring ICT as a Tool

### **Unit - III: Population and AIDS Education**

- ❖ Importance of Population Education – concept / meaning and objectives of population education – factors affecting population explosion – importance of Family Life Education, with reference to effect of Population Growth on: Economic Development, Social Development, Educational Development, Environmental and Natural Resources, Health and Nutrition
- ❖ Symptoms of AIDS – causes, Prevention of AIDS – AIDS Education – meaning and objectives. Role of different agencies in promoting AIDS Awareness Education – [Local, National and International Agencies – 2 each]

### **Unit - IV: Integrated Population Education**

- ❖ Role of Government and Non-Govt. Agencies concerning Population Education.
- ❖ Integration of Population Concept in different School Subjects.
- ❖ Population Education through co-curricular activities.
- ❖ Role of the Teacher in Population Education Programs.

## **SCHOOL LEADERSHIP (E-510)**

### **CO: COURSE OUTCOMES**

- CO1-** Develop a critical understanding of the notion of school organization.
- CO2-** Develop a comprehensive understanding of context-specific notions of school effectiveness.
- CO3-** Understanding of school leadership and challenges to management.
- CO4-** Apply connections between field-based project work, educational leadership and change facilitation.
- CO5-** Know the system of education, its relationship with school curriculum and management.

## Course Contents

### **Unit I: Structures and Processes of the Indian Education System**

- ❖ Types of schools within different administration bodies
- ❖ Roles and responsibilities of education functionaries
- ❖ Governance rules and financial management of different types of school.
- ❖ Relationships between support organizations(Affiliating, Regulating and Financing bodies) and the school.
- ❖ Understanding and interpreting educational policies that impact schools
- ❖ Concepts of school culture, organization, leadership and management.

### **Unit II: School Effectiveness and School Standards**

- ❖ School effectiveness -meaning and its assessment.
- ❖ Understanding and developing standards in education

### **Unit III: School Leadership**

- ❖ Administrative and academic leadership
- ❖ Styles of leadership
- ❖ Team leadership
- ❖ Pedagogical leadership
- ❖ Leadership for motivation and change

### **Unit IV: School Management**

- ❖ Desirable Change in management
- ❖ Conflict Management
- ❖ Classroom management effective communication and motivational skills.
- ❖ Learner- centred educational and inclusive Education.
- ❖ Role of school activities such as assemblies, annual days etc., in the creation of school culture.
- ❖ Accountability and Continuous Professional Development

### **Unit V: Changes in Education System**

- ❖ Sarva Shiksha Abhiyan (SSA) experiences and RMSA
- ❖ Equity in Education · Incentives and schemes for girl child
- ❖ Issues in educational and school reform
- ❖ Preparing for and facilitating change in education through Teacher Education system as prime mover.
- ❖ Role and functions of IASEs, DIETs, CTE · Role, functions and networking of institutions like UGC,
- ❖ NCERT, NCTE, NUEPA, SCERT etc.



**(Teaching Skills) Practical  
Work EF 2(B): School  
Internship (E-703)**

In the second year, there shall be a minimum of 16 weeks of intensive engagement with the school in the form of School Internship. For this, the student-teachers will go for 'School Placement', during which their role in the school is something like an apprentice and they shall work as a regular teacher & participate in all the school activities including planning, teaching and assessment, interacting with school-teachers, & children to understand the school in totality its philosophy & aims, organization and management, the life of a teacher, the needs of the physical, mental and emotional development of children. They will be engaged in school functioning in all its aspects in consultation with the School-mentor, like-

- ❖ Participating in various 'out-of-class room' activities in school.
- ❖ Organizing events e.g., cultural activities, debates, games, quiz, essay-competition, drama, etc.
- ❖ Preparation of School calendar, time-table, assessment schedule, evaluation tools etc.
- ❖ Preparing a suggested comprehensive plan of action for some aspect of school improvement.

School-Internship shall be designed to lead to the development of 'Teaching Competence of a professional, teacher dispositions and sensitivity.

During internship, student-teachers will be provided opportunities to teach in government and private schools with systematic support and feedback from the faculty. During this period, student-teachers will be actively engaged in teaching at school and will participate in day-to-day activities of school.

It is important that the student-teachers will consolidate and reflect on their teaching experience during the school-internship.

- ❖ Student-teachers will maintain a **Journal (A Diary)** in which he/she records one's experiences and observations, etc. daily.
- ❖ Student-teachers will maintain a **Portfolio** of all the activities like-details of daily-teaching eg., topic, date, class, objectives of teaching, resources used, assessment tools, homework given, etc.
- ❖ Student-teachers will **teach at least 30 lessons** during internship period. These lessons will be observed by their mentors in the school.
- ❖ Student-teachers will work on an **Action Research based Project** on any Educational problem of School, which will be selected in consultation with the concerned faculty supervisor.

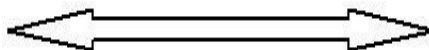
**Final Presentation**

At the end of School-Internship each student-teacher will be expected to present

- ❖ **The Journal**—Containing day-to-day report about different activities, like-teaching, events, etc. mentioned above.
- ❖ **The Portfolio**- Containing evidences (proof) of different activities and events in the form of different photographs, etc.
- ❖ **The Project Report**-Containing the data, analysis and interpretation based on Action Research conducted by him/her.
- ❖ **Presentation of Teaching through ICT**- on any topic of school subject.

These four activities will be included in the evaluation of School-Internship.

- ❖ The Journal of 50 marks
- ❖ The Portfolio of 50 marks
- ❖ The Project Report of 50 marks
- ❖ Presentation of teaching through ICT on any topic of school subject of 50 marks





## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Education**

### **Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Education (B.Ed.) Two Year Programme**

**Annual Pattern**

**(w.e.f. session 2015-16)**

**Approved and Adopted in the year 2015**

**(First Board of Studies; 22.06.2015)**

## ***Programme Educational Objectives (PEOs)***

- PEO 1** To enable the prospective teachers to understand the nature purpose and Philosophy of School Education.
- PEO 2** To acquire knowledge and develop an understanding of various aspects of school management.
- PEO 3** To change the behavior, attitude and values through which learners can make responsible and accountable agents of society
- PEO 4** To provide a rich programme of curricular and extra- curricular activities for overall development of learner's personalities.
- PEO 5** To prepare prospective teachers to understand psychological and sociological aspects of child's development.
- PEO 6** To enable the learners to gain in-depth conceptual knowledge in the area of education at primary and secondary levels
- PEO 7** To prepare up-coming teachers to understand child's behavior under different condition.
- PEO 8** To make familiar student- teachers to various teaching methodologies prevailing across the world.
- PEO 9** To sensitize student- teachers about various social and educational issues.
- PEO 10** To enable them to be more creative in their outlook as teachers and to be positive in their attitude and approach.
- PEO 11** To develop competencies and skills required for becoming a reflective and humane teacher.
- PEO 12** To sensitize them towards the promotion of social cohesion National integration and International understanding
- PEO 13** To develop communication skills, train them to use modern information and communication technology for school purposes
- PEO 14** To train them in conducting action research in educational situation and to improve the pedagogical practices in their subjects.

### ***Programme Specific Objectives (PSO's)***

**PSO 1** Problem Solving Skills – Learners will be able to develop reflective and analytical skills and understanding of critical issues of education.

**PSO 2** Professional Skills – Learners will be able to build skills and abilities of communication, reflection, art, aesthetics, and self-expression.

**PSO 3** Successful Career – Learners will exhibit contemporary knowledge in education and will be competent to work in private and government institutions.

**PSO 4** The Teacher and Society – Learners will be able to develop understanding about child's pedagogy, school management and community involvement.

### ***Programme Outcome Objectives (POO's)***

**POO 1** Teaching knowledge: To be able to use learner centered teaching methods and to assess children's learning ability using different pathways.

**POO 2** Problem analysis: To enable the prospective teachers to deal with both the personal and academic problems of students.

**POO 3** Design/ development of solutions: To be able to find and develop the solution of problems of learners related to teaching field.

**POO 4** Conduct investigations of complex problems: Being able to understand and investigate complex problems and find out their solutions.

**POO 5** Modern tool usage: To be able to adopt modern techniques for teaching skill development.

**POO 6** The teacher and society: To be able to engage with self, child, community and school to establish close connections between different curricular areas.

**POO 7** Environment and sustainability: To develop the knowledge, skills, values, attitudes and behavior among students to understand and care for their environment.

**POO 8** Ethics: To be able to develop possible ethical boundaries and values perceived by learners in teaching institutions.

**POO 9** Individual and team work: Student-teacher will be able to share insights, work together productively and efficiently to reach their goal and attain a positive outcome.

**POO 10** Communication: To be able to develop a strong sense of wellbeing and effective communicators and to communicate effectively, verbally as well as in writing.

**POO 11** Project management and finance: Being able to develop projects related to curriculum and study the financial needs and find the ways to meet them.

**POO 12** Life-long learning: Being able to demonstrate reading, writing, listening and speaking skills and also develop an ability to reflect on their own understanding.

## *Course Structure*

The present B.Ed. syllabus for two-year programme has been designed on the current guidelines of NCTE & UGC with the view to make the student-teachers reflective practitioners. The programme is comprised of three broad inter-related curricular areas: -

- (A) : Perspectives in Education: Core Courses (CC)
- (B) : Curriculum and Pedagogic Studies: Pedagogy Courses (PC)
- (C) : Engagement with the Field/Practicum (EF)

Transaction of the courses is to be done using a variety of approaches, such as tasks and assignments, projects, group discussion, seminar, interactions with community in multiple socio-cultural environments.

### **Group (A): Perspectives in Education- Core Courses (CC)**

These courses are intended to provide a conceptual understanding of relevant concepts and processes in teacher education and also situate them in the broader perspective of education and development.

#### **CC 1: Contemporary India and Education**

This course deals with conceptual understanding about issues of diversity, inequality and marginalization in Indian society, the implications for education with analysis of significant policy debates in Indian education.

#### **CC 2: Philosophical & Sociological Perspectives of Education**

This course deals with philosophical and sociological issues and provides an opportunity to understand and reflect on the vision of education as well as cultural context within which education operates.

#### **CC 3: Growing up as a Learner**

This course deals with individual development, nature and process of learning and an understanding of how learning and cognition are closely inter-related throughout individual development process.

#### **CC 4: Teacher, Teaching and Technology**

This course deals with rules and expectations of teachers in the form of accountability and code of ethics and the nature and various aspects of the teaching process in view of the professional development of the teacher.

#### **CC 5: Creating an Inclusive School**

This course deals with understanding of the cultures, policies and practices that need to be addressed in order to create an inclusive school and identify & utilize existing resources for promoting inclusive practices.

#### **CC 6: Gender, School and Society**

This course deals with meaning and experience of being a boy or a girl across different social groups, regions and time-periods. It also deals with gender inequalities through a variety of institutions such as the family, caste, religion, culture, the media and popular culture, law and the state.

#### **CC 7: Knowledge, Language and Curriculum**

This course deals with meaning, nature and sources of knowledge, to develop the ability of reading, comprehension and writing skills & to understand concepts and principles of curriculum development.

## **Group (B): Curriculum and Pedagogic Studies- Pedagogy Courses (PC)**

These courses pertain mainly to help student-teachers become effective teachers. For this, it offers the student-teachers not only reorganize one's previous understanding of one's subject of specialization but also the pedagogy as the integration of knowledge about the learner, the discipline and the societal context of learning, so that they may try out evolving a few learning situations and carry them out both in simulated as well as real situations.

### **PC 1 & PC 2: Pedagogy of School Subjects - I & II – Optional Courses**

These courses intend to enable student-teachers to recognize the nature of knowledge in various subject areas i.e. Sciences (Physical/Biological/Mathematics), Social Sciences, Languages (Hindi/English/Sanskrit), Commerce, Home Science, Computer Science and will help in developing & understanding of the pedagogical requirements in various teaching-learning situations. Each student-teacher will choose two School Subjects on the bases of his/her Graduation Stream.

### **PC 3: Assessment for Learning**

This course intends to lead to an understanding and appreciation of the relevance of assessment the how and why of it, as well as develop necessary competence in involving appropriate assessment modes in line with learning objectives. It also clarifies the significant shift in emphasis of the terms 'assessment for learning' as against 'assessment of learning.

### **PC 4: Optional Courses – any one of the following**

- I. Educational Administration and Management
- II. Guidance and Counseling
- III. Environmental Education
- IV. Computer Education
- V. Health, Physical Education and Yoga
- VI. Life Style Management

## **Group (C): Engagement with the Field/Practicum (EF)**

### **EF 1: Task and Assignment**

Task and Assignments that run through all the courses CC 1-7 and PC 3-4.

### **EF 2: Practicum**

#### **(A): Preparation to Function as a Teacher (Teaching Skills)**

This is visualized as a shorter-duration initial experience (5 weeks) of student-teachers to train in lesson-planning based on constructivist approach, micro-teaching skills and playing the role of teacher in simulated condition as well as in real classroom situation. It will help him/her to prepare himself/herself as a teacher possessing teaching skills.

#### **(B): School Internship**

This is visualized as a longer-duration field experience (16 weeks) of student-teachers supported by relevant interactive exposures within the school. During this period he/she will teach in the school, observe and participate in the day-to-day functioning of school, prepare a Journal containing day-to-day report about all activities including evaluation tools, and conduct an Action Research Project based on any school problem. It will help him/her to become a professional teacher, possessing teaching-competence.

### **EF 3: Enhancing Professional Capacities: Optional Courses**

A part from conceptual and practical learning gained through Core Courses (CC) and Pedagogy Courses (PC), student-teachers need to develop professional competencies and to experience the fact that the teacher is much more than someone who teaches a subject. The teacher is potentially a participant in the wider education system and he/she may play not only a proactive role in the community life of the school but also as an agent of social development and social transformation. It includes a number of experiences that will enhance the capacity of student-teachers in various essential dimensions. Each student-teacher will choose any three EPC activities in each year i.e. three in first year & three in second year.

EPC 1: Strengthening Language Proficiency

EPC 2: Art and Aesthetics

EPC 3: Reading and Reflecting on Texts

EPC 4: Understanding of ICT

EPC 5: Scouting and Guiding

EPC 6: Working with Community

EPC 7: Basics of Research

EPC 8: Drama and Art in Education

EPC 9: Entrepreneurship Development

## **Papers in the First Year**

### **From Group (A):**

Four compulsory papers as-

1. Contemporary India and Education
2. Philosophical & Sociological Perspectives of Education
3. Growing up as a Learner
4. Teacher Teaching Technology

### **From Group (B):**

Two Papers as PC 1 & 2 (Pedagogy of School Subjects - I & II)

(PC 1 & PC 2) These courses intend to enable student-teachers to recognize the nature of knowledge in various subject areas i.e. Sciences (Physical/Biological/Mathematics), Social Sciences, Languages (Hindi/English/Sanskrit), Commerce, Home Science, Computer Science and will help in developing & understanding of the pedagogical requirements in various teaching-learning situations. Each student-teacher will choose two School Subjects on the bases of his/her Graduation Stream.

### **From Group (C):**

#### **EF 1: Task and Assignment**

Task and Assignments that run through all the courses CC 1-4 and PC 1 & 2.

#### **EF 2: Practicum (A): Preparation to Function as a Teacher (Teaching Skills)**

#### **EF 3: Enhancing Professional Capacities: Optional Courses**

Each student-teacher will choose any three EPC activities in first year.



## Papers in the Second Year

### **From Group (A):**

Three compulsory papers as-

1. Creating an Inclusive School.
2. Gender, School and Society.
3. Knowledge, Language and Curriculum.

### **From Group (B):**

Two Papers as PC-3 (Assessment for Learning) & PC-4 (Optional Courses)

### **From Group (C):**

#### **EF 1: Task and Assignment**

Task and Assignments that run through all the courses CC 5-7 and PC 3 & 4.

#### **EF 2: Practicum (B): School Internship**

#### **EF 3: Enhancing Professional Capacities: Optional Courses**

Each student-teacher will choose any three EPC activities in second year.

**B.Ed. SYLLABUS FRAMEWORK  
(Based on NCTE Regulations 2014)**

**B.Ed. FIRST YEAR**

<b>Course Code</b>	<b>Title of the Course</b>	<b>Credits</b>	<b>Hours</b>	<b>Marks (External +Internal)</b>
<b>Perspectives of Education – Core Courses</b>				
E 101	CC 1: Contemporary India and Education	4	96	80+20
E 102	CC 2: Philosophical and Sociological Perspectives of Education	4	96	80+20
E 103	CC 3: Growing up as a Learner	4	96	80+20
E 104	CC 4: Teacher, Teaching and Technology	4	96	80+20
<b>Pedagogical Courses- Optional*</b>				
E 201 to 210	PC 1& 2: Pedagogy of School Subjects (Any two from the Table No. 1)	8 (4+4)	192(96+96)	80+20 80+20
<b>Engagement with the Field/Practicum</b>				
E 701	EF 2(A): Preparation to Function as a Teacher	4	8 weeks	80+20
E 702	Viva- Voce Examination based on 1. Task and Assignments that run through all the courses CC 1-4 and PC 1 & 2 2 EPC Activities of First Year*	2	4 weeks	80+20
<b>TOTAL</b>		<b>30</b>	<b>576 Hours + 12 Weeks</b>	<b>800</b>

## B.Ed. Second Year

Course Code	Title of the Course	Credits	Hours	Marks (External +Internal)
<b>Perspectives of Education – Core Courses</b>				
E 301	CC 5: Creating an Inclusive School	3	72	40+10
E 302	CC 6: Gender, School and Society	3	72	40+10
E 303	CC 7: Knowledge, Language and Curriculum	3	72	40+10
<b>Pedagogical Courses</b>				
E 401	PC 3 Assessment for Learning	4	96	80+20
E 501 to 506	PC 4 (Optional Courses)* (Any one from the Table No. 2)	3	72	40+10
<b>Engagement with the Field/Practicum</b>				
E 703	EF 2(B): School Internship*	8	16 weeks	160+40
E 704	Viva- Voce Examination based on 1. Task and Assignments that run through all the courses CC 5-7 and PC 3 & 4 2 EPC Activities of Second Year*	2	4 weeks	80+20
<b>TOTAL</b>		<b>26</b>	<b>432 Hours + 20 weeks</b>	<b>600</b>

**Note: 1 Credit = 24 Hours (Theory), 1 Credit = 2 Weeks (Practical)**

**Table No. 1**  
**PC 1 & 2: Pedagogical Courses- Optional**

These courses intend to enable student-teachers to recognize the nature of knowledge in various subject areas i.e. Sciences (Physical/Biological/Mathematics), Social Sciences, Languages (Hindi/English/Sanskrit), Commerce, Home Science, Computer Science and will help in developing & understanding of the pedagogical requirements in various teaching-learning situations. Each student-teacher will choose two school subjects on the bases of his/her Graduation Stream.

S. No.	Paper Code	Paper Name
1.	E 201	Pedagogy of Hindi
2.	E 202	Pedagogy of English
3.	E 203	Pedagogy of Sanskrit
4.	E 204	Pedagogy of Social Sciences
5.	E 205	Pedagogy of Mathematics
6.	E 206	Pedagogy of Physical Science
7.	E 207	Pedagogy of Biological Sciences
8.	E 208	Pedagogy of Computer Science
9.	E 209	Pedagogy of Home Science
10.	E 210	Pedagogy of Commerce

**Table No. 2**  
**PC-4: Optional Courses**

Each student-teacher will choose one paper from the following list.

S. No.	Paper Code	Paper Name
1.	E 501	Educational Administration and Management
2.	E 502	Guidance and Counseling
3.	E 503	Environmental Education
4.	E 504	Computer Education
5.	E 505	Health, Physical Education & Yoga
6.	E 506	Life Style Management

***Ordinance and Regulations***

**A. Duration Of Course**

1. Bachelor of Education (B.Ed.) course shall be a two-year full time professional pre-service teacher education programme with two year divided in yearly course and the examination shall be held at the end of each year.
2. First year shall be from 25<sup>th</sup> August to 30<sup>th</sup> April and the stretch of the second year shall be from 25<sup>th</sup> July to 20<sup>th</sup> April. At the end of each year the candidates shall be required to present themselves for examination.
3. It shall be a full-time course including Theory, Practice in teaching, internship, field work, professional development and other prescribed activities.

**B. Total Intake**

Total intake of B.Ed. course in the School of Education, Shobhit University, Gangoh shall be 100 as per NCTE norms.

**C. Eligibility Criteria**

The eligibility requirement for the admission of the candidates to B.Ed. course shall be in accordance with the eligibility criteria determine by NCTE/ U.P. Govt. Order issued from time to time.

**D. Procedure of Admission**

1. Admission to B.Ed. course shall be made in accordance with N.C.T.E rules and notifications issued from time to time.
2. Reservation of seats shall be as per N.C.T.E notifications.

**E. Academic Session**

First year of Bachelor of Education (B.Ed.) programme shall be Eight months long 25<sup>th</sup> August to 30<sup>th</sup> April excluding year-end examination and ten days winter break. Second year of Bachelor of Education (B.Ed.) programme shall be eight and half month long (25<sup>th</sup> July to 30<sup>th</sup> April).

**F. Classification of Successful Candidates**

1. No candidate shall be declared to be passed B.Ed. examination unless he/she secures 40% marks in aggregate of all the theory courses and 50% marks in practically separately for each academic session.
2. The division shall be determined on the aggregate of marks of all the courses prescribed for the degree separately in theory and practical in both the years as under:

<b>Division in theory &amp; Practical separately</b>	<b>Percentage of marks</b>
First division	60% or above
Second division	50% or above but below 60%
Third division in theory only	40% or above but below 50%

Note: The student will be awarded divisions separately in Theory & Practical Examination.

### **G. Examination: Rules And Regulations**

1. Students who have completed their course for the Bachelor of Education (B.Ed.) First yearly but have failed to appear/ pass the yearly examination will be allowed to re-appear in the subsequent First yearly examination. Those who fail to appear/ pass in any paper in the second yearly may be permitted to appear at the next year' examination without further attendance at lectures if their applications for permission meet with the approval of the Head of the School of Education and the Dean, Faculty of Education.
2. Candidates allowed to appear at the Bachelor of Education (B.Ed.) yearly examination under this ordinance as exempted candidates shall be required to pay the examination fee as prescribed by the University.
3. There shall be a Yearly-End examination and each student has to appear in all papers/ including Theory, Practical's, and Practice in teaching, internship, field work, and professional development.
4. Those candidates who pass a yearly examination can appear for improvement in only one theory paper of a yearly at the next Back Paper/ Regular examination of that yearly and not thereafter. However, the improvement facility will not be given in all the papers prescribed in the course.
5. Students of following categories shall be 'Eligible for Back Paper (EBP)'. An EBP candidate shall be promoted to next yearly. The back paper facility in a yearly provides promotion to the next yearly and another opportunity to obtain a minimum of the pass marks assigned for an individual paper or in the aggregate.
6. The candidates who fail to secure an aggregate of 50% of the maximum marks for a yearly but have obtained 40% of the maximum marks assigned to each of their papers may appear in all the papers as exempted candidate or may appear in only one theory paper of his choice as EBP candidate to secure a minimum in the aggregate.
7. The candidates who secure an aggregate of 50% of the maximum marks for a yearly but fail to secure a minimum of 40% of the maximum marks in one out of four papers prescribed for the yearly papers or in case where there are more than four papers prescribed for the yearly, the candidates who have failed in two theory papers or have failed in one theory paper shall be declared 'EBP'. Such candidates will appear only in their unclear papers.
8. A candidate with two out of three or three out of four unclear papers in his/ her first yearly examination shall be declared 'Failed' but will be promoted to the second yearly but not beyond till he/ she becomes a candidate under 3 or 4 by appearing as an exempted candidate in the next Back paper/ Regular examination of that yearly and not thereafter. Such a promotion from third to fourth yearly shall also be
9. The back paper facility will not be given to a candidate if the number of his unclear papers in all of his previous yearly examinations exceeds three.

10. The examination for the degree of the bachelor of education shall include: Theory of Examination, practice in teaching examination and practical examination, internship and professional development activities.
11. The students shall be required to complete their practice- in- teaching work, the prescribed Practical work, internship, field work, and other activities as per regular schedule of the department and the institution.

If candidate after completing the required percentage of attendance fails to appear in theory or in practical or both, he /she will be considered as ex-student in both theory as well as practical without attending further regular classes in the first or second year respectively.

12. A candidate shall be required to offer the course as prescribed in the syllabus. The theory courses shall carry 100 or 50 maximum marks in both the years. The practical course (E 701) EF 2(A): Preparation to function as a Teacher & E 702 Viva- Voce Examination based on 1. Task and Assignments that run through all the courses CC 1-4 and PC 1 & 2 will be of 200 marks in the first year, out of these 40 marks will be evaluated internally by the subject supervisors respectively and the remaining 160 marks by the board of examiners. In the same way, the practical course (E 703) EF 2(B): School Internship & E 704 Viva- Voce Examination based on 1. Task and Assignments that run through all the courses CC 5-7 and PC 3 & 4 will be of 300 marks in the second year, out of those 60 marks will be evaluated internally by the subject supervisors respectively and the remaining 240 marks by the board of examiners.
13. For a pass, a candidate is required to be obtain at least 40% marks in each paper with a minimum of 40% marks in external and internal assessment separately and 40% in the total aggregate in theory, 50% marks in external and internal assessment in practical separately and 50% in the total aggregate in practical in each year.
14. A candidate who has passed the B.Ed. first year examination may reappear in maximum two theory paper(s) of first year along with the second year examination in the immediately following year and in that case better performance in each such paper will be counted for working out the result.
15. A candidate who has passed the B.Ed. second year examination may reappear in maximum two theory paper of second year in the immediately following year and in that case better performance in each such paper will be counted for working out the result.
16. Candidates are given only one chance to reappear at the same examination for the purpose of improvement of performance in the immediately following year.

<b>Year</b>	<b>Marks</b>
First Year	800 (600 Theory + 200 Practical)
Second Year	600 (300 Theory + 300 Practical)
<b>Total</b>	<b>1400</b>

17. If a candidate fails in one or two paper of the first year examination, he/she may appear at the second year B.Ed. examination along with the one or two the failing paper(s) of the first year examination simultaneously. In case, he/she does not pass the failing paper(s) of the first year examination even at this chance, he/she will be required to reappear at the first year examination in full.

18. In the same way, if a candidate fails in one or two paper(s) of second year examination, he/she will have to appear in one/two paper(s) of the second year in the immediately following year .in case, he/she will be required to appear at the second year examination in full.
19. Each theory paper shall carry 100/50 marks which are allocated in the proportion of 80: 20 for year-end theory examination.
20. The division of marks in two year of Bachelor of Education (B.Ed.) programme shall be as follows:
  - Theory Papers 900 marks
  - Practice in Teaching Examination with 500 marks.
21. The medium of the written exam shall be Hindi or English only.

## **H. Awards of Degree**

The degree, Bachelor of Education (B.Ed.) shall be awarded by Shobhit University, Gangoh to candidates who have pursued a regular course of study in the university and have fulfilled all the conditions and have passed the prescribed examinations.

## **I. Evaluation Scheme**

The performance of the candidates appearing in B.Ed. examination will be evaluated as follows:

1. The evaluation of B.Ed. pupil teacher will be done in 1400 marks the division will be awarded separately in theory out of 900 marks and in practical out of 500 marks.
2. The theory part in all the papers **Perspectives in Education: Core Courses (CC) & Curriculum and Pedagogic Studies: Pedagogy Courses (PC)** will be evaluated through a system of external examination (80%) and internal Assessment (20%). The internal assessment will be based on Sessional Examinations (10%), Assignments (5%) & Attendance (5%) for each paper. The External Examination will be through the routine annual university examination, based on 03 essay type questions (48 marks), 04 short questions (16 marks) and 08 very short answer type questions (16 marks).
3. During the first-year evaluation procedure for the practical as follows:
  - (a) Evaluation procedure for paper **(E 701)-EF 2: Practicum (A): Preparation to Function as a Teacher**, a board of two examiners comprising one as Internal Examiner of concerned department & second one as External Examiner from any other University. Examiners will assess student separately and average of total sum of marks will be his\her final score in teaching skill out of 80 external marks and internal marks 20 marks will be given by two subject supervisors.
  - (b) For evaluation procedure paper **(E 702)-Viva- Voce Examination** of 80 marks will be conducted by the board of examiners & internal 20 marks given by respective supervisors.
4. During the second year, evaluation procedure for the practical will be as follows:
  - (a) Evaluation procedure for paper **(E 703)- EF 2(B): School Internship**, a board of two examiners comprising one as Internal Examiner of concerned department & second one as External Examiner from any other University, will assess the journal ,the portfolio and the final presentation of teaching of students through PPT or OHP separately and average of total sum of marks will be her final score in teaching competence out of 160 external marks and internal 40 marks will be given by the subject supervisors .it will be divide as follows:
    - i. The Journal of 50 marks (10+40).
    - ii. The Portfolio of 50 marks (10+40).
    - iii. Final presentation through PPT/OHP of each school subject 100 marks (20+80).
  - (b) Evaluation procedure for paper **(E 704)-Viva- Voce Examination** of 80 marks will be conduct by the board of examiners and internal 20 marks will be given by the respective supervisors.

## **5. Continuous and Comprehensive Evaluation (C.C.E)**

(a) In each paper the continuous internal assessment system would have a weightage of 20% marks, while the yearly end examination shall have a weightage of 80% marks.

(b) The weightage of components in continuous internal assessment system will be as under:

- Sessional Examination	10 %
- Assignment and Presentation	05 %
- Attendance	05 %

(c) It shall be the duty of the teacher/teachers to conduct Continuous and comprehensive Evaluation. In case more than one teacher is sharing the teaching work in a paper, each teacher shall evaluate independently but total weightage should be 20 %.

## **J. Attendance**

The B.Ed. program shall be of duration of two academic years, which can be completed in a maximum of three year. The minimum attendance of student teacher shall have to be 75% for all course work and 90% for Practicum/School Internship.



## **B.Ed. I Year Syllabus**

### **Core Course (CC-1)**

#### **CONTEMPORARY INDIA & EDUCATION (E-101)**

#### **CO: COURSE OUTCOMES**

**CO-1** Understand that development of education is influenced by socio-political forces of the time.

**CO-2** Acquire the knowledge of features of education in ancient, medieval and pre-independent period in India with their strengths and weaknesses.

**CO-3** Understand the contribution of various Committees and Commissions on education set up from time to time in the economic development of India.

**CO-4** Appreciate the developments of Indian Education in the Post Independent Period

#### **Course Contents**

##### **Unit - I: Education in India**

- ❖ Vedic Period, Buddhist Period and Medieval Period

##### **Unit - II: Policy Framework of Education in Pre-Independent Period**

- ❖ Macaulay's, Minutes (1835), Wood Dispatch (1854), Hunter Commission (1882) and Indianisation of Education, National Education Movement, Lord Curzon Policy (1902), Gokhle Bill (1910), Sadler Commission (1917), Hartog Committee (1929),

##### **Unit - III: Policy Framework of Education in Post-Independent Period**

- ❖ University Education Commission (1948-49)
- ❖ Secondary Education Commission (1952-53)
- ❖ Indian Education Commission (1964-66) in the context of Industrialization
- ❖ National Policy of Education (1986) and its review (1992) in the context of Liberalization and Globalization of Indian Economy
- ❖ National Curriculum Framework (2005)

##### **Unit - IV: Elementary Education**

- ❖ Universalization (Provision, Enrolment, Retention, Success), Wastage and Stagnation, Education for all (Sarva Shiksha Abhiyan), Minimum Level of Learning (MLL), Kasturba Balika Yojna, RTE (2009)

##### **Unit - V: Secondary Education**

- ❖ Expansion, differentiation of curricula between boys and girls, discrimination of curricula, Vocationalization of education

##### **Unit - VI: Current Issues**

- ❖ University autonomy, privatization of education, commercialization of education
- ❖ Education of marginalized groups-women, scheduled caste,
- ❖ Medium of schooling- Three Language Formula
- ❖ Population Education.

### **Suggested Readings:**

- Aggarwal, J.C. (2013) Landmarks in the History of Modern Indian Education, Vikas Publishing House, New Delhi.
- Chauhan, C.P.S. (2013) Modern Indian Education: Policies, Progress and Problems. New Delhi: Kanishka Publishers and Distributors.
- Dash, M. (2004) Education in India: Problems and Perspectives. Atlantic Publishers, New Delhi
- Ghosh, S. C. (2007) The History of Education in Modern India: 1757-2007. Orient Black Swan Private Limited, New Delhi
- Kohli, V.K. (1996) Indian Education and its Problems. Vivek Publishers, Ambala. 51
- Kumar, Rajiv and Kumar, Narendra (2013) Higher Education in India. New Delhi: Atlantic Publishers

### **Core Course (CC-2)**

#### **PHILOSOPHICAL & SOCIOLOGICAL PERSPECTIVES OF EDUCATION (E-102)**

#### **CO: COURSE OUTCOMES**

**CO1-** Answer three basic questions-what ? why & How of the Education.

**CO2-** Develop an understanding of contribution of Indian & Western philosopher.

**CO3-** Build their own view about different Indian Religion and respect them.

**CO4-** Describe the role of Education in desirable social change and socio-economic development.

**CO5-** Transform one-self and society to empower people to assure responsibilities for creating sustainable future.

#### **Course Contents**

##### **Unit - I: Education and Knowledge**

- ❖ Education – meaning, nature and modes-Formal, Informal and Non-formal
- ❖ Purposes of education-individual development
- ❖ Knowledge-meaning and ways of knowing
- ❖ Forms of knowledge-local & universal, concrete & abstract, theoretical & practical, contextual & textual, school & out-of-school

##### **Unit - II: Education and Philosophy**

- ❖ Philosophy of Education-meaning and significance in the context of aims of education, curriculum
- ❖ Major schools of thoughts and their impact on education.
  - (i) Idealism, Naturalism, Realism, Pragmatism and Humanism.
  - (ii) Sankhya, Yog and Advaita philosophy

##### **Unit - III: Education and Society**

- ❖ Educational sociology – meaning, nature and socialization of the child
- ❖ Education as a means of social change and social welfare
- ❖ Education as a means of human resource development
- ❖ Meaning of a new social order and modernization of education

##### **Unit - IV: Educational Thoughts: Indian & Western Thinkers**

- ❖ MK Gandhi, Tagore, Aurobindo, Vivekanand, J.Krishnamurthy & Giju Bhai
- ❖ Aristotle, Socrates, Plato, Rousseau, Dewey, Froebel & Montessori

### **Unit - V: Education and Values**

- ❖ Values – meaning, nature & types.
- ❖ Source of values – The Constitution of India, democracy, secularism, fundamental rights & duties, directive principles, constitutional provisions for education.
- ❖ Education for peace – issues of national and international conflicts, social injustice, communal conflicts harmony, individual alienation

### **Unit - VI: Education for National Integration**

- ❖ National integration – meaning and need, role of teacher, institutions and cultural heritage, regional expectation and aspiration
- ❖ Role of celebration of Indian festivals

#### **Suggested Readings:**

- Giddens, Anthony (1990). Sociology. Cambridge, UK: Polity Press.
- Gupta, Dipankar (1989). Social stratification. New Delhi, India: Oxford University Press.
- Horton, P.B. & Hunt, C.B. (1987). Sociology. Singapore: McGraw-Hill.
- Haralamboss, Michael (1989). Sociology, Themes and Perspectives. New Delhi, India: Oxford University Press.
- Kolenda, Pauline (1997). Caste in Contemporary India, Beyond Organic Solidarity. Jaipur, India: Rawat Publications.
- Kamat, A.R. (1985). Education and Social Change in India. Bombay, India: Somaiya Publication.

### **Core Course (CC-3)**

#### **GROWING UP AS A LEARNER (E-103)**

#### **CO: COURSE OUTCOMES**

**CO1-** Acquire the basic principles of psychology of learners.

**CO2-** Understands learner characteristics and implications for teaching-learning.

**CO3-** Understand learner's mental health problems & choose appropriate strategies to cope with such problems.

**CO4-** Apply various psychological principles and approaches to learning.

**CO5-** Appreciate the role of psychology in the teaching-learning process.

#### **Course Contents**

#### **Unit - I: Psychology and learner**

- ❖ Psychology – its meaning, nature and scope
- ❖ Educational psychology – meaning, scope and its relevance for teachers, teaching and learning.
- ❖ Individual differences – concept & types-mentally retarded, backward, delinquent, gifted, slow learner

#### **Unit - II: Human Development**

- ❖ Concept & stages of development – infancy, childhood, adolescence
- ❖ Types of development- physical, cognitive social, emotional, moral with reference to Piaget.

### **Unit - III: Learning**

- ❖ Concept & theories of learning and its implications – Thorndike, Pavlov, Kohler, Skinner,

### **Unit - IV: Mental Health**

- ❖ Concepts and factors affecting mental health, ways of improving mental health
- ❖ Adjustment and ways for reducing maladjustment

### **Unit - V: Personality**

- ❖ Concept, dimensions and theories of personality- psycho-analytic, trait, type
- ❖ Measurement of personality

### **Unit - VI: Intelligence and Creativity**

- ❖ Intelligence-meaning, nature and measurement
- ❖ Types of intelligence with reference to multiple intelligence and emotional intelligence,
- ❖ Creativity – meaning, nature and measurement, techniques for fostering creativity

#### **Suggested Readings :**

- Aries, P. (1965). Centuries of Childhood-A social history of the family life. RandomHouse Inc. Chapter 1: The Ages of Life, Chapter 2: The Discovery of Childhood,
- Cole, M., Cole, S. R. and Lightfoot, C. (2004). The Development of Children. New York: Worth Publishers. Chapter 1: The study of Human Development.
- Harris, M. and Butterworth, G. (2002) The two concepts of childhood ,Developmental Psychology: a student's handbook. New York: Taylor & Francis. Chapter 1: A Brief History of Developmental Psychology.
- Newman, B. M. and Newman, P.H. (2007). Theories of Human Development. London: Lawrence Erlbaum Associates, publishers. Chapter 1: Introduction.
- Saraswathi, T.S. (Ed.) (1999). Culture, Socialization and Human Development: Theory, Research and Applications in India. Sage publications.

### **Core Course (CC-4)**

#### **TEACHER, TEACHING AND TECHNOLOGY (E-104)**

#### **CO: COURSE OUTCOMES**

- CO1-** Acquire theoretical basis of educational technology and to develop awareness about recent developments in the areas of educational technology
- CO2-** Equip them with various technologies to apply for improving instructional practices
- CO3-** Develop teaching skill required for effective instructional and institutional management.
- CO4-** Manage teaching and learning effectively and efficiently.
- CO5-** Identify and implement instructional strategies in different situations.

#### **Course Contents**

#### **Unit - I: Technology and Teaching**

- ❖ Educational technology-meaning, concept and types-hardware, software, systems approach,

- ❖ Types of educational technology -teaching technology, instructional technology and behavioral technology, information communication technology
- ❖ Programmed instruction- concept, principles, assumptions and types – linear and branching

### **Unit - II: Task of Teaching**

- ❖ Phases of teaching and its operations-pre-active, inter-active & post-active
- ❖ Levels of teaching-memory, understanding and reflective

### **Unit III: Teaching Aids and Teaching**

- ❖ Teaching aids-meaning, need, types-projected, non-projected, electronic
- ❖ Multi-sensory teaching-meaning and importance
- ❖ Edgar Dale's Cone of experience
- ❖ Audio-visual equipment's-OHP Projector, audio-video recording instruments, radio, television
- ❖ Use of teaching-learning technologies – Tele-conferencing (Face to Face Distance mode of Education), language laboratory, e-mail, internet, smart classes,

### **Unit - IV: Management of Learning and Teaching**

- ❖ Planning
- ❖ Organizing
- ❖ Leading
- ❖ Controlling

### **Unit - V: Strategies of Teaching**

- ❖ Concept and classification, different teaching strategies - lecture, demonstration, heuristic, discovery, project, assignment, tutorial, group work, brain-storming, role playing,

### **Unit - VI: Modification of Teacher Behavior**

- ❖ Modification of teacher behavior-simulation teaching, t-group training, interaction- analysis, action research, micro teaching with special reference to components of various teaching skills like -Introduction, Reinforcement, Probing Question, Stimulus Variation,

### **Unit - VII: Professional Development of Teachers**

- ❖ Teacher evaluation, teacher autonomy, teacher accountability, code of ethics for teachers
- ❖ Strategies for professional development of teachers

### **Suggested Readings:**

- Aggarwal, J.C. (1995), Essentials of Educational Technology: Teaching Technology. New Delhi, Vikas Publishing House Pvt. Ltd.
- Mangal S.K. (1992), Fundamentals of Educational Technology. Ludhiana, M/S Prakash Brothers.
- Mangal S. K., Foundations of Educational Technology, Tandon Publications Ludhiana (2001).
- Nanda V. K., Modern Techniques of Teaching, Vol. I Educational Technology for Adults, Anmol, publications (1998)
- Sharma R. A, Technology of Teaching, Loyal Book Depot, Meerut International Publishing House Meerut, (1993)

## Pedagogy Courses

### हिन्दी शिक्षण (E-201)

#### CO: COURSE OUTCOMES

**CO1-** Understand about the nature and characteristics of a language and mother tongue and the use of language.

**CO2-** Practice the required skill and their- interlinks for mastering a language.

**CO3-** Understand the various approaches for planning for successful language teaching.

**CO4-** Understand the Approaches for teaching different aspects of language.

**CO5-** Understand the Aids and other similar available material that could be used for teaching language.

**CO6-** Practice the technique of obtaining feedback for self-evaluation and evaluation of student's success in learning and using the language.

#### Course Contents

##### यूनिट . 1 : भाषा का स्वरूप, प्रकृति एवं हिन्दी भाषा ।

- ❖ भाषा का अर्थ, प्रकृति एवं भाषा अधिगम के सिद्धान्त ।
- ❖ मातृभाषा और राष्ट्र भाषा के रूप में हिन्दी का महत्त्व ।
- ❖ मातृभाषा, राष्ट्रभाषा एवं विदेशी भाषा के रूप में हिन्दी शिक्षण

##### यूनिट . 2 : हिन्दी का भाषा विज्ञान एवं उपयोगिता ।

- ❖ हिन्दी ध्वनि विज्ञान, उसके विभिन्न अंग ।
- ❖ हिन्दी रूप विज्ञान, वर्गीकरण एवं निर्माण प्रक्रिया ।
- ❖ हिन्दी वाक्य विज्ञान, प्रकार एवं प्रभावी निर्माण प्रक्रिया ।
- ❖ विराम चिह्न एवं उनका उचित प्रयोग ।

##### यूनिट . 3 : भाषायी कौशल—शिक्षण, उद्देश्य एवं प्रक्रिया ।

- ❖ श्रवण कौशल— अर्थ उद्देश्य एवं शिक्षण क्रियाएँ ।
- ❖ वचन कौशल—अर्थ, उद्देश्य एवं शिक्षण क्रियाएँ ।
- ❖ पठन कौशल— अर्थ, उद्देश्य एवं विकास हेतु उपाय ।
- ❖ लेखन कौशल— अर्थ, उद्देश्य एवं शिक्षण क्रियाएँ ।
- ❖ सूक्ष्म शिक्षण का स्वरूप एवं निम्न कौशलों के विकास हेतु सूक्ष्म पाठयोजना कानिर्माण—  
अ. प्रस्तावना कौशल ब. प्रश्न कौशल स.

##### यूनिट . 4 : हिन्दी साहित्य की विधाएँ एवं उनका शिक्षण

- ❖ पाठयोजना का अर्थ एवं उपयोगिता, इकाई योजना का निर्माण एवं उद्देश्य ।
- ❖ हिन्दी की निम्न विधाओं के शिक्षण का उद्देश्य, विधियाँ एवं पाठ नियोजन—अ. गद्य— गहन पाठ एवं द्रुत पाठ ब. पद्य स. व्याकरण द. रचना शिक्षण

##### यूनिट . 5 : हिन्दी में दक्षता विकसित करने वाले घटक

- ❖ हिन्दी शिक्षण में सहायक शैक्षिक तकनीकी, आई0सी0टी0 एवं अन्य उपकरणों का प्रयोग । पत्रिकाएँ, अखबार, पुस्तकालय, भाषा प्रयोगशाला, कम्प्यूटर सहायक अनुदेशन, पावर पॉइन्ट, प्रस्तुतिकरण, मृदु पागम आदि ।
- ❖ निम्न पाठ्यक्रम सहगामी क्रियाएँ एवं उनका महत्त्व—परिचर्चा, वाद—विवाद, खेल, कार्यशाला, गोष्ठी, निबन्ध लेखन, आदि ।

##### यूनिट . 6 : परीक्षण एवं मूल्यांकन

- ❖ हिन्दी में मूल्यांकन सतत एवं समग्र
- ❖ हिन्दी में अच्छे परीक्षण की विशेषताएँ एवं परीक्षण पदों का विकास (वस्तुनिष्ठ, लघुत्तरीय, निबन्धात्मक)
- ❖ हिन्दी में निष्पत्ति परीक्षण हेतु प्रश्न—पत्र का निर्माण
- ❖ उपचारात्मक एवं निदानात्मक शिक्षण

## PEDAGOGY OF ENGLISH (E 202)

### CO: COURSE OUTCOMES

**CO1-** Understand about the nature and characteristics of a language and mother tongue and the use of language.

**CO2-** Practice the required skill and their-interlinks for mastering a language.

**CO3-** Understand the various approaches for planning for successful language teaching.

**CO4-** Understand the Approaches for teaching different aspects of language.

**CO5-** Understand the Aids and other similar available material that could be used for teaching language.

**CO6-** Practice the technique of obtaining feedback for self-evaluation and evaluation of student's success in learning and using the language.

### Course Contents

#### Unit - I: Background to the Study of English

- ❖ Role of English in the present day; position of English in the Indian school curriculum in the context of the three-language formula
- ❖ English as a second Language
- ❖ Functions of language
- ❖ Linguistic principles
- ❖ Aims and objectives of teaching of English at Junior and

#### Unit - II: Content and pedagogical analysis

- ❖ Teaching of prose, poetry, composition and grammar.
- ❖ Pedagogical analysis based on unit analysis, objectives, learning experience, chosen methods and material and composition and grammar.
- ❖ Preparation of micro lessons based on the following skills :  
Introduction, Illustration, Stimulus variation

#### Unit - III: Methods of Teaching and Skills of Teaching

- ❖ Various approaches of teaching English; structural approach, communicative approach, holistic approach
- ❖ Difference between and 'approach' and 'method', major methods of teaching English-Grammar-cum-translation method, direct method and bilingual method
- ❖ Structural approach: meaning of structure and pattern, principles of selection and gradation of structure, presentation and practice of structure
- ❖ Latest developments in the approach and methods of teaching English including the linguistic communicative approach, lesson planning
- ❖ Use of ICT in teaching-learning process of English with computer-aided methods like-Power Point, Multimedia etc.

#### Unit - IV: Teaching Aids

- ❖ Importance of instructional material and their effective use
- ❖ Use of following aids :

(i) Chalk board	(vii) Record-Player(lingua phones)
(ii) Flannel board	(viii) Radio
(iii) Pictures.	(ix) Television
(iv) Picture cut-out	
(v) Charts	
(vi) Tape-recorder.	

## Unit V : Evaluation

- ❖ Basic principles testing English, tools and techniques of evaluation
- ❖ The meaning and significance of comprehensive and continuous evaluation in English
- ❖ Development of good test items in English (objectives type, short answer type, essay type)
- ❖ Construction of an achievement test, diagnostic testing and

### संस्कृत- शिक्षण (E 203)

#### CO: COURSE OUTCOMES

- CO1-** Understand about the nature and characteristics of a language and mother tongue and the use of language
- CO2-** Practice the required skill and their-interlinks for mastering a language.
- CO3-** Understand the various approaches for planning for successful language teaching.
- CO4-** Understand the Approaches for teaching different aspects of language.
- CO5-** Understand the Aids and other similar available material that could be used for teaching language.
- CO6-** Practice the technique of obtaining feedback for self-evaluation and evaluation of student's success in learning and using the language.

#### CONTENT

यूनिट . 1 : भाषा – स्वरूप, प्रकृति एवं महत्व भाषा की उत्पत्ति, विकास एवं परिनिष्ठित परिभाषा।

- ❖ भाषा के विविध रूप।
- ❖ भारतीय भाषाओं में संस्कृत का स्थान एवं त्रिभाषा सूत्र की व्याख्यज्ञं
- ❖ भाषा की प्रकृति।
- ❖ सीखने के सिद्धान्त तथा वर्तमान परिप्रेक्ष्य में संस्कृत का सांस्कृतिक एवं

यूनिट 2 : संस्कृत में भाषागत कौशल एवं शिक्षण उद्देश्य।

- ❖ संस्कृत का प्रारम्भिक व्याकरण—पुरुष, वचन, शब्द रूप, धातुरूप सन्धि, समास, उपसर्ग प्रत्यय।
- ❖ संस्कृत भाषा की ध्वनियाँ उनके उच्चारण स्थान (चपदज वित्तजपबनसंजपवद) एवं सूत्र, आभ्यन्तर एवं बाह्य प्रयत्न, समय एवं काल से उत्पन्न ध्वनि—भेद।
- ❖ भाषायी कौशल – उच्चारण, वाचन श्रवण, बोध एवं अभिव्यञ्जन, सभी कौशलों के शिक्षण
- ❖ उद्देश्य, विधियाँ, कौशलों से सम्बन्धित दोष, कारण और उपचार।

यूनिट 3 : संस्कृत साहित्य की विधाएँ एवं उनका शिक्षण।

- ❖ साहित्य की विभिन्न विधाएँ, अवर माध्यमिक एवं उच्च माध्यमिक स्तर पर उनके शिक्षण—उद्देश्य, ब्लूम द्वारा गया वर्गीकरण।
- ❖ संस्कृत शिक्षण की सामान्य विधियाँ।



- ❖ संस्कृत-गद्य, पद्य, व्याकरण, रचना, नाटक, द्रुतपाठ एवं निबन्ध-शिक्षण की विधियाँ एवं उद्देश्य।
- ❖ पाठ योजना के विभिन्न प्रकार एवं उनकी निर्माण-प्रक्रिया।
- ❖ संस्कृत, वर्तनी से सम्बन्धित छात्रों की सामान्य त्रुटियाँ,

#### यूनिट 4 :संस्कृत पाठ्यक्रम एवं पाठ्य पुस्तकें।

- ❖ पाठ्यक्रम से तात्पर्य उसकी आवश्यकता, आधार, पाठ्यक्रम निर्माण के सिद्धान्त, पाठ्यक्रम निर्माण के समय ध्यान रखने योग्य सावधानियाँ।
- ❖ उत्तर प्रदेश में अवर एवं उच्च माध्यमिक स्तर के संस्कृत शिक्षण पाठ्यक्रम की समीक्षा एवं मूल्यांकन।
- ❖ पाठ्य पुस्तक का मूल प्रत्यय, पाठ्य पुस्तक निर्माण के सिद्धान्त, पाठ्य पुस्तक के मूल्यांकन एवं चयन की प्रक्रिया।
- ❖ संस्कृत पाठ्यक्रम व शिक्षण हेतु चयनित पाठ्य पुस्तकों का मूल्यांकन।
- ❖ उत्तर प्रदेश के विद्यालय

#### यूनिट 5 :संस्कृत भाषा में मूल्यांकन।

- ❖ मूल्यांकन का प्रत्यय, आवश्यकता एवं परम्परागत एवं आधुनिक मूल्यांकन।
- ❖ परीक्षणों/मूल्यांकन की प्राचीन एवं नवीन विधियाँ।
- ❖ उद्देश्य केन्द्रित (ड्रमबजपम बमदजतमक) परीक्षणों की निर्माण प्रक्रिया तथा परीक्षण रचना के समय ध्यान रखने योग्य सावधानियाँ।
- ❖ अच्छे परीक्षणों की विशेषताएँ।
- ❖ विभिन्न संस्कृत विद्याओं के मूल्यांकन हेतु परीक्षण एवं उनके प्रकार।

#### यूनिट 6 : संस्कृत शिक्षण में दक्षता के प्रभावी घटक।

- ❖ संस्कृत अध्यापक की विशेषताएँ।
- ❖ संस्कृत-कक्ष, शिक्षण सामग्री के प्रकार, तकनीकी उपकरण।
- ❖ संस्कृत शिक्षण में पाठ्य सहगामी क्रियाएँ।
- ❖ संस्कृत में निदानात्मक एवं उपचारात्मक शिक्षण।
- ❖ संस्कृत शिक्षण – गृह कार्य के प्रकार एवं महत्व।

### PEDAGOGY OF SOCIAL SCIENCES (E 204)

#### CO: COURSE OUTCOMES

- CO1- Understand concept, meaning and scope of social sciences.
- CO2- Get acquainted with appropriate methodology as applicable to social sciences
- CO3- Prepare unit plan and lesson plan.
- CO4- Acquire skill in teaching social sciences.
- CO5- Acquire knowledge of various evaluation procedures and to device effective evaluation tools.
- CO6- Acquire the ability to develop instructional support materials.

#### Course Contents

### **Unit - I: Nature and Scope of Social Sciences**

- ❖ Social sciences and social studies: Course subjects of social sciences - History, Civics, Geography and Economics, inter-relationship between them
- ❖ Rational for including these areas in school curriculum
- ❖ Instructional objectives of teaching social sciences at secondary level

### **Unit - II: Methodology for Social Science Pedagogy**

- ❖ Instructional strategies, methods of teaching social science
- ❖ Strategies for teaching social science in terms of specific methods like Lecture, Question-Answer, Group Discussion, Project and Source Methods, Socialized Recitation and
- ❖ Micro teaching skills- Introduction, Reinforcement, Probing Questioning, Stimulus Variation, Explaining, Blackboard Writing etc.
- ❖ Selecting and using teaching aids: chalk boards, objects and specimen, histrionics, models, graphs, charts, maps, pictures, slides, films, filmstrips, audio-visual aids, projected aids: overhead projectors
- ❖ Use of ICT in teaching-learning process of social science with computer-aided methods like-Power Point, Simulation, Softwares, Webinars etc.
- ❖ Content analysis, unit planning and lesson planning

### **Unit - III: Curriculum and Text-Books**

- ❖ Place of social studies in Secondary School curriculum
- ❖ Teacher and Curriculum planning, hidden curriculum, Evaluation of curriculum, Characteristics of good text-book, Evaluation of textbooks, analysis of textbooks from peace education and environmental education perspective

### **Unit - IV: Social Science Teacher and co-curricular activities**

- ❖ Qualities of social science teacher
- ❖ Professional development of social science teacher
- ❖ Principles of organizing co-curricular activities
- ❖ Formation and management of social science clubs
- ❖ Organizing seminars, debates, quiz, exhibition, competition, wall magazine, manuscript
- ❖ Using community resources
- ❖ Organizing field trips
- ❖ Social science room

### **Unit - V: Transaction mode and Evaluation**

- ❖ Objectives of evaluation in social science, developing a blueprint – objective, content, items
- ❖ Essay type, short answer type and objective type question in social sciences, their advantages and limitations.
- ❖ Construction of achievement test in social science
- ❖ Continuous evaluation using feedback for improvement of teaching and learning in social science
- ❖ Diagnostic testing and remedial teaching

## **PEDAGOGY OF MATHEMATICS (E 205)**

### **CO: COURSE OUTCOMES**

- CO1-** Understand and appreciate the uses and significance of mathematics in daily life.
- CO2-** Learn successfully various approaches of teaching mathematics and to use them judiciously.
- CO3-** Know the methods of planning instruction for the classroom.
- CO4-** Prepare curricular activities as per the needs
- CO5-** Appreciate and organize activities to develop aesthetics of mathematics.

### **Course Contents**

### **Unit I: Entering into the Discipline**

- ❖ Meaning and nature of mathematics, use and significance of mathematics
- ❖ Contribution of some great mathematicians - Aryabhata, Bhaskaracharya, Ramanujam, Euclid, Pythagoras, Rene Decarte.
- ❖ Aims and objectives of teaching mathematics at secondary
- ❖ Objectives of teaching mathematics in terms of behavior outcomes.

### **Unit II: Methodology for Mathematics Teaching**

- ❖ Methods of teaching: Inductive- Deductive, Analytic- Synthetic, Problem solving, Heuristics, Project & Laboratory Method.
- ❖ Techniques of teaching: Oral, Written, Drill, Home-Assignment, Supervised study, and programmed learning technique.
- ❖ Micro teaching skills-Introduction, Reinforcement, Probing Question, Stimulus variation, Explaining, Blackboard Writing etc.
- ❖ Use of ICT in teaching-learning process of mathematics with computer-aided methods like- Power Point, Multimedia.

### **Unit III: Developing Lesson Plan, Unit Plan and Material Aids**

- ❖ Lesson plan - meaning, purpose and Performance of lesson plan and its rationality
- ❖ Unit plan – meaning and purpose of unit plan
- ❖ Teaching –aids importance and classification
- ❖ Developing/preparing low cost improvised teaching aids
- ❖ Application of computer in teaching of mathematics.

### **Unit IV: Development of Curriculum, Text Book and Activities of Mathematics**

- ❖ Principles and rationale of curriculum development, organizing the syllabi both logically and psychologically according to the age groups of children
- ❖ Planning activities and methods of developing the substitute/ alternative material to the prescribed syllabus for completing it in due course of time
- ❖ Organization of mathematics laboratory
- ❖ Text book of mathematics- qualities of a good text book of mathematics  
Using mathematics as a game for recreation; organizing quiz programmes, skill-development in answering puzzles riddles etc.
- ❖ Learning about the short cuts mentioned in Vedic mathematics
- ❖ Development of maths laboratory

### **Unit V: Evaluation in Mathematics**

- ❖ Meaning and needs of evaluation.
- ❖ Process of obtaining feedback and evaluation in mathematics in terms of cognitive affective and psychomotor behavioral development
- ❖ Comprehensive and continuous evaluation (C.C.E.) in mathematics
- ❖ Development of test item (short answer and objective type)
- ❖ Diagnostic testing and remedial teaching

## **PEDAGOGY OF PHYSICAL SCIENCES (E 206)**

### **CO: COURSE OUTCOMES**

- CO1-** Develop a broad understanding of the principles and procedures used in modern physical science education.
- CO2-** Enhance their essential skill for practicing modern physical science education
- CO3-** Develop their skills necessary for preparing international accessories.
- CO4-** Prepare acceptance lesson models which lay down this procedure to the acceptance for preparing designs for lesson.
- CO5-** Manage introduction activity in such a way that the vast majority of the learners attain most of the objectives.

### **Course Contents**

#### **Unit - I: Concept, Nature and Importance**

- ❖ Meaning and nature of physical science, path tracking discoveries and land mark development in science, impact of science on modern communities, globalization and science
- ❖ Justification for including science as a subject in school curriculum, eminent Indian and world Scientists - an introduction

#### **Unit - II: Aims and Objectives of Teaching Physical Science**

- ❖ General aims and objectives of teaching physical science at secondary and senior secondary school stage, instructional objectives with special emphasis on Bloom's taxonomy
- ❖ Concept of entering and terminal behavior, defining desired outcomes (statements of objectives) for different levels of education like primary, secondary and senior secondary.

#### **Unit - III: Methodology of Teaching Physical Science**

- ❖ Methods - Lecture, Demonstration, Lecture-cum Demonstration, Heuristic, project, Laboratory, Problem Solving
- ❖ Techniques – Team-Teaching
- ❖ Excursion, science – museums, science – club, science – fair, science projects
- ❖ Micro teaching skills-Introduction, Reinforcement, Probing Question, Stimulus variation, Explaining, Black Board-Writing etc.
- ❖ Use of ICT in teaching-learning process of physical sciences with computer-aided methods like-Power Point, Simulation, Software, Webinars etc.

#### **Unit - IV: Curriculum and Instructional Material Development**

- ❖ Meaning, definition and principles of curriculum construction and its types
- ❖ Curriculum organization using procedure like concentric, topical, process and integrated approaches, adaptation of the curriculum according to the local needs and the availability of local resources.
- ❖ Development of physical science curriculum at different stages of school education e.g. primary, upper primary, secondary and senior secondary
- ❖ Preparation, selection and use of teaching aids
- ❖ Curriculum accessories and support material - text books, journals, hand books, student's workbook, display slide

#### **Unit - V: Content Analysis and Lesson Planning**

- ❖ Content analysis, pedagogical analysis of content (Taking an example of any one topic of physical science). Following points should be followed for pedagogical analysis –

Identification of minor and major concepts, Listing behavioral outcomes, Listing activity and experiments Listing evaluation procedure

### **Unit - VI: Evaluation in Physical Science Teaching**

- ❖ Evaluation: meaning and needs, formative and summative evaluation
- ❖ Process of development of tests for measuring specific outcomes - cognitive outcomes, affective outcomes and psychomotor outcomes.
- ❖ Diagnostic testing and remedial teaching
- ❖ Preparation of achievement test

## **PEDAGOGY OF BIOLOGICAL SCIENCES (E 207)**

### **CO: COURSE OUTCOMES**

**CO1-** Develop broad understanding of principles and knowledge used in biology science.

**CO2-** Develop their essential skills for practicing biological science.

**CO3-** Know various approaches and methods of teaching life science.

**CO4-** Lesson planning of biological science properly.

**CO5-** Prepare tools for evaluation in biological sciences.

### **Course Contents**

#### **Unit I: Nature, Concepts and Importance**

- ❖ History and nature of biological sciences
- ❖ Importance of biological science for environment, health and peace
- ❖ Interdisciplinary linkage of biological science and other school subjects
- ❖ Value of biological sciences in our lives

#### **Unit II: Objectives of Teaching Biological Sciences**

- ❖ General aims and objectives of teaching biology difference between aims and objectives, Bloom's taxonomy of educational objectives
- ❖ Writing objectives in terms of learning outcomes (behavioral term) for different levels of school teaching VIII, IX and X classes-RCEM approach of writing objectives

#### **Unit III: Exploring learning**

- ❖ Inductive and deductive approach, different methods and techniques of teaching biological sciences
- ❖ Teacher centered approaches-lecture, demonstration, lecture cum demonstration
- ❖ Child centered approach-project method,
- ❖ Use of ICT in teaching-learning process of biological sciences with computer-aided methods like-Power Point, Simulation, Softwares, Webinars etc.
- ❖ Micro-teaching skills- Introduction, Explaining, Illustration, Stimulus variation, Blackboard writing etc.
- ❖ Analysis of content, preparing unit plan, lesson plan

#### **Unit IV: Learner Centered School Curriculum**

- ❖ Principles of development of biological science curriculum, trends in biological sciences curriculum.
- ❖ Analysis of text books and biology syllabi of NCERT and U.P. State VIII, IX and X classes.
- ❖ Importance and type of teaching aids, use of audiovisual aids and improvised apparatus in teaching biology, biology laboratory
- ❖ Biology museum, biology club, field trips, aquarium herbarium

### **Unit V: Concept of Evaluation and Measurement**

- ❖ Meaning and nature of evaluation and measurement
- ❖ Tools and techniques of evaluation in biological science
- ❖ Characteristics of a good test-reliability, validity
- ❖ Essay type, short answer and objective type tests, their merits and demerits
- ❖ Concept of formative, summative and diagnostic test
- ❖ Construction of achievement test
- ❖ Diagnostic testing

## **PEDAGOGY OF COMPUTER SCIENCE (E 208)**

### **CO: COURSE OUTCOMES**

- CO1-** Develop a broad understanding of the principles and procedures used in computer science education.
- CO2-** Develop their skills necessary for preparing instructional accessories
- CO3-** Know the methods of planning instruction for the classroom
- CO4-** Learn successfully various methods of teaching computer science and use them judiciously.
- CO5-** Manage instructional activity in such a way that the vast majority of the learner attains most of the objectives

### **Course Contents**

#### **Unit - I: Historical Perspectives, Aims and Objectives of Computer Science**

- ❖ Historical development of computer (hardware and software)
- ❖ Present status of computer science as a school subject.
- ❖ Significance of teaching computer science at secondary/senior secondary schools
- ❖ Aims and objectives of teaching computer science-
- ❖ Classification of educational objectives (Bloom's taxonomy)

#### **Unit - II: Development of Curriculum in Computer Science**

- ❖ Principles and rationale of curriculum development, organizing the syllabi both logically and psychologically according to the age groups of children.
- ❖ Organization of Computer Science Laboratory.
- ❖ Text book of Computer Science - qualities of a good text book of Computer Science.

#### **Unit - III: Methods of Teaching Computer Science**

- ❖ Lecture method, demonstration-cum-discussion method, personalized instruction method
- ❖ CAI technique, Hands on experience, Video Technology, Power Point Presentation, Software etc.
- ❖ Co-operative learning approach, multimedia approach
- ❖ Micro teaching Skills-Introduction, Probing Question, Stimulusvariation, Explaining, Blackboard-Writing etc.

#### **Unit - IV: Unit Planning, Lesson Planning and Teaching Aids**

- ❖ Meaning and definition of unit plan and lesson plan
- ❖ Importance and steps of planning a lesson.
- ❖ Need, Importance, preparation and using of teaching aids in computer science
- ❖ Organization of computer laboratory

#### **Unit - V: Basic Processes in Computer Science**

- ❖ Basic programming
- ❖ Data representation
- ❖ Computer organization
- ❖ Operating environment

#### **Unit - VI: Evaluation in Computer Science**

- ❖ Meaning and importance of evaluation.
- ❖ Comprehensive and continuous evaluation (CCE) in computer science
- ❖ Development of test items objective type, short answer type, essay type
- ❖ Preparation of an achievement test
- ❖ Analysis and interpretation of test results

### **PEDAGOGY OF HOME SCIENCE (E 209)**

#### **CO: COURSE OUTCOMES**

**CO1-** Understand the nature and scope of Home Science

**CO2-** Acquaint with the objectives of teaching Home Science in secondary and higher secondary schools.

**CO3-** Acquire skills in planning a lesson with reference to methods and instructional materials and processing it effectively.

**CO4-** Understand the various methods and techniques that can be employed in the teaching of Home Science.

**CO5-** Develop a practical understanding of the technology of teaching Home Science and giving them practice in the use of various aids relating to the technology of teaching.

#### **Course Contents**

##### **Unit - I: Concepts**

- ❖ The concept of home science: meaning and components; place of home science in secondary education
- ❖ Job opportunities in home science
- ❖ Aims and objectives of teaching of home Science

##### **Unit II : Pedagogical Analysis**

- ❖ Foods, nutrition and health
- ❖ Child care
- ❖ Fiber and fabric

- ❖ Home management-importance of planning
- ❖ Hygiene and sanitation

### **Unit III: Methods of Teaching**

- ❖ Method of teaching as applied to home science  
Teacher centered methods-lecture, demonstration  
Child centered method-laboratory, project, assignment, discussion
- ❖ Micro-teaching skills-Introduction, Explaining, Probing Questioning, Illustration, Stimulus variation, Blackboard writing, etc.
- ❖ Use of ICT in teaching-learning process of home science with computer-aided methods like-Multimedia, Simulation, Webinars etc.

### **Unit IV: Equipments of Teaching**

- ❖ Development and designing of curriculum
- ❖ Teaching aids-classification and importance
- ❖ Concept of Unit and lesson plan, preparation of unit and lesson plan
- ❖ Planning of space and equipment for home science laboratory

### **Unit V: Evaluation**

- ❖ Evaluation in home science-meaning and importance of evaluation
- ❖ Characteristics of a good evaluation device
- ❖ Evaluation devices-written, oral, observation, practical work, assignment
- ❖ Diagnostic testing and remedial teaching

## **PEDAGOGY OF COMMERCE (E-210)**

### **CO: COURSE OUTCOMES**

**CO1-** Acquire knowledge of the terms and concepts used in the pedagogical analysis of Commerce and Accountancy

**CO2-** Understand lesson planning and evaluation aspects in teaching Commerce and Accountancy

**CO3-** Apply the knowledge in analyzing higher secondary Commerce and Accountancy contents in terms of the techniques and aids for the purpose of teaching Commerce and Accountancy

**CO4-** Develop skills in the preparation of lesson plan and construction of evaluation tools using the suitable techniques

**CO5-** Develop interests in learning recent developments in Commerce and Accountancy

**CO6-** Develop a desirable positive attitude towards the teaching of Commerce and Accountancy.

### **Course Contents**

#### **Unit I: Concept, Aims and Objectives of Commerce Teaching**

- ❖ Meaning and scope of commerce as a subject,
- ❖ Meaning of Commerce education and historical development of commerce education in India
- ❖ Aims of commerce education



- ❖ Objectives of commerce education at High school and Intermediate levels (vocational & academic)
- ❖ Instructional objectives - meaning, importance and specification of instructional objectives in behavioural terms (with respect to Bloom's Taxonomy)

### **Unit II: Methods of Commerce Teaching**

- ❖ Lecture and discussion methods, Project method, Problem solving method, Approaches of book-keeping teaching (journal approach, ledger approach, cash-book & equation approach) Plans of commercial practice teaching (office model)
- ❖ Micro teaching Skills-Introduction, Reinforcement, Probing Question, Stimulus variation, Explaining, Blackboard-Writing, etc.
- ❖ Use of ICT in teaching-learning process of commerce with computer-aided methods like-Power Point, Simulation, Software, Webinars etc.

### **Unit III: Techniques and Teaching Aids**

- ❖ Techniques of commerce teaching-questioning and demonstration
- ❖ Text book of commerce teaching
- ❖ Commerce room
- ❖ Teaching aids in commerce

### **Unit IV: Curriculum, Correlation with other Subjects, Commerce Teacher and Lesson Planning**

- ❖ Curriculum in commerce (i) principles of curriculum construction (ii) critical evaluation of High School syllabus
- ❖ Correlation of commerce with other subjects (i) need and importance (ii) correlation with math, geography and economics
- ❖ Commerce teaching (i) profile of a good commerce teacher (ii) professional growth of a commerce teacher
- ❖ Lesson Planning-meaning, need
- ❖ Unit and resource planning

### **Unit V: Evaluation in Commerce**

- ❖ Concept, scope and importance of evaluation
- ❖ Tools and techniques of evaluation
- ❖ Construction and administration of an achievement test
- ❖ Diagnostic testing and remedial teaching

## **(Teaching Skills) Practical Work**

### **EF 2(A): Preparation to Function as a Teacher (E-701)**

During the first year, the teacher-preparation programme will offer the training amounting to a maximum of 8 weeks. This will include:

- ❖ **Two week workshop on Lesson-Planning** based on constructivist approach (Covering different aspects like theory of lesson-planning, questioning, Defective Questions, Developing Question, How to put Question, How to receive Answers, Discipline, Role of Eye-control, etc.).
- ❖ **Two week workshop on 'Micro-Teaching'** (at least 5 teaching skills will be mastered in each Pedagogy course like-Introduction, Reinforcement, Probing Question, Stimulus Variation, Explaining etc. ).
- ❖ **Two week Practice-Teaching in Simulated condition** in each Pedagogy course. During this phase every student-teacher will **teach at least 6 lessons**. These lessons will be observed by subject-supervisors

- ❖ **Two week Practice-Teaching in Real-Class room situation in a school.** For it, the student-teachers will be attached to a particular school as 'School Attachment', where they will deliver their lessons. During this phase every student-teacher will **teach at least 20 lessons**. These lessons will be observed by peers as well as by subject-supervisors daily, which will provide them feedback for the modification of their behavior.

This shorter period is to provide the student-teachers adequate exposure to have a 'feel' of dealing with teaching-learning. It will help him/her to develop the basic teaching skill required to deal with students effectively in classroom.

**(E-702 & 704)**

**Viva- Voce Examination based**

**On**

**Task and Assignments that run through all the courses CC 1-7 and PC 1 to 42 EPC**

**Activities**

### **EPC 1: Strengthening Language Proficiency**

Language is the medium for comprehending ideas, for reflection and thinking, as well as for expression and communication. Enhancing one's capacity in language proficiency is thus a vital need of student-teachers irrespective of the subject area that they are going to teach.

**Objectives: To enable student-teachers to-**

- Strengthen the ability to read correctly
- Strengthen the ability to pronunciation
- Strengthen the ability to write correctly
- Strengthen the ability to communicate correctly

**Activities**

One or two workshops on Language proficiency course on Hindi and English of 7-10 day each may be organized. It may course the following content –

- हिन्दी भाषा (1) वर्ण-स्वर व व्यंजन ध्वनि, मात्राएं (2) शब्द – पर्यायवाची व विलोम शब्द (3) शब्द रचना-सन्धि, समास, उपसर्ग, प्रत्यय (4) रूप विचार- संज्ञा, सर्वनाम, विशेषण, क्रिया क्रियाविशेषण, आदि (5) वाक्य विचार-विराम चिन्ह, आदि (6) रचना-पत्र, प्रार्थना पत्र, निबन्ध कहानी आदि।

English Language – (i) Alphabet-Vowel & Consonant sounds (ii) word-synonym & Antonym (iii) Word Formation (iv) Parts of Speech – Noun, Pronoun, Adjective, Verb, Adverb, etc. (v) Sentence-Punctuation & Analysis (vi) Composition-Letter, Application, Essays, Story, etc.

### **EPC 2: Art and Aesthetics**

The need to integrate arts education in the formal schooling of our students is to retain our unique cultural identity in all its diversity and richness. The National curriculum Framework (2005) reminds us that the school curriculum must integrate various domains of knowledge with a deep relationship between head, heart & hand so that the curriculum encompasses all and is not separated from the co-curricular or extra-curricular.

**Objectives: To help student-teachers to-**

- Gain direct experiences
- Develop motor skill
- Make students believe in the dignity of labor
- To nurture children's creativity and aesthetic sensibilities.

## Activities

An artist may be invited to organize a workshop on Art & Aesthetics. The student-teachers may be asked to prepare at least 5-items of different categories-

- Paper meshing
- Pot Decoration
- Wall hanging
- Paper cutting
- Flower making
- Candle Making
- Stitching
- Knitting
- Embroidery
- Soft toys making
- Paper framing
- Weaving or printing of textiles
- Making of poster
- Making of Rangoli
- Making of Puppets etc.

## EPC 3: Reading and Reflecting on Texts

This course will serve as a foundation to enable student-teachers to read and respond to a variety of texts in different ways depending on the purposes of reading, like-personal or creative or critical or all of these.

### Objectives: To enable student-teachers to-

- Develop study – habits
- Develop skill of reading & writing
- Develop skill of summarization
- Develop skill of note-taking.

## Activities

Student-teachers are expected to sit in the library regularly and to review at least 10-books of different categories in about 500 words each. These may be as follows –

- Review of text books related to core courses
- Review of reference Book related to core courses
- Review of Text Books related to Pedagogy courses
- Review of Reference to Book related to Pedagogy courses.
- Review of Policy Documents, Autobiography, Commission Reports, etc.
- Review of studies about school, historical books and other educational miscellaneous books.

## EPC 4: Understanding of ICT

Preparing teachers to use technology in a classroom is an important step of ICT enabled education in the country. This course will focus on moving beyond computer literacy and ICT aided learning, to help student-teachers interpret and adapt ICTs in the teaching-learning process.

### Objectives: To enable student-teachers to-

- ❖ Have a basic familiarity with computers
- ❖ Understand & appreciate ICT as an effective learning tool for learners
- ❖ Understand ICT as an enormous functional support to teachers.

**Activities A workshop on ICT for 10-15 days may be organized or a provision of one period/week may be made daily in the time-table to learn and to practice in computer labs. Student-teacher sare expected to learn the following:**

- ❖ Use of radio and audio media in script writing, story-telling, etc.
- ❖ Use of TV & video in education
- ❖ Use of newspaper in education
- ❖ Functional knowledge of operating computers- word processing, power point, excel, etc.
- ❖ Effective browsing of the internet for selecting relevant information.
- ❖ Downloading relevant material
- ❖ Competencies in developing software
- ❖ Developing PPT slide show for classroom use
- ❖ Use of available software or CDs with LCD projection for subject learning interactions
- ❖ Generating demonstrations using computer software.

### **EPC 5: Working with Community**

This programme gives opportunity to attach with and to solve the problems of the community to make the student-teachers sensitive and aware about the society.

**Objectives: To enable student-teachers to-**

- ❖ Develop social-sensitivity among student-teachers
- ❖ Develop sympathy with the poor and the people below-poverty-line.
- ❖ Develop awareness about the environment.
- ❖ To have the positive attitude toward the neglected class.

**Activities:**

This can be achieved by organizing a number of programme for the welfare of the community, like –

- ❖ To educate the dropouts and adults (Literate India)
- ❖ To educate the people of slum areas to take the nutritious diet. (Quit Mal-nutritious).
- ❖ To make the people learn the importance of small family norm (chota pariwar sukhi pariwar)
- ❖ To make the people learn the importance of the girls-child & its education for the Familyand the society (Beti Bachao Beti Padhao)
- ❖ To motivate the people to grow more plants (Green India)
- ❖ To motivate the people to keep the city and the public places clean (Clean India)
- ❖ To motivate the people to save river and ponds (Clean Water)

### **EPC 6: Basics of Research**

This programme will enable the student teacher to know the basic research methodology, to identify the school based research problem and to solve them scientifically. In the course student teacher will do the research and write the report using the following points:-

- ❖ Identification of an educational problem.
- ❖ Formulation of various solutions.
- ❖ Selection of the most probable solution
- ❖ Developing a tool for data collection
- ❖ Data collection
- ❖ Data analysis
- ❖ Reporting findings

## **EPC 7: Drama and Art in Education**

Real education implies reflection, introspection and action, with a deep relationship between the Head, Heart and Hand. Drama and art helps the student teacher to understand the self and to realize it as a form of self-expression and for enhancing creativity.

Following activities can be organized under the course: (any two)

- ❖ Script writing
- ❖ Street play
- ❖ Visit to an art gallery
- ❖ Visiting/Organizing exhibitions
- ❖ Visiting/Organizing cultural fests
- ❖ Report on the folk life
- ❖ Interview with experts from the field like artists, actors, singers, writers, poets, painters, musicians, dancer, etc
- ❖ Appreciation of a film/drama/novel/folk drama, etc.
- ❖ Use of Music/ Arts in Education

## **EPC 8: Entrepreneurship Development**

Education system plays a critical role in the economic advancement of nation, since it is the primary developer of human resource. Entrepreneurship education and training is about the development of professional skills and qualities of the student teachers so that they can gain knowledge and understand the ways in which the economy works. This evolves approaches to the development of creativity, problem solving, decision making, team working, leadership and other individual skills. It also identifies the role of the entrepreneur in the society and various requirements of self-employment.

**Following activities shall be organized under the course: (any one)**

**Field work:-**

- ❖ Educational Market Survey for needs analysis
- ❖ Interview of Educational Book Publisher/Entrepreneurs
- ❖ Visit to Vocational Institute
- ❖ Survey of the usability of an existing /self-developed educational product
- ❖ Write an essay on „Entrepreneurship“

**B.Ed. II Year Syllabus**  
**Core Course (CC-5)**

**CREATING AN INCLUSIVE SCHOOL (E-301)**

**CO: COURSE OUTCOMES**

**CO1-** Understand inclusive education- concept and nature.

**CO2-** Understand the global and national commitments towards the education of children with diverse needs

**CO3-** Prepare conducive teaching learning environment in inclusive schools.

**CO4-** Identify and utilize existing resources for promoting inclusive practice

**Course Contents**

**Unit - I: Introduction to Inclusive Education**

- ❖ Definition, concept needs and importance of inclusive education
- ❖ Historical perspectives on education of children with diverse needs
- ❖ Difference between special education, integrated education and inclusive education
- ❖ Policies and legislations for inclusive education and rehabilitation

**Unit - II: Children with Diverse Needs**

- ❖ Definition and characteristics of children with diverse needs
- ❖ Sensory (hearing, visual and physically challenged)
- ❖ Intellectual (gifted, talented and mentally challenged)
- ❖ Developmental disabilities (autism, cerebral palsy, learning disabilities)
- ❖ Social and emotional problems
- ❖ Scholastic backwardness, under achievement, slow learners
- ❖ Children with special health problems
- ❖ Environmental / ecological difficulties
- ❖ Children belonging to other marginal groups

**Unit - III: Inclusive Education and its Practices**

- ❖ Inclusive instructional design and collaborative instruction for inclusion.
- ❖ Differentiating instruction – peer tutoring and peer mediated instruction and interventions, co-operative learning and co-operative teaching assignments, self- regulated learning
- ❖ Inclusive instruction strategies at school level- remedial help, team teaching, co-teaching, student assistance teams, buddy system, circle of friends
- ❖ E-learning and inclusive education

**Unit - IV: Inclusive Schools**

- ❖ Infrastructural facilities for an inclusive school
- ❖ An ideal inclusive school
- ❖ Role of inclusive school in modern times.
- ❖ Inclusive classroom managements

**Unit - V: Teachers Role in Inclusive Education**

- ❖ Qualities of an inclusive teacher
- ❖ Teachers role in shaping inclusive class room

- ❖ Inclusive teacher educator in facilitating inclusive education
- ❖ Guidance and counseling for inclusive teachers, students and principals

### **Suggested Readings:**

- Baquer, A. & Sharma, A. (1997) .Disability: Challenges Vs. responses, Can Pub.
- Bartlett, L. D., Weisentein, G.R. (2003) Successful inclusion for educational leaders, Prentice Hall, New Jersey.
- Bhargava, M. (1994), Introduction to exceptional Children, Sterling Publishers.
- Dessent, T. (1987). Making ordinary school special. Jessica Kingsley Pub.
- Gargiulo, R. M. (1997). Special education in contemporary society: an introduction to exceptionality, Wadsworth, Belmont

## **Core Course (CC-6)**

### **GENDER, SCHOOL AND SOCIETY (E-302)**

#### **CO: COURSE OUTCOMES**

**CO1-** Sensitize the future teachers towards basic understanding of various key concepts of gender studies.

**CO2-** Learn about gender issues in school, curriculum and textual materials across disciplines, pedagogical process and its interaction with class, caste, religion and region.

**CO3-** Help them understand the contribution of women in social, economic & political development of the society.

**CO4-** Apply the conceptual tools learn regarding gender & sexuality to understand issues related to sexual harassment at the workplace and child sexual abuse.

#### **Course Contents**

#### **UNIT - I: Gender Issues: Key Concepts**

- ❖ Gender, sex, sexuality, patriarchy, masculinity and feminism – in cross cultural perspectives
- ❖ Gender bias, gender stereotyping and empowerment
- ❖ Equity and equality in relation with caste, class, religion, ethnicity

#### **UNIT - II: Gender Inequality in the Schools**

- ❖ In the structure of knowledge.
- ❖ In the development of curriculum, gender and hidden curriculum.
- ❖ Gender in text and context (text books inter-sectionality with other disciplines, classroom processes including pedagogy)
- ❖ In the class room
- ❖ In the management of school

#### **UNIT - III: Women in Indian Society**

- ❖ Situational analysis of women in India society (focus on sex ratio pattern, education, health, work participation violence against women)
- ❖ Women's access to and participation in formal and non-formal education (gender bias in enrolment, curriculum content, dropouts)
- ❖ Participation of women in planning and decision making
- ❖ Human right

#### **UNIT - IV: Theories on Gender and Education: In Indian Context**

- ❖ Socialization theory
- ❖ Gender difference theory
- ❖ Structural theory
- ❖ Deconstructive theory

#### **UNIT - V: Gender, Sexuality, Sexual Harassment and Abuse**

- ❖ Linkage and differences between reproductive rights and sexual rights.
- ❖ Development of sexuality, including primary influences in the lives of children (such as gender, body image, role models)
- ❖ Sites of conflict : social
- ❖ Understanding the importance of addressing sexual harassment in family, neighborhood
- ❖ Agencies perpetuating violence : family, school
- ❖ Institutions redressing sexual harassment and abuse.

#### **Suggested Readings:**

- Ambasht, et al (1971). Developmental Needs of Tribal People, NCERT
- Bhattacharjee, Nandini (1999). Through the looking-glass: Gender Socialisation in a Primary School in T. S. Saraswathi (ed.) Culture, Socialization and Human
- Development: Theory, Research and Applications in India. Sage: New Delhi.
- Frostig, M, and Maslow, P. (1973). Learning Problems in the Classroom: Prevention and Remediation. Grune & Stratton: New York.
- Geetha, V . (2007). Gender. Stree: Calcutta.
- Ghai, A. (2005). Inclusive education: A myth or reality In Rajni Kumar, Anil Sethi

#### **Core Course (CC-7)**

### **KNOWLEDGE, LANGUAGE & CURRICULUM (E-303)**

#### **CO: COURSE OUTCOMES**

**CO1-** To examine the Epistemological basic of education

**CO2-** To understand the concept and principles of curriculum development

**CO3-** To understand the formulation of new curriculum

**CO4-** To develop the ability to read & comprehend

**CO5-** To develop writing skill

#### **Course Contents**

##### **Unit – I: Knowledge**

- ❖ Epistemology – meaning, philosophical basic of knowledge according to Indian and Western philosophy
- ❖ Knowledge – nature and sources, validity of knowledge
- ❖ Differences between knowledge and skill, teaching and training, knowledge and information, reason and belief



- ❖ Chronological review on knowledge generation, myth based faith and logical based knowledge, various structures of society

### **Unit - II: Language and Reading Comprehension**

- ❖ Need and importance
- ❖ Types of reading : skimming and scanning
- ❖ Strategies for effective reading, mechanism for reading, loud reading
- ❖ Schema theory of reading

### **Unit - III: Developing Writing skills**

- ❖ Need and importance
- ❖ Making reading writing connection
- ❖ Process and strategies of writing for children, mechanism of writing, summarizing

### **Unit - IV: Curriculum and Development**

- ❖ Meaning and concept of curriculum syllabus and units
- ❖ Curriculum development – meaning, concept stages in the process of curriculum development
- ❖ Fusion Intervention & Inter-subject co-relation

### **Unit - V: Determinants of Curriculum**

- ❖ Philosophical Foundation of curriculum development in view of different schools of philosophy
- ❖ Social and political forces, cultures and cultural roots of curriculum, sociology of curriculum
- ❖ Model of curriculum development : Hilda Taba's Model
- ❖ Core curriculum, activity curriculum

#### **Suggested Readings:**

- Apple, Michael W. (1979). Ideology and Curriculum; Routledge and K. Paul.
- Connelly, F. Michael (Editor) (2008); The Sage Handbook of Curriculum and Instruction; Sage Publications India Pvt. Ltd.; New Delhi.
- Muijs, Daniel and Reynolds, David (2005) Effective Teaching: Evidence and practice Second Edition; Sage Publication; London.
- Mukunda, Kamala V. (2009) What Did You Ask At School Today: A Handbook of Child Learning; Harper Collins Publishers; NOIDA
- National Curriculum Framework for School Education (2005); NCERT; New Delhi;

### **PC 3: ASSESSMENT FOR LEARNING (E-401)**

#### **CO: COURSE OUTCOMES**

**CO1-** Become cognizant of key concepts such as measurement & evaluation, assessment, test examination, formative & summative evaluation etc

**CO2-** Be exposed to different kinds of assessment that aid student learning.

**CO3-** Have an idea of new trends in evaluation.

**CO4-** Learn the different characteristics of standardize test-Reliability, validity, Norms, etc.

**CO5-** Relate & use statistics in educational setting

### **Course Structure**

#### **Unit - I: Assessment and Evaluation**

- ❖ Concept of measurement and evaluation, test assessment, examination, formative & summative evaluation, open book examination, grading, cumulative grade point average (CGPA)
- ❖ Purposes of assessment in a 'constructivist' paradigm, distinction between Assessment for Learning & 'Assessment of Learning'

#### **Unit - II: Assessment tools**

- ❖ Quantitative and qualitative Tools.
- ❖ Constructing an achievement test- blue-print
- ❖ Standardization of test – objectivity, reliability validity

#### **Unit - III: Techniques of Test Conduct**

- ❖ Importance of establishment of rapport with the students
- ❖ Security of tests and testing material
- ❖ Arranging the seat and distribution of question for minimum pillage and copying
- ❖ Technique of avoiding guessing in answering objective questions
- ❖ Introducing flexibility in examination
- ❖ Improving quality and range of questions including school-based credits

#### **Unit - IV: Data and Measures of Central tendency**

- ❖ Data: meaning and types, frequency distribution, graphic representation, percentage
- ❖ Central Tendency – Mean, Median, Mode.

#### **Unit - V: Measures of Variability and Correlation**

- ❖ Range, quartile deviation, mean deviation, standard deviation, percentile
- ❖ Rank- order method

#### **Unit - VI: Normal Probability Curve**

- ❖ Meaning, characteristics and use of NPC

#### **Suggested Readings:**

- Cohen, Louis; Manion, Lawrence and Morrison, Keith(2004); A Guide to Teaching Practice- Fifth Edition; Routledge Falmer-Taylor and Francis Group; London.
- Ebel Robert L., (1991). Essentials of Educational Measurement, Prentice Hall of India.
- Gunter, Mary Alice et.al(2007)., Instruction: A Model's Approach- Fifth Edition; Pearson Education Inc.; Boston.
- Kubiszyn Tom. (2003). Educational Testing and Measurement, John Wiley.
- Linn, Robert L. and Gronlund, Norman E. (2000). Measurement and Assessment in Teaching; Pearson Education Inc.

**PC 4: (OPTIONAL COURSE-ANY ONE)**

**EDUCATIONAL ADMINISTRATION AND MANAGEMENT**

**(E-501)**

**CO: COURSE OUTCOMES**

**CO1-** Acquaint the student teachers with the concept and concerns of educational administration.

**CO2-** Develop an understanding of the role of the headmaster and the teacher in school management.

**CO3-** Enable the students to understand the concept and importance of communication and its possible barriers in educational administration.

**CO4-** Enable the student teacher to critically analyse the administrative scenario in relation to the functioning of the other secondary schools of the area.

**CO5-** Acquaint the student teacher with the scientific practices of educational management and keep him to apply it in work situation

**Course Contents**

**Unit - I: Concept of Educational Administration**

- ❖ Concept of educational management human beings as inputs, process and product inputs
- ❖ Nature, objectives and scope of educational administration

**Unit - II: Basic Functions of Administration**

- ❖ Planning, organizing, directing and controlling
- ❖ Maintenance of discipline, control management
- ❖ Co-ordination and growth development
- ❖ Supervision and inspection, defects in the present supervision and inspection.
- ❖ Scope of educational supervision, types of supervision, providing guidance, leadership function, crisis in management, decision making

**Unit - III: Communication in Educational Administration**

- ❖ Role of communication in effective management and administration
- ❖ Methods of communication
- ❖ Barriers of communication in educational administration
- ❖ Overcoming barriers to communication and effective communication in educational administration

**Unit - IV: Management of Schools**

- ❖ Role of headmaster in planning of school activities approaches to management- manpower approach, cost benefit approach, social demand approach, and social justice approach
- ❖ Involvement of other functionaries and agencies in the preparation of a plan
- ❖ Delegation of authority and accountability
- ❖ Role of the headmaster in monitoring, supervision and evaluation
- ❖ Role of headmaster in motivating the staff, in resolution of interpersonal conflicts
- ❖ Role of the headmaster in creating resources and managing financial matters
- ❖ Optimum use of available resources for growth and development of the school
- ❖ Staff development programmes.
- ❖ Role of teachers in school management and administration

**Unit - V: Educational Administration in the State**

- ❖ The administrative structure in the field of education in the state
- ❖ Control of school education in the state a critical analysis

- ❖ Functions of the state government in relation to secondary and higher secondary schools
- ❖ Functions of the board of secondary education in controlling secondary schools
- ❖ Problems of secondary school administration in government schools

## **GUIDANCE AND COUNSELLING (E-502)**

### **CO: COURSE OUTCOMES**

**CO1-** Develop an understanding of the need and importance of career information for the pupils.

**CO2-** Identify their role and function in locating, collecting, evaluating and disseminating career information for the use of pupils.

**CO3-** Develop an understanding of how one's ability, interests and aptitudes are related to world of work.

**CO4-** Know about the importance of developing the right attitude and values at every stage of education.

### **Course Contents**

#### **Unit - I: Meaning and concept of Guidance**

- ❖ Concepts, need and importance of guidance
- ❖ Principles of guidance, procedure of guidance (steps)
- ❖ Types-educational, vocational and personal
- ❖ Counselling-need functions and types
- ❖ Observation, interview and sociometry as techniques of guidance

#### **Unit - II: Meaning and concept Counseling**

- ❖ Concepts, need and importance of counseling
- ❖ Principles of counseling, counseling process and role
- ❖ Directive, non-directive and elective counseling
- ❖ Lectures, discussions and dramatic as techniques of counseling

#### **Unit - III: Meaning and concept Career Information**

- ❖ Meaning of career and career information components of career information.
- ❖ Occupational information, information about education and opportunity and personal-social information.
- ❖ Aims to study career information at different levels
- ❖ Career information: sources, method of collection, classification and filling-up of information and evaluation of the information

#### **Unit - IV: Career Information and Training**

- ❖ Information about education and training opportunities of primary, elementary and secondary levels of school

#### **Unit - V: Career Information and School**

- ❖ Personal-social information at every school level

## ENVIRONMENTAL EDUCATION (E-503)

### CO: COURSE OUTCOMES

**CO1-** Enable the student teacher understands about the concept of environmental education.

**CO2-** Develop in the student teacher a sense of awareness about the environmental pollution, and possible hazards and its causes and remedies.

**CO3-** Develop a sense of responsibility towards conservation of environment, bio-diversity and sustainable development.

**CO4-** Develop reasonable understanding about the role of school and education in fostering the idea and learning to live in harmony with nature

**CO5-** Enable the students to understand about the various measures available to conserve the environment for sustaining the development.

### Course Contents

#### Unit - I: Basic Concept and Nature of Environment

- ❖ Meaning, scope and nature of environment, natural and man-made environment
- ❖ Ecosystem-structure, function and components.
- ❖ Energy flow in ecosystem-food chains, food webs and ecological pyramids.
- ❖ Introduction and characteristic feature of-forest, grass land, desert and aquatic ecosystem.

#### Unit - II: Natural Resources and Associated Problems

- ❖ Forest resources – use and overexploitation. Deforestation-cause, effects and remedy
- ❖ Water resources- use and overexploitation of surface and ground water, rain water harvesting and watershed management.
- ❖ Mineral resources-use, exploitation and conservation, effect of mining on man and environment
- ❖ Food resources- world food problems-changes caused by agriculture and overgrazing, effect of modern agriculture, fertilizers, pesticides, water logging and salinity.
- ❖ Energy resources- growing energy need renewable and non-renewable energy sources, conservation and alternate energy sources

#### Unit - III: Biodiversity and its conservation

- ❖ Meaning and values of biodiversity, India as a mega diversity nation
- ❖ Threats to biodiversity-habitat loss, poaching of wild life, man wildlife conflicts
- ❖ Conservation of genetic diversity, an important environment priority: learning to live in harmony with nature

#### Unit - IV: Environment Issues and Its Preventive Measures

- ❖ Causes and effects of environmental hazard, global and local environmental pollution and its remedies, Air, Water, Soil, Marine, Noise, Thermal and Nuclear Pollution
- ❖ Climate change- Global Warming, Acid Rain, Ozone layer depletion, Polar Melting.
- ❖ Natural disasters-Flood, Earthquake, Cyclone and Landslides.

#### Unit - V: Environment Management

- ❖ Salient features of environmental awareness through education, programmes of environmental education for secondary school children
- ❖ Programmes of environmental education for attitude changes among the children
- ❖ Environmental ethics and values
- ❖ Environmental acts, rule and regulations
- ❖ National efforts-Ministry of Forest and Environment, government plans, action and policies
- ❖ Role of school in environmental conservation and sustainable development

## COMPUTER EDUCATION (E-504)

### CO: COURSE OUTCOMES

**CO1-** Acquire knowledge of computers, its accessories and software

**CO2-** Understand features of MS Office and their operations

**CO3-** Apply the knowledge gained in respect of to process various data of students as well as simple library financial transaction of the school.

**CO4-** Appreciate the value of CAI/CML packages on optional subjects and use them in class room instruction.

**CO5-** Acquire skill in accessing World Wide Web and Internet and global accessing of information. integrate technology in to classroom teaching learning strategies

### Course Contents

#### Unit I: Meaning, Definition and Historical Perspectives of Computer

- ❖ Meaning and definition of computer
- ❖ Historical perspective
- ❖ Computer generations and its classification
- ❖ Block diagram of a computer Peripherals, and working of a computer

#### Unit II: Computer Hardware

- ❖ Input devices: keyboard, mouse, joystick, touch screen, touch pad, magnetic ink character reader, optical mark reader, bar code reader, scanner, web camera etc.
- ❖ Output devices: monitor printers (line, serial, dot matrix, inkjet, and laser).
- ❖ Primary storage devices: RAM ROM and its types.
- ❖ Secondary storage devices: FDD, HDD, CD, DVD, Pen Drive (USB)

#### Unit III: Binary Arithmetic and Data Representations:

- ❖ Decimal and binary number system
- ❖ Representation of characters
- ❖ Integers and fractions in computers
- ❖ Films point representation and floating point representation

#### Unit IV: Computer Programmes

- ❖ MS-WINDOWS
- ❖ MS-WORD
- ❖ SPREADSHEET
- ❖ POWER POINT
- ❖ INTERNET

#### Unit V: Computers in Education

- Computer application in educational institutions-
  - o Co-curricular activities
    - ⌋ Academic activities
    - ⌋ Administrative activities
  - o Examination work
  - o Research activities
  - o Library
  - o Class room teaching

## HEALTH, PHYSICAL EDUCATION & YOG (E-505)

### CO: COURSE OUTCOMES

**CO1-** Understand the concept of wholistic health and its various dimension and determinants of health.

**CO2-** Acquaint them to school health programme & its importance.

**CO3-** Sensitize the student teacher towards physical fitness & its importance.

**CO4-** Acquire the skills for assessment of physical fitness.

**CO5-** Introduce them to the philosophical bases of Yoga.

**CO6-** Understand the process of stress management through Yoga education.

### Course Contents

#### Unit - I: Health

- ❖ Introduction, definition and meaning of health
- ❖ Dimension of health
- ❖ Determinants of health
- ❖ Importance of balance diet
- ❖ School health programme and role of teacher in development of health

#### Unit - II: Physical Education

- ❖ Introduction, definition and meaning of physical education
- ❖ Objectives of physical education.
- ❖ Scope of physical education and allied areas in physical education
- ❖ Need and importance of physical education in different level of school

#### Unit - III: Physical Fitness

- ❖ Definition, meaning type and factors of physical fitness
- ❖ Factors affecting physical fitness
- ❖ Benefits of physical fitness
- ❖ Importance of physical activities at school level
- ❖ Assessment of physical fitness

#### Unit - IV: Concept of Yoga and Ashtang Yoga

- ❖ Yoga meaning concept and importance
- ❖ Mis-concept of yoga
- ❖ Eight disciplines of Yog-Ashtang Yoga
- ❖ Precautions to keep in mind while performing Yogasan
- ❖ Different types of Yogassans & their techniques of practicing

#### Unit - V: Meditation, Pranayam and Stress Management

- ❖ Pranayam: meaning, nature and relationship with mind
- ❖ Different types of Pranayam; kapalbhati; Bhastrika Pranayam, Surya Bhedan Pranayam, Chandrabhedan Pranayam, Anulomvilom Pranayam
- ❖ Meditation: nature, procedure and importance
- ❖ Stress: meaning, reasons, role of Yog in stress management

## LIFE STYLE MANAGEMENT (E-506)

### CO: COURSE OUTCOMES

**CO1-** Understand the theoretical foundations of Life Skills Education

**CO2-** Apply Life Skills in various spheres.

**CO3-** Ability to contribute as youth workers specialized in the area of Life Skills Education.

**CO4-** Develop the spirit of social responsibility in students.

**CO5-** Develop social and emotional well-being in students.

### Course Contents

#### Unit - I: Introduction

- ❖ Life Skills: Concept, need and importance of Life Skills for human beings.
- ❖ Life Skills Education: Concept, need and importance of Life Skills Education for teachers.
- ❖ Difference between Livelihood Skills and Life Skills.
- ❖ Core Life Skills prescribed by World Health Organization.
- ❖ Key Issues and Concerns of Adolescent students in emerging Indian context.

#### Unit - II: Process and Methods Enhancing the Life Skills

- ❖ Classroom Discussions
- ❖ Brainstorming and Role plays
- ❖ Demonstration and Guided Practice
- ❖ Audio and Visual activities, e.g. Arts, Music, Theatre, Dance
- ❖ Small Groups discussions followed by a presentation of group reports.
- ❖ Educational Games and Simulation
- ❖ Case Studies, Storytelling, Debates
- ❖ Decision making and mapping of using problem trees.

#### Unit - III: Core Life Skills (I)

- ❖ Skills of Self-awareness and Empathy: Concept, Importance for Teachers in particular, Integration with the teaching learning process, learning to live together with other living beings. acceptance of diversity in perspectives of different societies and cultures. Acceptance and importance of all living being as along ecological and psychological social structures.
- ❖ Skills of Coping with Stress and Emotion: Concept, importance for Teachers in particular and Integration with the teaching learning process.

#### Unit - IV: Core Life Skills (II)

- ❖ Skills of Critical thinking and Creative thinking: Concept, importance for Educationists, Integration with the teaching learning process.
- ❖ Skills of Problem Solving and Decision making: Concept, importance for Educationists, Integration within the teaching -learning process.

#### Unit – V: Core Life Skills (III)

- ❖ Skill of Effective Communication: Concept, importance for Human beings and Educationists, Integration within the teaching learning process.
- ❖ Skills of Building Interpersonal relationships: Concept, Importance for Teachers in particular and Integration with the teaching- learning process.



**(Teaching Skills) Practical  
Work EF 2(B): School  
Internship (E-703)**

In the second year, there shall be a minimum of 16 weeks of intensive engagement with the school in the form of School Internship. For this, the student-teachers will go for 'School Placement', during which their role in the school is something like an apprentice and they shall work as a regular teacher & participate in all the school activities including planning, teaching and assessment, interacting with school-teachers, & children to understand the school in totality its philosophy & aims, organization and management, the life of a teacher, the needs of the physical, mental and emotional development of children. They will be engaged in school functioning in all its aspects in consultation with the School-mentor, like-

- ❖ Participating in various 'out-of-class room' activities in school.
- ❖ Organizing events e.g., cultural activities, debates, games, quiz, essay-competition, drama, etc.
- ❖ Preparation of School calendar, time-table, assessment schedule, evaluation tools etc.
- ❖ Preparing a suggested comprehensive plan of action for some aspect of school improvement.

School-Internship shall be designed to lead to the development of 'Teaching Competence of a professional, teacher dispositions and sensitivity.

During internship, student-teachers will be provided opportunities to teach in government and private schools with systematic support and feedback from the faculty. During this period, student-teachers will be actively engaged in teaching at school and will participate in day-to-day activities of school.

It is important that the student-teachers will consolidate and reflect on their teaching experience during the school-internship.

- ❖ Student-teachers will maintain a **Journal (A Diary)** in which he/she records one's experiences and observations, etc. daily.
- ❖ Student-teachers will maintain a **Portfolio** of all the activities like-details of daily-teaching eg., topic, date, class, objectives of teaching, resources used, assessment tools, homework given, etc.
- ❖ Student-teachers will **teach at least 30 lessons** during internship period. These lessons will be observed by their mentors in the school.
- ❖ Student-teachers will work on an **Action Research based Project** on any Educational problem of School, which will be selected in consultation with the concerned faculty supervisor.

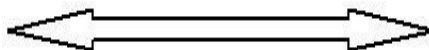
**Final Presentation**

At the end of School-Internship each student-teacher will be expected to present

- ❖ **The Journal**-Containing day-to-day report about different activities, like-teaching, events, etc. mentioned above.
- ❖ **The Portfolio**- Containing evidences (proof) of different activities and events in the form of different photographs, etc.
- ❖ **The Project Report**-Containing the data, analysis and interpretation based on Action Research conducted by him/her.
- ❖ **Presentation of Teaching through ICT**- on any topic of school subject.

These four activities will be included in the evaluation of School-Internship.

- ❖ The Journal of 50 marks
- ❖ The Portfolio of 50 marks
- ❖ The Project Report of 50 marks
- ❖ Presentation of teaching through ICT on any topic of school subject of 50 marks



# **School of Law and Constitutional Studies**



## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Law and Constitutional Studies**

#### **Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Law (LLB) Three Year Programme Semester  
Pattern  
(w.e.f. session 2022-23)**

**Revised and approved in the year 2022 (17<sup>th</sup> meeting Board of  
Studies**

## **Programme Educational Objectives (PEOs)**

**PEO 1** To provide students with a comprehensive understanding of legal principles, doctrines, and the framework of laws governing various fields.

**PEO 2** To develop the ability to critically analyze legal issues, interpret statutes, and apply legal reasoning to complex situations

**PEO 3** To instill ethical values and professional integrity, ensuring that graduates adhere to the highest standards of legal practice and contribute to social justice and equity

**PEO 4** To enhance oral and written communication skills, equipping students to present legal arguments persuasively and represent clients effectively in courts, tribunals, and other forums.

**PEO 5** To cultivate strong legal research skills and foster an attitude of lifelong learning, enabling students to stay updated with legal developments and contribute to academic and professional discourses.

**PEO 6** To prepare graduates to serve as legal professionals who address societal challenges, advocate for policy changes, and contribute to nation-building through leadership roles in the legal and judicial systems.

## **Programme Specific Objectives (PSO's)**

**PSO 1** To equip students with a thorough understanding of national and international legal systems, statutory laws, and judicial precedents

**PSO 2** To develop practical skills such as drafting legal documents, conducting negotiations, and preparing case strategies for litigation and alternative dispute resolution mechanisms

**PSO 3** To prepare students to use their legal knowledge for promoting social justice, providing legal aid to underprivileged sections of society, and contributing to the public interest.

**PSO 4** To enable students to critically evaluate laws and policies, suggest legal reforms, and participate in legislative drafting processes to address contemporary social, economic, and environmental issues.

**PSO 5** To provide opportunities for students to specialize in cutting-edge legal fields, such as intellectual property rights, cyber law, environmental law, or international trade law, catering to global demands.

**PSO 6** To prepare students for careers in the judiciary, government services, or corporate law by providing insights into procedural laws, administrative processes, and governance mechanisms.

## **Programme Outcome Objectives (POO's)**

**POO 1** Graduates will acquire in-depth knowledge of legal concepts, principles, and procedures, enabling them to interpret and apply laws effectively in practical scenarios

**POO 2** Graduates will demonstrate the ability to critically analyze legal issues, evaluate evidence, and develop reasoned arguments to solve complex legal problems.

**POO 3** Graduates will exhibit ethical conduct, professionalism, and a commitment to justice in their legal practice, adhering to the standards of the legal profession

**POO 4** Graduates will develop strong oral and written communication skills, enabling them to present legal arguments persuasively in courts, tribunals, and other professional settings.

**POO 5** Graduates will use their legal expertise to address societal challenges, uphold human rights, and advocate for marginalized communities, contributing to social equity and justice.

**POO 6** Graduates will demonstrate the ability to continuously update their legal knowledge and adapt to evolving legal landscapes, ensuring competence in the face of new challenges.

LL.B First Year

First Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 101	Law of Contract I	4	0	0	4
LLB 103	Family Law I (Hindu law)	4	0	0	4
LLB 105	Constitutional Law I	4	0	0	4
LLB 107	Law of Torts Including M.V. Act & Consumer Protection Laws	4	0	0	4
LLB-109 LLB-109A LLB-109B LLB-109C LLB-109D	English Spanish-I German-I Chinese-I French-I	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

Bachelor of Law (LL.B)Second  
Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 102	Law of Contract II	4	0	0	4
LLB 104	Family law II (Muslim Law)	4	0	0	4
LLB 106	Constitutional Law II	4	0	0	4
LLB 108	Law of Crimes (I.P.C.)	4	0	0	4
LLB 110	Environmental Law	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

## LL.B SECOND YEAR

### Third Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB-201	Jurisprudence	4	0	0	4
LLB-203	Law of Evidence	4	0	0	4
LLB-205	Law of Property	4	0	0	4
LLB-207	Public International Law	4	0	0	4
LLB-209	Intellectual Property Law	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

### Fourth Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 202	Administrative law	4	0	0	4
LLB 204	Company law	4	0	0	4
LLB 206	Labor Law I	4	0	0	4
LLB 208	Civil Procedure Code and Law of Limitation	4	0	0	4
LLB 210	Criminal Procedure Code and Law of Juvenile Justice and Probation of Offenders	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

**LL.B THIRD YEAR**

Fifth Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 301	Interpretation of Statutes	4	0	0	4
LLB 303	U.P. Land Laws	4	0	0	4
LLB 305	Law of banking and Negotiable Instruments	4	0	0	4
LLB 307	Alternate Dispute Resolution	2	0	8	6
LLB 309	Professional Ethics and Professional Accounting System	2	0	8	6
	Total	16	0	0	24

**Sixth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 302	English and Legal Language	4	0	0	4
LLB 304	Information Technology Law	4			4
LLB 306 LLB 308 LLB 310	Optional (Choose any one from the following) – a. Law Relating to Women b. Human Rights Law c. Law of Investment and Securities	4	0	0	4
LLB 312	Drafting Pleading and Conveyancing	1		6	4
LLB 314	Moot Court, Observation of trial, Pre – Trial preparation and Internship	--	--	8	4
	Total	13	0	14	20

# **Semester-I**



## LAW OF CONTRACT-I

Sub. Code: LLB 101

L – 4, C – 4.

### Course Objectives

- Understand the basic principles of contract law.
- Learn the rules for forming valid contracts.
- Analyse remedies for breach of contract.
- Apply contract law to real-life scenarios
- Develop legal reasoning and research skills

### Unit I:

Definition and essentials of a valid Contract - Definition and essentials of a valid Offer - Definition and essentials of valid Acceptance - Communication of Offer and Acceptance - Revocation of Offer and Acceptance through various modes including electronic medium - Consideration - salient features - Exception to consideration - Doctrine of Privity of Contract - Exceptions to the privity of contract - Standard form of Contract.

### Unit-II :

Capacity of the parties - Effect of Minor's Agreement - Contracts with insane persons and persons disqualified by law - Concepts of Free Consent - Coercion - Undue influence - Misrepresentation - Fraud - Mistake - Lawful Object - Immoral agreements and various heads of public policy - illegal agreements - Uncertain agreements - Wagering agreements - Contingent contracts - Void and Voidable contracts.

### Unit-III:

Discharge of Contracts - By performance - Appropriation of payments - Performance by joint promisors - Discharge by Novation - Remission - Accord and Satisfaction - Discharge by impossibility of performance (Doctrine of Frustration) - Discharge by Breach - Anticipatory Breach - Actual breach.

### Unit-IV:

Quasi Contract - Necessaries supplied to a person who is incapable of entering into a contract - Payment by an interested person - Liability to pay for non-gratuitous acts - Rights of finder of lost goods - Things delivered by mistake or coercion - Quantum meruit - Remedies for breach of contract - Kinds of damages - liquidated and unliquidated damages and penalty - Duty to mitigate.

### Unit-V:

Specific Relief - Recovering possession of property - Specific performance of the contract - Rectification of instruments - Rescission of contracts - Cancellation of instruments - Declaratory Decrees - Preventive Relief - Injunctions - Generally - Temporary and Perpetual injunctions - Mandatory & Prohibitory injunctions - Injunctions to perform negative agreement.

## FAMILY LAW–I (Hindu Law)

**Sub. Code: LLB 103**

**L – 4, C – 4.**

### **Course Objectives**

- Understand the fundamental principles of Hindu Law.
- Learn the legal framework governing marriage and divorce.
- Study laws related to succession and inheritance.
- Analyse the rights and duties within Hindu joint families.
- Apply legal concepts to family disputes.

### **Unit-I:**

Sources of Hindu Law – Scope and application of Hindu Law – Schools of Hindu Law - Mitakshara and Dayabhaga Schools – Concept of Joint Family, Coparcenary, Joint Family Property and Coparcenary Property – Institution of Karta- Powers and Functions of Karta - Pious Obligation - Partition – Debts and alienation of property.

### **Unit-II:**

Marriage - Definition - Importance of institution of marriage under Hindu Law – Conditions of Hindu Marriage – Ceremonies and Registration – Monogamy – Polygamy.

### **Unit-III:**

**Matrimonial** Remedies under the Hindu Marriage Act, 1955 - Restitution of Conjugal Rights – Nullity of marriage – Judicial separation – Divorce – Maintenance *pendente lite* – importance of conciliation.

### **Unit-IV:**

Concept of Adoption - Law of Maintenance - Law of Guardianship - Hindu Adoption and Maintenance Act, 1956 – Hindu Minority and Guardianship Act 1956.

### **Unit-V:**

Succession – Intestate succession – Succession to the property of Hindu Male and Female; Dwelling House – Hindu Succession Act, 1956 as amended by the Hindu Succession (Andhra Pradesh Amendment) Act, 1986 & the Hindu Succession (Amendment) Act, 2005 – Notional Partition – Classes of heirs – Enlargement of limited estate of women into their absolute estate.

# Constitutional Law – I

**Sub. Code: LLB 105**

**L – 4, C – 4.**

## **Course Objectives**

- Gain knowledge of the fundamental principles of the Constitution.
- Examine the fundamental rights and duties of individuals.
- Understand the roles and powers of the Legislature, Executive, and Judiciary.
- Explore the concept of separation of powers in governance.
- Study the importance and process of constitutional amendments.

## **Unit-I**

Constitution-Meaning and Significance - Evolution of Modern Constitutions -Classification of Constitutions-Indian Constitution - Historical Perspectives - Government of India Act, 1919 - Government of India Act, 1935 - **Drafting of Indian Constitution - Role of Drafting Committee of the Constituent Assembly**

## **Unit-II**

Nature and Salient Features of Indian Constitution - Preamble to Indian Constitution - Union and its Territories-Citizenship - **General Principles relating to Fundamental Rights(Art.13) - Definition of State**

## **Unit-III**

Right to Equality(Art.14-18) – Freedoms and Restrictions under Art.19 - Protection against Ex-post facto law - **Guarantee against Double Jeopardy - Privilege against Self-incrimination - Right to Life and Personal Liberty - Right to Education – Protection against Arrest and Preventive Detention**

## **Unit-IV**

Rights against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - **Right to Constitutional Remedies - Limitations on Fundamental Rights(Art.31-A,B and C)**

## **Unit-V**

Directive Principles of State Policy – Significance – Nature – Classification - Application and Judicial Interpretation - Relationship between Fundamental Rights and Directive Principles - **Fundamental Duties – Significance - Judicial Interpretation**

# Law of Torts Including M.V. Act and Consumer Protection laws

Sub. Code: LLB 107

L – 4, C – 4.

## Course Objectives

- Learn the fundamental concepts and scope of tort law.
- Examine the legal rules governing liability for wrongful acts.
- Understand the compensation mechanisms under the Motor Vehicles Act.
- Explore consumer rights and protections under relevant laws.
- Apply tort law to practical situations and legal disputes.

## Unit-I:

Nature of Law of Torts - Definition of Tort - Elements of Tort - Development of Law of Torts in England and India - Wrongful Act and Legal Damage - *Damnum Sine Injuria* and *Injuria Sine Damnum* - Tort distinguished from Crime and Breach of Contract - General Principles of Liability in Torts - Fault - Wrongful intent - Malice - Negligence - Liability without fault - Statutory liability - Parties to proceedings.

## Unit-II

General Defences to an action in Torts – Vicarious Liability - Liability of the State for Torts – Defence of Sovereign Immunity – Joint Liability – Liability of Joint Torfeasors – Rule of Strict Liability (*Rylands V Fletcher*) – Rule of Absolute Liability (*MC Mehta vs. Union of India*) – Occupiers liability – Extinction of liability – Waiver and Acquiescence – Release – Accord and Satisfaction - Death.

## Unit-III

Specific Torts - Torts affecting the person - Assault - Battery - False Imprisonment - Malicious Prosecution - Nervous Shock - Torts affecting Immovable Property - Trespass to land - Nuisance - Public Nuisance and Private Nuisance - Torts relating to movable property – Liability arising out of accidents (Relevant provisions of the Motor Vehicles Act).

## Unit-IV

Defamation - Negligence - Torts against Business Relations - Injurious falsehood - Negligent Misstatement - Passing off - Conspiracy - Torts affecting family relations - Remedies - Judicial and Extra-judicial Remedies – Damages – Kinds of Damages – Assessment of Damages – Remoteness of damage - Injunctions - Death in relation to tort - *Actio personalis moritur cum persona*.

## Unit-V Consumer Laws:

Common Law and the Consumer - Duty to take care and liability for negligence - Product Liability - Consumerism - Consumer Protection Act, 1986 - Salient features of the Act - Definition of Consumer - Rights of Consumers - Defects in goods and deficiency in services – Unfair trade practices - Redressal Machinery under the Consumer Protection Act - Liability of the Service Providers, Manufacturers and Traders under the Act – Remedies.

## English & Legal language

Sub. Code: LLB 109

L – 4, C – 4.

### Course Objectives

- Develop proficiency in English for effective legal communication.
- Enhance skills in legal drafting and interpretation.
- Understand the use of precise language in legal contexts.
- Improve comprehension of legal terminology and concepts.
- Strengthen research and writing abilities for legal purposes.

### Unit-I

Sentence, Phrase and clause, Noun, Pronoun, verb, Adverb and Adjectives, Preposition and conjunctions, Articles and modals, Punctuation and Capital Letter, One word substitution, Synonyms and Antonyms, Note making, Comprehension Passages, Active and Passive voice, Idioms and Phrases, Prefixes and suffixes.

### Unit-II

Sources of Law, Distinction between civil and criminal law, Law and Custom, Law and morals, Law of crimes and Law of Torts, Substantive law and procedural law, Public law and private law, Law of contract and Law of torts, Law and fact, Law and equity.

Essays on contemporary topics such as, environmental law cyber-crime/ law, women empowerment etc.

(A) **Terms-Meaning and Usage:** Complaint, Written Statement, Plaintiff, Defense, Petition, Appeal, Magistrate, Judge Court, Tribunal, Divorce, Judicial Separation, Litigation, Public, Private, Legal, Illegal, Monogamy, Bigamy, Polygamy, Will Deed, Agency, Agreement, Bail, Bailable, Non-Bailable, Bailment, Minor, Misstatement, Pledge. Amicus Curie, Extradition, Forfeiture, Habeas corpus, Hereditaments, Impeachment.

(B) **Legal**, Inalienable, infanticide, Judgment debtor, Jurisprudence, Laches, Legacy, Letters of Administration, License, Moratorium, Notary Public, Null and Void, Privilege of Witness, Prosecution, Punishment, Preponderance of Probabilities, Void and Voidable, Ab initio, Ab intra, Ad hoc, Ad interim, Ad Volorem, Bona fides, Corpus juris civilis, De facto, De novo, Detenu, De jure, Ex officio, Ex parte, En route, Ex post facto, Impane, Inter alia, Jure divino, Jure Humane, Locus standi, Mala fide, Modus operandi, PariPassu, Status quo, Sub judice, Subpoena.

### (C) Commonly used Urdu words in courts

eqn~nbZ] tkfeu] tokcnkok] eqalfje] xokg] nok] bDtkbZ] lihuk] gtkZuk] [kpkZ] jkthukek] fgckukek] oknh] izfroknh] bdjkjukek] dkfrc] btjk] et:c] eQ:j] fpV~Bhet:ch] rLdjk] Fkkuk&gktk] jkstukepkvke] eqgfjZj] QnZcjkenxh] ekyeqdnek] dyecanc;ku] gyQukek] odkyrukek] fudkgukek] iSjksdkj] ltk;kchokjaV] [kpkZ , ikunku] esgj] gd "kqQk] x"r] ckfry] Qkfln] bfRryk] eqfYte] eqtfje] ltk;k¶rk] rkthjkr , fgan] eqofDdy] cSukek] c;kukgd&tkSft;r] olh;r] jgu] btc] [;kj&my&cqywx] fgtkur] oDQ] uQdk] f[kyor&my&lghg] gqnwn&,&njck] rLnhd] f"uk[r

### **(D) Commonly used Latin terms in courts**

Ab initio, Res judicata, Res-subjudice, Adhoc, Adinfinitum, Adinterim, Adjourn sine die, Ad litem, Advalorem, Alibi, Aliter, Almamater, Amicus Curiae, Animus, Animus possidendi, Alumini, Antimeridiam, Bonafide, Bona Vacantia, Cause causans, Coram non  
judice, Corpus Possessionis, Custodia Legis, Compos mentis, Cypress, Defacto, DeJure, Denovo, Donation mortis  
cause, Enventresamere, Enroute, Ex officio, Ex gratia, Ex parte, Ex post  
facto, Factum valet, Fem sole, Filius nullius, In forma  
pauperis, Ibid, In limine, In memoriam, In parimaterial, Intelligible differentia, Inter alia, Inter se, Ipso jure, Intot  
o, Ipso facto, In invitum, In locoparentis, In pais, In pari delicto, potio est condition possidentis (or  
defendentis), In rem, Intervivos, Intra-vires, Justertii, Jus civile, Jus divinum, Lex Fori, Lex Loci  
delicti, Lis pendens, Locus standi, Malafide, Mens Rea, Modus operandi, Modus Vivendi, Non compos  
mentis, Nonfeasance,  
Nudum Pactum, Onus probandi, Pacta Sunt Servanda, Pari Passu, Pendente lite, Per annum, Per capita, Per diem,  
Per mensem, Per stripes, Persona non  
grata, Postmeridiam, Postmortem, Prima facie, Pro bono publica, Prorata, Protanto, Protem, Quasi-judicial,  
Quid pro quo, Rati decidendi, Raison d'etre, Res Gestae, Res integra, Res nullius, Sine qua  
non, Sine die, Solatium, Stare decisis, Status quo, Sub-judice, Suppression, Scienter, Trespasser ab initio,  
Ultra-vires, Vice Versa, Vis-à-vis, Vis major

### **Unit III: Legal maxims**

1. Absoluta sententia expositore non indiget
2. A bundanscautela non nocet.
3. Actio-personalis moritur-cum persona
4. Actori incumbit onus probandi
5. Actus curiae neminem gravabit
6. Actus dei nemini facit injuriam
7. Actus reus
8. Actus legis nemini est damnosus
9. Actus non facit reum nisi mens sit rea
10. Actio Personalis Moritur Cum Persona.
11. Delegatus Non Potest Delegare
12. Ejusdem Generis
13. Exturpi causa non oritur action
14. Noscitur o socii
15. Non-Execusat
16. Novus actus interveniens
17. Respondent superior
18. Falsus in uno falsus in omnibus
19. Acquitus sequitur legem
20. Allegans contraria non est audiendus
21. Audi alteram partem
22. Caveat emptor
23. Damnum sine injuria
24. De minimis non curat lex
25. Dolus malus pactum se non servabit
26. Delegates non potest delegare
27. Fiat Justitia ruat caelum
28. Ignorantia legis neminem excusat
29. Ignorantia facti excusat ignorantia Juris

30. Injuria sine damno
31. Interest republicae ut sit finis litium
32. Lex non cogit ad impossibilia
33. Nemo dat quod non habet
34. Nemo debet esse iudex in propria causa
35. Quantum meruit
36. Qui approbat non-reprobat
37. Qui facit per alium per-se
38. Res ipsa loquitur
39. Salus populi est Suprema Lex
40. Ubi-jus ibi-remedium
41. Vigilantibus non-dormientibus jus subveniunt

**Unit IV: (A) Paragraph & Precise Writing of Legal Texts  
(B) Translate Hindi to English & English to Hindi of case laws**

**Unit V: Writing of Moot Memorials**

**Suggested Reading:**

1. Myneni S.R., Legal language and Legal Writing, Central Law Agency, Allahabad.
2. Jain R.L., Legal Language, Central Law Agency, Allahabad.
3. Prasad Anirudh, Legal Language, Central Law Publications, Allahabad.

## Spanish-I

**Sub. Code: LLB-109A**

**L – 4, C – 4.**

### **Course Objectives**

- Build a foundation in basic Spanish vocabulary and grammar.
- Develop listening and speaking skills for everyday conversations.
- Learn to read and comprehend simple Spanish texts.
- Practice writing basic sentences and paragraphs in Spanish.
- Gain cultural insights into Spanish-speaking regions.

### **Unit 1: Introduction to Spanish**

Overview of the Spanish language and its global significance, Alphabet and pronunciation, Basic greetings and introductions

### **Unit 2: Basic Grammar and Vocabulary**

Nouns, articles, and gender, Common adjectives and their agreement with nouns, Essential vocabulary: family, colours, numbers

### **Unit 3: Present Tense Verbs**

Introduction to regular verbs (AR, ER, IR), Conjugation patterns and usage  
Practical exercises and dialogues

### **Unit 4: Common Expressions and Questions**

Essential phrases for everyday conversation, Forming questions and negation  
Role-playing dialogues

### **Suggested Readings:**

1. "Madrigal's Magic Key to Spanish" by Margarita Madrigal
2. A classic introductory book that simplifies grammar and vocabulary, making it accessible for beginners.
3. "Practice Makes Perfect: Spanish Verb Tenses" by Dorothy Richmond
4. Focuses on mastering verb tenses with clear explanations and exercises.
5. "Easy Spanish Step-By-Step" by Barbara Bregstein
6. A structured approach to learning Spanish, emphasizing grammar and vocabulary in a logical progression.
7. "Living Language Spanish" (Complete Course)
8. A comprehensive language course that includes audio components and a variety of exercises.



# German-I

**Sub. Code: LLB-109B**

**L – 4, C – 4.**

## **Course Objectives**

- Acquire basic German vocabulary and grammar skills.
- Develop the ability to engage in simple conversations in German.
- Learn to read and understand basic German texts.
- Practice writing short sentences and paragraphs in German.
- Explore cultural aspects of German-speaking countries.

## **Unit 1: Introduction to German**

German alphabet and pronunciation, Basic greetings and introductions, Pronunciation drills, Icebreaker introductions

## **Unit 2: Numbers and Colours**

Numbers 1-100, Basic colours and their usage, Number games, Colour identification exercises

## **Unit 3: Everyday Vocabulary**

Family members, Common nouns (e.g., household items, animals) Create a family tree, Vocabulary flashcard games

## **Unit 4: Basic Grammar and Sentence Structure**

Introduction to articles (definite and indefinite), Subject-verb-object structure, Sentence formation exercises, Group writing tasks

## **Suggested Readings:**

1. "German Made Simple: Learn to Speak and Understand German Quickly and Easily"  
Author: Arnold Leitner
2. A straightforward introduction to the language, covering essential vocabulary and grammar.
3. "German for Dummies"
4. Author: Wendy Foster
5. "The Everything Learning German Book"  
Author: Julie Gutin
6. "Practice Makes Perfect: Complete German Grammar"
7. Author: Ed Swick
8. A comprehensive workbook that reinforces grammar concepts with exercises and explanations.

## Chinese-I

**Sub. Code: LLB-109C**

**L – 4, C – 4.**

### **Course Objectives**

- Build a foundation in essential Chinese vocabulary and grammar.
- Improve listening and speaking abilities for basic Chinese conversations.
- Learn to read and write simple Chinese characters.
- Practice constructing basic sentences and dialogues in Chinese.
- Explore the culture and traditions of Chinese-speaking regions.

### **Unit 1: Introduction to Chinese**

Pinyin and pronunciation, Basic greetings and self-introduction, Pronunciation practice  
Icebreaker introductions

### **Unit 2: Numbers and Dates**

Numbers 1-100, Days of the week and months, Number games, Calendar exercises

### **Unit 3: Everyday Vocabulary**

Family members, Common nouns (e.g., animals, objects), Family tree project  
Vocabulary flashcards

### **Unit 4: Basic Grammar and Sentence Structure**

Subject-verb-object structure, Introduction to measure words, Sentence formation exercises  
Simple writing tasks

### **Suggested Readings:**

1. "Integrated Chinese" (Textbook + Workbook)
  - a. Authors: Tao-chung Yao, Yuehua Liu, et al.
  - b. A comprehensive series that covers speaking, reading, and writing. It includes cultural notes and exercises.
2. "Chinese Made Easier"
  - a. Authors: Maureen S. W. D. H. Wong, et al.
  - b. Focuses on conversational skills with a gradual introduction to reading and writing.
3. "New Practical Chinese Reader"
  - a. Authors: Liu Xun
  - b. A popular series that integrates language and cultural elements, with a focus on conversational skills.
4. "Reading & Writing Chinese"
  - a. Author: William McNaughton
  - b. A guide to learning characters, with clear explanations and practice exercises.

## **French-I**

**Sub. Code: LLB-109D**

**L – 4, C – 4.**

### **Course Objectives**

- Acquire basic French vocabulary and grammar essentials.
- Enhance speaking and listening skills for everyday French conversations.
- Develop reading comprehension of simple French texts.
- Practice writing basic French sentences and paragraphs.
- Explore the culture and customs of French-speaking regions.

### **Unit 1: Daily Routines**

Common verbs (aller, être, avoir), Talking about daily activities

### **Unit 2: Food and Drink**

Vocabulary related to food, Expressing likes and dislikes

### **Unit 3: Clothing and Shopping**

Vocabulary for clothing, Shopping dialogue and role-play

### **Unit 4: Directions and Transportation**

Asking for and giving directions, Vocabulary for transportation

### **Suggested Readings:**

1. "Easy French Step-By-Step" by Myrna Bell Rochester
2. A clear, gradual approach to learning French grammar and vocabulary.
3. "French for Dummies" by Dodi-Katrin Schmidt and Michelle M. Williams
4. "Practice Makes Perfect: Complete French Grammar" by Annie Heminway
5. Comprehensive grammar explanations with exercises for practice.
6. "Fluent in French: The Most Complete Study Guide to Learn French" by Frederic Bibard
7. Covers vocabulary, grammar, and cultural insights

## **Semester-II**

## Law of Contract - II

Sub. Code: LLB 102

L – 4, C – 4.

### Course Objectives

- Understand the concepts of contract performance and breach.
- Study the different types of contracts and their legal implications.
- Examine the rules surrounding contract termination and discharge.
- Explore the remedies available for contract breach and enforcement.
- Apply advanced contract law principles to real-world scenarios.

### Unit-I:

Indemnity and Guarantee - Contract of Indemnity, definition - Rights of Indemnity holder - Liability of the indemnified - Contract of Guarantee - Definition of Guarantee - Essential characteristics of Contract of Guarantee - Distinction between Indemnity and Guarantee - Kinds of Guarantee - Rights and liabilities of Surety - Discharge of surety. Contract of Bailment - Definition of bailment - Essential requisites of bailment - Kinds of bailment - Rights and duties of bailor and bailee - Termination of bailment - Pledge - Definition of pledge - Rights and duties of Pawnor and Pawnee - Pledge by non-owner.

### Unit-II:

Contract of Agency - Definition of Agent - Creation of Agency - Rights and duties of Agent - Delegation of authority - Personal liability of agent - Relations of principal and agent with third parties - Termination of Agency.

### Unit-III:

Contract of Sale of Goods - Formation of contract - Subject matter of sale - Conditions and Warranties - Express and implied conditions and warranties - Pricing - *Caveat Emptor*.

### Unit-IV:

Property - Possession and Rules relating to passing of property - Sale by non-owner - *Nemo dat quod non habet* - Delivery of goods - Rights and duties of seller and buyer before and after sale - Rights of unpaid seller - Remedies for breach.

### Unit-V:

Contract of Partnership - Definition and nature of partnership - Formation of partnership- Test of partnership - Partnership and other associations - Registration of firm - Effect of non-registration - Relations of partners - Rights and duties of partners - Property of firm - Relation of partners to third parties - Implied authority of partners - Kinds of partners - Minor as partner - Reconstitution of firm - Dissolution of firm.

**Suggested Readings:**

1. Anson's *Law of Contract*, 25th Ed. 1998, Oxford University Press, London.
2. Venkatesh Iyyer: *The Law of Contracts and Tenders*, Gogia & Company Hyderabad.
3. Cheshire & Fifoot: *Law of Contract*, Butterworth, London, 1976.
4. Mulla: *The Indian Contract Act*, N.M. Tripathi (P) Ltd. Bombay, 1984.
5. G.C.V. Subba Rao: *Law of Contracts*, S. Gogia & Co., Hyderabad, 1995.
6. Krishnan Nair: *Law of Contracts*, S. Gogia & Co. Hyderabad, 1995.
7. Avtar Singh: *Law of Contracts*, Eastern Book Company, Lucknow, 1998.
8. A Ramaiah's *Sale of Goods Act*, 4th Ed. 1998, The Law Book Co., Allahabad.
9. Benjamin's *Sale of Goods*, 1st Ed. 1978, Sweet & Maxwell, London.
10. P.S. Atiyah: *Sale of Goods Act*, 9th Ed. 1997, Universal Book Traders, Delhi.

## Family Law – II (Muslim Law)

Sub. Code: LLB 104

L – 4, C – 4.

### Course Objectives

- Understand the basic principles and sources of Muslim personal law.
- Study the laws governing marriage, divorce, and maintenance under Muslim law.
- Examine the rules of inheritance and succession in Muslim communities.
- Analyse the rights and duties of Muslim family members.
- Apply Muslim law principles to practical family law issues.

### Unit-I:

Origin and development of Muslim Law - Sources of Muslim Law - Schools of Muslim Law - Difference between the Sunni and Shia Schools – Sub-schools of Sunni Law - Operation and application of Muslim Law - Conversion to Islam - Effects of conversion - Law of Marriage, nature of Muslim Marriage - Essential requirements of valid Marriage - Kinds of Marriages - distinction between void, irregular and valid marriage - Dower (Mahr) - Origin, nature and importance of dower, object of dower and classification of dower.

### Unit-II:

Divorce - Classification of divorce - different modes of Talaq - Legal consequences of divorce - Dissolution of Muslim Marriage Act, 1939 - Maintenance, Principles of maintenance, Persons entitled to maintenance - The Muslim Women (Protection of Rights on Divorce) Act, 1986 - Effect of conversion on maintenance and difference between Shia and Sunni Law.

### Unit-III:

Parentage - Maternity and Paternity - Legitimacy and acknowledgment - Guardianship - Meaning - Kinds of guardianship - Removal of guardian - Difference between Shia and Sunni Law. Gift - Definition of Gift - Requisites of valid gift - Gift formalities - Revocation of gift - Kinds of gift. Wills - Meaning of Will - Requisites of valid Will - Revocation of Will - Distinction between Will and Gift - Difference between Shia and Sunni Law.

### Unit-IV :

Waqf \_ Definition - Essentials of Waqf - Kinds of Waqf – Creation of Waqf - - Revocation of Waqf - Salient features of the Waqf Act, 1995 – Mutawalli - Who can be Mutawalli - Powers and duties of Mutawalli - Removal of Mutawalli and Management of Waqf property. Succession - Application of the property of a deceased Muslim - Legal position of heirs as representatives - Administration - Waqf Tribunals and Jurisdiction.

### Unit-V:

Special Marriage Act, 1954 - Salient features of Indian Divorce Act, 1869 - Domicile - Maintenance to dependents/ Spouses - Intestate succession of Christians under the Indian Succession Act, 1925.

**Suggested Readings:**

1. Tahir Mahmood: *The Muslim Law of India*, 1980, Law Book Company, Allahabad.
2. Aquil Ahmed: *Text Book of Mohammadan Law*, 5th Edition 1992, Central Law Agency, Allahabad.
3. Prof. G.C.V. Subba Rao: *Family Law in India*, 6th Edition, 1993, S.Gogia & Company, Hyderabad.
4. Asaf A.A.Fyzee: *Outlines of Mohammadan Law*, 4th Edition, 1999, Oxford University Press, Delhi.



## Constitutional Law – II

Sub. Code: LLB 106

L – 4, C – 4.

### Course Objectives

- Understand the concept of federalism and distribution of powers in the Constitution.
- Study the structure and functions of various constitutional bodies.
- Analyze the role of the judiciary in interpreting the Constitution.
- Examine the relationship between fundamental rights and public policy.
- Explore the process and significance of constitutional amendments.

### Unit-I

Legislature under Indian Constitution - Union and State Legislatures - Composition, Powers, Functions and Privileges - Anti-Defection Law - Executive under Indian Constitution - President and Union Council of Ministers - Governor and State Council of Ministers - Powers and position of President and Governor

### Unit-II

Judiciary under Constitution - Supreme Court - Appointment of Judges, Powers and Jurisdiction - High Courts - Appointment and Transfer of Judges - Powers and Jurisdiction - Subordinate Judiciary - Independence of judiciary - Judicial Accountability

### Unit-III

Centre-State Relations - Legislative, Administrative and Financial Relations - Cooperation and Coordination between the Centre and States - Judicial Interpretation of Centre-State Relations - Doctrines evolved by Judiciary

### Unit-IV

Liability of State in Torts and Contracts - Freedom of Interstate Trade, Commerce and Inter course - Services under the State - All India Services - Public Service Commissions

### Unit-V

Emergency – Need of Emergency Powers - Different kinds of Emergency - National, State and Financial emergency - Impact of Emergency on Federalism and Fundamental Rights - Amendment of Indian Constitution and Basic Structure Theory

### Suggested Readings:

1. M.P.Jain, *Indian Constitutional Law*, Wadhwa & Co, Nagpur
2. V.N.Shukla, *Constitution of India*, Eastern Book Company, Lucknow
3. Granville Austin, *Indian Constitution-Cornerstone of a Nation*, OUP, New Delhi
4. H.M.Seervai, *Constitutional Law of India* (in 3 Volumes), N.M.Tripathi, Bombay
5. G.C.V.Subba Rao, *Indian Constitutional Law*, S.Gogia & Co., Hyderabad
6. B.Shiva Rao, *Framing of India's Constitution* (in 5 Volumes), Indian Institute of Public Administration, New Delhi
7. J.N.Pandey, *Constitutional Law of India*, Central Law Agency, Allahabad

## LAW OF CRIMES

Sub. Code: LLB 108

L – 4, C – 4.

### Course Objectives

- Understand the key principles and categories of criminal law.
- Study the elements of criminal offenses and defenses.
- Examine the criminal justice system, including police, prosecution, and courts.
- Analyze the procedures for trial and punishment in criminal cases.
- Apply criminal law principles to real-life case scenarios.

### Unit-I:

Concept of crime - Definition and meaning of crime - Distinction between crime and tort - Stages of crime - Intention, Preparation, Attempt and Commission of Crime - Elements of Crime - *Actus Reus and Mensrea* - Codification of Law of Crimes in India - Application of the Indian Penal Code - Territorial and Extra Territorial application - General Explanations - Punishments.

### Unit-II:

General exceptions - Abetment - Criminal Conspiracy - Offences against the State - Offences against public peace and Tranquility.

### Unit-III:

Offences affecting human body (offences affecting human life) Culpable Homicide and Murder – Hurt and Grievous Hurt - Wrongful restraint and Wrongful confinement - Criminal force and Assault - Kidnapping and abduction - Sexual offences - Unnatural offences.

### Unit-IV:

Offences affecting the public health, safety, convenience, decency and morals - Offences against Property - Theft - Extortion - Robbery & Dacoity - Cheating - Mischief - Criminal Trespass – Criminal misappropriation and Criminal breach of trust.

### Unit-V :

Offences by or relating to public servants - False Evidence and Offences against Public Justice - Offences relating to documents - Offences relating to Marriage - Cruelty by husband and relatives of husband - Defamation.

### Suggested Readings:

1. Ratan Lal and Dhiraj Lal: *Indian Penal Code*, Wadhwa & Co., 2000.
2. Achutan Pillai: *Criminal Law*, Butterworth Co., 2000.
3. Gour K.D.: *Criminal Law - Cases and Materials*, Butterworth Co., 1999.
4. Kenny's: *Outlines of Criminal Law*, (1998 Edition)

## Environmental Law

Sub. Code: LLB 110

L – 4, C – 4.

### Course Objectives

- Understand the key principles and framework of environmental law.
- Study national and international regulations on environmental protection.
- Examine the legal aspects of environmental pollution and conservation.
- Explore the roles of governmental and non-governmental organizations in environmental law.
- Apply environmental law concepts to contemporary issues and case studies.

### Unit-I

The meaning and definition of environment – Ecology - Ecosystems-Biosphere - Biomes - Ozone depletion - Global Warming - Climatic changes - Need for the preservation, conservation and protection of environment - Ancient Indian approach to environment- Environmental degradation and pollution - Kinds, causes and effects of pollution.

### Unit-II

Common Law remedies against pollution - trespass, negligence, and theories of Strict Liability & Absolute Liability - Relevant provisions of I.P.C. and Cr.P.C. and C.P.C., for the abatement of public nuisance in pollution cases - Remedies under Specific Relief Act - Reliefs against smoke and noise - Noise Pollution.

### Unit-III

The law relating to the preservation, conservation and protection of forests, wild life and endangered species, marine life, coastal ecosystems and lakes etc. - Prevention of cruelty towards animals - The law relating to prevention and control of water pollution - Air Pollution - Environment pollution control mechanism - Law relating to environment protection – National Environmental Tribunal and National Environmental Appellate Authority.

### Unit-IV:

Art. 48A and Art. 51A(g) of the Constitution of India - Right to wholesome environment - Right to development - Restriction on freedom of trade, profession, occupation for the protection of environment - Immunity of Environment legislation from judicial scrutiny(Art.31C) - Legislative powers of the Centre and State Government - Writ jurisdiction - Role of Indian Judiciary in the evolution of environmental jurisprudence.

### Unit-V

International Environmental Regime - Transactional Pollution - State Liability - Customary International Law - Liability of Multinational Corporations/Companies - Stockholm Declaration on Human Environment, 1972 - The role of UNEP for the protection of environment - Ramsar Convention 1971 – Bonn Convention (Migratory Birds) 1992 - Nairobi Convention, 1982 (CFCC) - Biodiversity Convention (Earth Summit), 1992 - Kyoto Protocol 1997, Johannesburg Convention 2002.

### Suggested Readings:

1. Paras Diwan: *Studies on Environmental Cases*.
2. S.N. Jain (ed.): *Pollution Control and the Law*.
3. Armin Rosencranz and Shyam Diwan: *Environmental Law and Policy in India*.
4. A. Agarwal (ed.): *Legal Control of Environmental Pollution*
5. Chetan Singh Mehta: *Environmental Protection and Law*
6. V.K. Krishna Iyer: *Environment Pollution and Law*
7. Shah: *Environmental Law*
8. Paras Diwan: *Environmental Law and Policy in India*,1991
9. Dr. N. Maheshwara Swamy, *Environmental Law*, Asia Law House, Hyderabad.

## **Semester-III**

# JURISPRUDENCE

**Sub. Code: LLB 201**  
**Course Objectives**

**L – 4, C – 4.**

- Explore the fundamental concepts and theories of law.
- Analyse the nature and sources of legal authority and norms.
- Study the relationship between law, morality, and justice.
- Examine different schools of jurisprudential thought and their impact.
- Apply jurisprudential principles to contemporary legal issues.

## **Unit-I:**

Meaning and Definition of Jurisprudence — General and Particular Jurisprudence - Elements of Ancient Indian Jurisprudence — Schools of Jurisprudence — Analytical, Historical, Philosophical and Sociological Schools of Jurisprudence. Theories of Law — Meaning and Definition of Law — The Nature and Function of Law — The Purpose of Law — The Classification of Law — Equity, Law and Justice — Theory of Sovereignty.

## **Unit-II :**

Sources of Law — Legal and Historical Sources — Legislation - Definition of legislation - Classification of legislation- Supreme and Subordinate Legislation - Direct and Indirect Legislation - Principles of Statutory Interpretation. Precedent — Definition of Precedent — Kinds of Precedent — *Stare Decisis* — Original and Declaratory Precedents — Authoritative and Persuasive Precedents. Custom – Definition of Custom – Kinds of Custom – General and Local Custom – Custom and Prescription - Requisites of a valid custom - Relative merits and demerits of Legislation , Precedent and Custom as a source of Law . Codification — Advantages and disadvantages of codification.

## **Unit-III:**

Persons — Nature of personality — Legal Status of Lower Animals, Dead Persons and Unborn persons — Legal Persons — Corporations — Purpose of Incorporation — Nature of Corporate Personality - Rights and Duties — Definition of Right — Classification of Rights and Duties — Absolute and Relative Rights and Duties — Rights and Cognate concepts like Liberty, Power, Immunity, Privilege etc.

## **Unit-IV:**

Obligation — Nature of Obligation — Obligation arising out of Contract, Quasi Contract, trust and breach of obligation etc. — Liability — Nature and kinds of liability — Acts — *Mens Rea* — Intention and Motive — Relevance of Motive — Negligence — Strict Liability — Accident — Vicarious Liability — Measure of Civil and Criminal Liability.

## **Unit-V:**

Ownership — Definition and kinds of Ownership - Possession — Elements of Possession - Relation between Ownership and Possession — Possessory Remedies — Property — Meaning — Kinds of Property — Modes of Acquisition of Property — Legal Sanctions - Meaning of Sanction — Classification of Sanctions — Civil and Criminal Justice — Concept of Justice — Theories regarding purpose of Criminal Justice — Deterrent, Preventive, Reformatory and Retributive theories.

## **Suggested Readings:**

1. Salmond: *Jurisprudence*, Universal Publishers 12th Edn. 1966.
2. Rama Jois, *Legal and Constitutional History of India*, Universal Law Publications, Delhi.
3. N.V. Pranjape – Jurisprudence
4. S.R. Dhyani - Jurisprudence

## LAW OF EVIDENCE

Sub. Code: LLB 203

L – 4, C – 4.

### Course Objectives

- Grasp the basic principles and rules governing evidence in law.
- Learn about different types of evidence and their acceptability in court.
- Explore the roles and procedures involving witnesses, including examination and cross-examination.
- Understand the concepts of burden of proof and legal presumptions.
- Apply evidentiary rules to real-life legal cases and scenarios.

#### Unit-I:

The Indian Evidence Act, 1872 — Salient features of the Act – Meaning and kinds of Evidence — Interpretation clause — May Presume, shall presume and Conclusive proof - Fact, Fact in issue and Relevant facts — Distinction between Relevancy and Admissibility - Doctrine of *Res Gestae* — Motive, preparation and conduct — Conspiracy — When Facts not otherwise relevant become relevant — Right and custom — Facts showing the state of mind etc.

#### Unit-II:

Admissions & Confessions: General Principles concerning Admissions — Differences between "Admission" and "Confession" — Confessions obtained by inducement, threat or promise – Confessions made to police officer - Statement made in the custody of a police officer leading to the discovery of incriminating material — Admissibility of Confessions made by one accused person against co-accused.

Dying Declarations and their evidentiary value — Other Statements by persons who cannot be called as Witnesses — Admissibility of evidence of witnesses in previous judicial proceedings in subsequent judicial proceedings.

#### Unit-III:

Relevancy of Judgments — Opinion of witnesses — Expert's opinion — Opinion on Relationship especially proof of marriage — Facts which need not be proved — Oral and Documentary Evidence - General Principles concerning oral evidence and documentary evidence — Primary and Secondary evidence — Modes of proof of execution of documents — Presumptions as to documents — General Principles regarding Exclusion of Oral by Documentary Evidence.

#### Unit-IV:

Rules relating to Burden of Proof - Presumption as to Dowry Death — Estoppel — Kinds of estoppel — Res Judicata, Waiver and Presumption.

#### Unit-V:

Competency to testify — Privileged communications - Testimony of Accomplice — Examination in Chief, Cross examination and Re-examination — Leading questions — Lawful questions in cross examination — Compulsion to answer questions put to witness — Hostile witness — Impeaching the credit of witness — Refreshing memory — Questions of corroboration — Improper admission and rejection of evidence.

**Suggested Readings:**

1. Batuk Lal: *The Law of Evidence*, 13th Edition, Central Law Agency, Allahabad, 1998.
2. M. Munir: *Principles and Digest of the Law of Evidence*, 10th Edition (in 2 vols), Universal Book Agency, Allahabad, 1994.
3. Vepa P. Saradhi: *Law of Evidence* 4th Edn. Eastern Book Co., Lucknow, 1989.
4. Avtar Singh: *Principles of the Law of Evidence*, 11th Edn. Central Law Publications.
5. V. Krishnama Chary: *The Law of Evidence*, 4th Edn. S.Gogia & Company, Hyderabad.

## LAW OF PROPERTY

**Sub. Code: LLB 205**

**L – 4, C – 4.**

### **Course Objectives**

- Understand the fundamental principles of property law.
- Study the different types of property, including movable and immovable.
- Learn about the legal aspects of ownership, transfer, and possession of property.
- Examine rights related to property, such as easements, licenses, and mortgages.
- Apply property law concepts to practical legal scenarios and disputes.

### **Unit-I:**

**Meaning** and concept of property — Kinds of property — Transfer of property — Transferable and non-transferable property — Who can transfer — Operation of transfer — Mode of transfer — Conditional transfer — Void and unlawful conditions — Condition precedent and condition subsequent — Vested and contingent interest — Transfer to unborn person

### **Unit-II:**

Doctrine of Election — Covenants — Transfer by ostensible owner — Doctrine of Feeding the Grant by Estoppel — Doctrine of Lis Pendens — Fraudulent Transfer — Doctrine of Part-performance.

### **Unit-III:**

Sale - Essential features — Mode of Sale — Rights and liabilities of parties. Mortgage - Kinds of Mortgages - Rights and liabilities of mortgagor and mortgagee — Marshalling and Contribution — Charges.

### **Unit-IV:**

Lease — Essential features — Kinds of leases — Rights and liabilities of lessor and lessee — Termination of lease — forfeiture — Exchange — Gifts — Different types of gifts — Registration of Gifts — Transfer of Actionable Claims.

### **Unit-V:**

Easements — Definition of easement — Distinction between Lease and License — Dominant and Servient Tenements. Acquisition of property through testamentary succession — Will — Codicil — Capacity to execute Will — Nature of bequests — Executors of Will — Rights and Obligations of Legatees.

### **Suggested Readings:**

1. Mulla: *Transfer of Property*, Butterworths Publications.
2. Subba Rao GCV: *Commentaries on the Transfer of Property Act*.
3. Krishna Menon: *Law of Property*.
4. Upadhya's *Common Matrix of Transfer of Property*



## PUBLIC INTERNATIONAL LAW

Sub. Code: LLB 207

L – 4, C – 4.

### Course Objectives

- Understand the foundational principles and sources of international law.
- Study the rights and responsibilities of states under international law.
- Explore the role of international organizations in global governance.
- Analyse the legal aspects of international treaties and agreements.
- Apply public international law to current global issues and conflicts.

### Unit-I:

Definition, Nature, Scope and Importance of International Law — Relation of International Law to Municipal Law — Sources of International Law — Codification.

### Unit-II:

State Recognition — State Succession — Responsibility of States for International delinquencies — State Territory — Modes of acquiring State Territory

### Unit-III:

Position of Individual in International Law — Nationality — Extradition — Asylum — Privileges and Immunities of Diplomatic Envoys — Treaties – Formation of Treaties - Modes of Consent, Reservation and termination.

### Unit-IV:

The Legal Regime of the Seas – Evolution of the Law of the Sea – Freedoms of the High Seas – Common Heritage of Mankind – United Nations Convention on the Law of the Sea – Legal Regime of Airspace – Important Conventions relating to Airspace – Paris, Havana, Warsaw and Chicago Conventions – Five Freedoms of Air – Legal Regime of Outer space – Important Conventions such as Outer space Treaty, Agreement on Rescue and Return of Astronauts, Liability Convention, Agreement on Registration of Space objects, Moon Treaty - Unispace.

### Unit-V:

International Organizations — League of Nations and United Nations — International Court of Justice — International Criminal Court - Specialized agencies of the UN — WHO, UNESCO, ILO, IMF and WTO.

### Suggested Readings:

1. S.K. Kapoor, *Public International Law*, Central Law Agencies, Allahabad.
  2. H.O. Agarwal, *International Law and Human Rights*, Central Law Publications, Allahabad.
- S.K. Verma, *An Introduction to Public International Law*, Prentice Hall of India

## INTELLECTUAL PROPERTY RIGHTS

Sub. Code: LLB 209

L – 4, C – 4.

### Course Objectives

- Grasp the key concepts and types of intellectual property rights.
- Understand the legal protections for patents, copyrights, trademarks, and designs.
- Learn the procedures for registering and enforcing intellectual property rights.
- Explore issues of infringement and the available legal remedies.
- Apply intellectual property law to practical business and legal situations.

### Unit-I:

Meaning, Nature, Classification and protection of Intellectual Property — The main forms of Intellectual Property — Copyright, Trademarks, Patents, Designs (Industrial and Layout) -- Geographical Indications - Plant Varieties Protection and Biotechnology.

### Unit-II:

Introduction to the leading International instruments concerning Intellectual Property Rights — The Berne Convention — Universal Copyright Convention — The Paris Union — Patent Co-operation Treaty -- The World Intellectual Property Organization (WIPO) and the UNEESCO, International Trade Agreements concerning IPR — WTO — TRIPS.

### Unit-III:

Select aspects of the Law of Copyright in India — The Copy Right Act, 1957 - Historical evolution — Meaning of copyright — Copyright in literary, dramatic and musical works, computer programmes and cinematograph films — Neighbouring rights — Rights of performers and broadcasters, etc. — Ownership and Assignment of copyright — Author's special rights — Notion of infringement — Criteria of infringement — Infringement of copyright in films, literary and dramatic works — Authorities under the Act — Remedies for infringement of copyright.

### Unit-IV:

Intellectual Property in Trademarks and the rationale of their protection - The Trade Marks Act, 1999 — Definition of Trademarks — Distinction between Trademark and Property Mark - Registration — Passing off — Infringement of Trademark — Criteria of Infringement — Remedies. The Designs Act, 2000 — Definition and characteristics of Design — Law in India — Protection and rights of design holders — Copyright in design — Registration — Remedies for infringement.

### Unit-V:

Patents — Concept of Patent — Historical overview of the Patents Law in India — Patentable Inventions — Kinds of Patents — Procedure for obtaining patent — The Patents Act, 1970 — Rights and obligations of a patentee — Term of patent protection — Use and exercise of rights — Exclusive Marketing Rights — Right to Secrecy — The notion of 'abuse' of patent rights — Infringement of patent rights and remedies available.

**Suggested Readings:**

1. P. Narayanan: *Patent Law*, Eastern Law House, 1995.
2. Roy Chowdhary, S.K. & Other: *Law of Trademark, Copyrights, Patents and Designs*, Kamal Law House, 1999.
3. Dr. G.B. Reddy, *Intellectual Property Rights and the Law* 5th Ed. 2005 Gogia Law Agency.
4. John Holyoak and Paul Torremans: *Intellectual Property Law*.
5. B.L. Wadhwa: *Intellectual Property Law*, Universal Publishers, 2nd Ed. 2000.
6. W.R. Cornish: *Intellectual Property Law*, Universal Publishers, 3rd Ed. 2001.

# **Semester-IV**

## ADMINISTRATIVE LAW

Sub. Code: LLB 202

L – 4, C – 4.

### Course Objectives

- Understand the principles and scope of administrative law.
- Study the powers and functions of administrative agencies.
- Examine the legal framework governing administrative decisions and actions.
- Explore the mechanisms for judicial review of administrative actions.
- Apply administrative law concepts to real-world governmental issues.

### Unit-I:

Nature and scope of Administrative Law — Meaning, Definition and Evolution of Administrative Law— Reasons for the growth of Administrative Law — Relationship between Administrative Law and Constitutional Law.

### Unit-II:

Basic concepts of Administrative Law — Rule of Law — **Interpretation** of Dicey's Principle of Rule of Law — **Modern trends - Theory of Separation of Powers — Position in India, UK and USA**

### Unit-III:

Classification of Administrative functions — Legislative, Quasi-judicial, Administrative and Ministerial functions — Delegated Legislation — Meaning, Reasons for the growth and Classification of delegated legislation— **Judicial and Legislative Control of Delegated litigation.**

### Unit-IV:

Judicial Control of Administrative Action - Grounds of Judicial Control — Principles of Natural Justice — **Administrative discretion and its control.**

### Unit-V:

Remedies available against the State — Writs — Lokpal and Lok Ayukta — Liability of the State in Torts and Contracts — Rule of Promissory Estoppel — Administrative Tribunals - **Commissions of Inquiry — Public Corporations.**

### Suggested Readings:

1. Griffith and Street: *Principles of Administrative Law*.
2. H.W.R. Wade: *Administrative Law*, Oxford Publications, 8th Edn. 2000, London.
3. De Smith: *Judicial Review of Administrative Action*, Sweet and Maxwell, 1998.
4. S.P. Sathe: *Administrative Law*, Butterworths, 6th Edn. 1998.
5. I.P. Massey: *Administrative Law*, Eastern Book Company, 5th Edn. 2001

## COMPANY LAW

Sub. Code: LLB 204

L – 4, C – 4.

### Course Objectives

- Grasp the basics of company formation and the various types of business structures.
- Understand the roles and responsibilities of company directors, shareholders, and other parties involved.
- Learn about the laws that regulate the management and functioning of companies.
- Explore the legal processes related to corporate governance, mergers, and acquisitions.
- Apply the principles of company law to real-life business and legal situations.

### Unit-I:

Definition and attributes of Company — Distinction between Partnership Firm and Company — Kinds of Companies including Multinational Companies — Advantages and Disadvantages of Incorporation — Consequences of non-compliance of the provisions of the Companies Act in matters of incorporation.

### Unit-II:

Promoters and Registration — Pre-incorporation contracts — Memorandum of Association — Articles of Association.

### Unit-III:

Prospectus — Members — Shareholders — Share Capital — Shares and Dividends — Debentures — Directors — Powers and Liabilities of Directors.

### Unit-IV:

Director, Manager and Secretary — Meetings — Majority powers and minority rights — Prevention of Oppression and Mismanagement

### Unit-V:

Modes of winding up of companies — Consequences of winding up — Functions of Official Liquidator.

## LABOUR LAWS– I

Sub. Code: LLB 206

L – 4, C – 4.

### Course Objectives

- Understand the key principles of labour law and employment regulations.
- Learn about the rights and duties of employees and employers.
- Study the legal framework governing labour contracts, wages, and working conditions.
- Explore dispute resolution mechanisms in labour law, including trade unions and collective bargaining.
- Apply labour law principles to real-world workplace scenarios and legal issues.

### Unit-I

Trade Unions: History of Trade Union Movement - The Trade Union Act 1926 – Definitions - Registration – Rights and Liabilities of Registered Trade Unions – Immunities – Amalgamation and dissolution of Unions – Reorganization of Trade Unions.

### Unit-II

Prevention and Settlement of Industrial Disputes in India - The role of State in Industrial Relations – The Industrial Disputes Act 1947 - Definition of industry - Industrial Dispute – Individual Dispute - workman- Lay off – Retrenchment - Closure -Award - Strike – Lockout

### Unit-III

Authorities under the ID Act – Works committee – Conciliation - Court of inquiry - Labour Courts-Tribunal – Powers and functions of authorities - Voluntary Arbitration - Provisions under Chapter V-A & V- B of the Act- Alteration of conditions of service – Management rights of action during pendency of proceedings – Recovery of money due from employer – Unfair labour practices - miscellaneous provisions of the Act.

### Unit-IV

Standing Orders -Concept and Nature of Standing Orders – scope and coverage- Certification process – its operation and binding effect – Modification and Temporary application of Model Standing Orders – Interpretation and enforcement of Standing Orders and provisions contained in the Industrial Employment (Standing Orders ) Act 1946.

### Unit-V

Disciplinary Proceedings in Industries - Charge sheet – Explanation – Domestic enquiry - Enquiry officer – Enquiry report – Punishment – Principles of Natural Justice.

### Suggested Readings:

1. Srivastava: *Law of Trade Unions*, Eastern Book Company, Lucknow
2. Goswami: *Labour and Industrial Law*, Central Law Agency.
3. R.F. Rustomji : *Law of Industrial Disputes* : Asia Publishing House, Mumbai
4. S.N. Misra : *Labour and Industrial Law*
5. J.N. Malik: *Trade Union Law*
6. Khan& Khan: *Labour Law*, Asia Law House, Hyderabad
7. S.C. Srivastava: *Industrial Relations and Labour Law*, Vikas Publishing House

## CIVIL PROCEDURE CODE AND LAW OF LIMITATION

Sub. Code: LLB 208

L – 4, C – 4.

### Course Objectives

- Understand the key provisions of the Civil Procedure Code and its application in legal proceedings.
- Study the stages of civil litigation, including filing suits and conducting trials.
- Learn about the rules governing the service of summons, pleadings, and evidence in civil cases.
- Explore the principles of limitation, including time limits for filing suits and appeals.
- Apply civil procedure and limitation laws to practical legal scenarios and case management.

### Unit-I :

Codification of Civil Procedure and Introduction to CPC — Principal features of the Civil Procedure Code — Suits — Parties to Suit — Framing of Suit — Institution of Suits — Bars of Suit - Doctrines of *Sub Judice* and *Res Judicata* — Place of Suing — Transfer of suits — Territorial Jurisdiction — ‘Cause of Action’ and Jurisdictional Bars — Summons — Service of Foreign summons.

### Unit-II :

Pleadings — Contents of pleadings — Forms of Pleading — Striking out / Amendment of Pleadings - Plaint— Essentials of Plaint - Return of Plaint—Rejection of Plaint—Production and marking of Documents— Written Statement — Counter claim — Set off — Framing of issues.

### Unit-III :

Appearance and Examination of parties & Adjournments — *Ex-parte* Procedure — Summoning and Attendance of Witnesses — Examination — Admissions — Production, Impounding, Return of Documents — Hearing — Affidavit — Judgment and Decree — Concepts of Judgment, Decree, and Interim Orders and Stay — Injunctions — Appointment of Receivers and Commissions — Costs -- Execution — Concept of Execution — General Principles of Execution — Power of Execution — Power of Executing Courts — Procedure for Execution — Modes of Execution -- Arrest and detention — Attachment and Sale.

### Unit-IV:

Suits in Particular Cases — Suits by or against Government — Suits relating to public matters;— Suits by or against minors, persons with unsound mind, - Suits by indigent persons -- Interpleader suits — Incidental and supplementary proceedings - Appeals, Reference, Review and Revision — Appeals from Original Decrees — Appeals from Appellate Decrees — Appeals from Orders — General Provisions Relating to Appeals.

### Unit-V:

Law of Limitation — Concept of Limitation — Object of limitation - General Principles of Limitation — Extension — Condonation of delay — Sufficient Cause — Computation of limitation -- Acknowledgment and Part-payment — Legal Disability — Provisions of the Limitation Act, 1963 (Excluding Schedule)



**Suggested Readings:**

1. Mulla: *Code of Civil Procedure*: Tripathi (Abridged Edition), 11th Edn.(StudentEdition) Edited by P.M. Bakshi, Bombay, 1985.
2. A.N. Saha: *Code of Civil Procedure*.
3. C.K. Takwani: *Civil Procedure*, 4th Edn. Eastern Book Co., Lucknow, 1974.
4. B.B. Mitra: *Limitation Act*, 17th Edn. Eastern Law House, Calcutta, 1974, Allahabad.
5. Sanjiva Row: *Limitation Act*, 7th Edn. (in 2 Vols), Law Book Co., Allahabad,
6. Sanjiva Row: *Code of Civil Procedure*, 3rd Edn. (in 4 Vols), Law Book Co., Allahabad.
7. *AIR Commentaries on Limitation Act*, W.W. Chitaley, AIR Ltd., Nagpur

## **CRIMINAL PROCEDURE CODE AND LAW OF JUVENILE JUSTICE AND PROBATION OF OFFENDERS**

**Sub. Code: LLB 210**

**L – 4, C – 4.**

### **Course Objectives**

- Grasp the key provisions and procedures of the Criminal Procedure Code (CrPC).
- Understand the steps involved in criminal investigations, arrests, and trials under the CrPC.
- Study the legal protections and processes for juveniles in the criminal justice system.
- Learn about probation laws and practices aimed at rehabilitating offenders.
- Apply CrPC and juvenile justice principles to practical legal scenarios involving offenders.

### **Unit-I:**

The Code of Criminal Procedure, 1973 : The rationale of Criminal Procedure — The importance of fair trial — Constitutional Perspectives : Articles 14, 20 & 21 — The organization of Police, Prosecutor and Defense Counsel — Pre-trial Process — Arrest — Distinction between “cognizable” and “non-cognizable” offences — Steps to ensure presence of accused at trial -- Warrant and Summons cases — Arrest with and without Warrant — **The absconder status — Rights of arrested persons under Cr.P.C. and Article 22 (2) of the Constitution of India.**

### **Unit-II:**

Search and Seizure — Search with and without warrant — Police search during investigation — General Principles of Search — Seizure — **Constitutional aspects of validity of Search and Seizure proceedings.**

### **Unit-III :**

Trial Process: Commencement of Proceedings — Dismissal of Complaint — Bail, Bailable and Non-bailable Offences — Cancellation of Bails — Anticipatory Bail — General Principles concerning Bail Bond — Preliminary pleas to bar trial — Jurisdiction — Time Limitations — Pleas of *Autrefois Acquit* and *Autrefois Convict* — Fair Trial — Concept of fair trial — Presumption of innocence — Venue of trial — Jurisdiction of Criminal Courts — Rights of accused -- **Constitutional Interpretation of Article 21 as a right to speedy trial — Charge — Form and content of Charge — Trial before a Court of Session : Procedural steps and substantive rights.**

### **Unit-IV:**

Judgment: Form and content -- Summary trial — Post-conviction orders in lieu of punishment — Modes of providing judgment copy — appeals, review and revisions.

### **Unit-V:**

Probation and Parole: Authority granting Parole — Supervision — Conditional release -- suspension of sentence — Procedure under Probation of Offenders Act, 1958 -- Salient features of the Act. Juvenile Justice System -- Juvenile Justice (Care and Protection of Children) Act of 2000 -- Procedure under Juvenile Justice...Act — Treatment and Rehabilitation of Juveniles — **Protection of Juvenile Offenders — Legislative and Judicial Role.**

**Suggested Readings:**

1. Kelkar R.V.: *Criminal Procedure*, 3rd Edn. Eastern Book Co., Lucknow, 1993.
2. Ratanlal and Dhirajlal: *The Code of Criminal Procedure*, 15th Edn. Wadhwa & Co.,
3. Padala Rama Reddi: *The Code of Criminal Procedure*, 1973, Asia Law House, Hyderabad.
4. Prof. S.N. Misra: *The Code of Criminal Procedure*, Central Law Agency.
5. M.P. Tandon: *Criminal Procedure Code*, Allahabad Law Agency.  
Shoorvir Tyage: *The Code of Criminal Procedure*, Allahabad Law Agency

# **Semester-V**

## Interpretation of Statutes

Sub. Code: LLB 301  
Course Objectives

L – 4, C – 4.

- Understand the fundamental principles and methods of interpreting statutes.
- Learn about the various rules and techniques used in statutory interpretation.
- Study the role of judicial decisions in interpreting laws and resolving ambiguities.
- Examine the relationship between statutory provisions and legislative intent.
- Apply statutory interpretation techniques to real-life legal cases and issues.

### Unit-I:

— Classification of Statues — Meaning and Definition of Interpretation — General Principles of Interpretation — Rules of Construction under the General Clauses Act, 1897.

### Unit-II

Grammatical Rule of Interpretation — Golden Rule of Interpretation – Rule of Interpretation to avoid mischief.

### Unit-III:

Interpretation of Penal Statutes and Statutes of Taxation — Beneficial Construction — Construction to avoid conflict with other provisions — Doctrine of Harmonious Construction.

### Unit-IV:

External Aids to Interpretation — Statement of objects of legislation, Legislative debates, identification of purpose sought to be achieved through legislation — Internal Aids to Interpretation — Preamble, title, interpretation clause, marginal notes, explanations etc. — Presumptions.

### Unit-V:

Effect of Repeal — Effect of amendments to statutes — Conflict between parent legislation and subordinate legislation — Methods of interpreting substantive and procedural laws.

### Suggested Readings:

1. Vepa P. Sarathi: *Interpretation of Statutes*, Eastern Book Co, 4th Edition, 1976.
2. Chatterjee: *Interpretation of Statutes*.
3. G.P. Singh: *Principles of Statutory Interpretation*, Wadhwa and Company, 8th Ed., 2001.

## UTTAR PRADESH LAND LAWS

Sub. Code: LLB 303

L-4, C-4

### Course Objectives

- Understand the key principles and provisions of land laws in Uttar Pradesh.
- Study the legal framework governing land ownership, transfer, and registration.
- Learn about land revenue systems, including assessments and collection procedures.
- Explore the rights and responsibilities of landowners, tenants, and other stakeholders.
- Apply Uttar Pradesh land laws to practical land disputes and legal issues.

### Unit I: Introduction

Interpretation Clause, Objects and Clause of UP Zamindari Abolition and Land Reforms Act 1950, Characteristics of Act.

### Unit II: Classes and Rights of Tenure Holder

Bhumidhar with Transferable Rights, Bhumidhar with Non-Transferable Rights, Asami, Government Lease.

### Unit III: Succession

General Order of Succession, Succession as per strips, Critical Approach to Law of Succession, Succession for Females.

### Unit IV: Ejectment

Ejectment of Tenure Holder from the Land of Public Utility, Ejectment of Trespasser, Ejectment of Bhumidhar, Ejectment of Asami, Abandonment and Surrender.

### Unit V: UP Land Revenue Act, 1901

Authorities under the Act, Procedure of Collecting Land Revenue, Bar on Jurisdiction of Civil Courts, Records of Rights, Mutation and Boundary Disputes.

### Leading Cases For Detail Study

- \*Abdul Saeed And Another Vs State Of Uttar Pradesh & Others
- \*Smt. Mainia Vs Dy. Director Consolidation
- \*Satyendra Singh Vs State Of Up
- \*Lalsa Vs State Of Up
- \*InduBhushan Vs State Of Up

### Suggested Reading:

1. Maurya R.R., Uttar Pradesh Land Laws, Central Law Publications, Allahabad.
2. Singh C.P., Uttar Pradesh Land Laws, Central Law Agency, Allahabad.

## LAW OF BANKING AND NEGOTIABLE INSTRUMENTS

**Sub. Code: LLB 305**

**L -4, C -4**

### **Course Objectives**

- Grasp the basic principles and regulations governing banking law.
- Study the roles, duties, and obligations of banks and financial institutions.
- Understand the legal aspects of negotiable instruments like cheques, promissory notes, and bills of exchange.
- Explore the processes of transferring, negotiating, and enforcing negotiable instruments.
- Apply banking law and negotiable instrument principles to practical financial situations and disputes.

### **Unit-I:**

History of the Banking Regulation Act — Salient features — Banking Business and its importance in modern times.

### **Unit-II:**

Relationship between Banker and Customer — Debtor and Creditor Relationship — Fiduciary Relationship — Trustee and Beneficiary — Principal and Agent — Bail and Bailee — Guarantor, etc.

### **Unit-III:**

Cheques — Crossed Cheques — Account Payee — Banker's Drafts — Dividend Warrants — Postal order and money orders — Travelers cheques and circular notes — Negotiable instruments and deemed negotiable instruments — Salient features of Negotiable Instruments Act.

### **Unit-IV:**

The Paying Banker — Statutory protection to Bankers — Forgeries—Collecting Banker - Statutory protection.

### **Unit-V:**

Banker's lien and set off. -- Advances - Pledge - Land - Stocks - Shares - Life Policies - Document of title to Goods - Bank Guarantees - Letters of Credit.

### **Suggested Readings:**

1. Tannan: *Banking Law & Practice in India*, 18th Edn., Orient Law House, New Delhi.
2. Avtar Singh: *Negotiable Instruments*, 3rd Edn., Eastern Book Company, Lucknow, 1997.
3. P.N.Varshney: *Banking Law & Practice*, 17th Edn. Sultan Chand & Sons, New Delhi.
4. Taxman: *Law of Banking*, India Law House

## ALTERNATE DISPUTE RESOLUTION

Sub. Code: LLB 307

L -4, C -4

### Course Objectives

- Grasp the fundamental concepts and techniques of alternative dispute resolution (ADR).
- Explore different ADR methods such as mediation, arbitration, and negotiation.
- Understand the legal framework surrounding ADR and its enforceability.
- Examine the benefits and limitations of resolving disputes outside traditional court proceedings.
- Apply ADR practices to practical situations and conflict resolution cases.

The written examination of this paper will be for 50 marks and the remaining 50 marks for record and *viva voce*. There shall be classroom instruction on the following topics:

### Unit-I:

Alternate Dispute Resolution — Characteristics — Advantages and Disadvantages—Unilateral — Bilateral — Triadic (Third Party) Intervention — Techniques and processes -- Negotiation — Conciliation — Arbitration — Distinction between Arbitration, Conciliation and Negotiation.

### Unit-II:

The Arbitration and Conciliation Act, 1996 — Historical Background and Objectives of the Act — Definitions of Arbitration, Arbitrator, Arbitration Agreement -- Appointment of Arbitrator — Termination of Arbitrator -- Proceedings in Arbitral Tribunal -- Termination of Proceedings — Arbitral Award -- Setting aside of Arbitral Award — Finality and Enforcement of Award — Appeals – Enforcement of Foreign Awards. Conciliation – Appointment of Conciliators – Powers and Functions of Conciliator -- Procedure – Settlement of disputes through conciliation.

### Unit-III:

Other Alternative Dispute Resolution Systems —Tribunals -- Lokpal and Lokayukta — Lok Adalats — Family Courts. Section 89 and Order X, Rules 1A, 1B and 1C of Civil Procedure Code.

### Practical Exercises (30 marks)

(a) The students are required to participate in 5 (five) simulation proceedings relating to Arbitration, Conciliation, Mediation and Negotiation. Participation in each such simulation proceeding shall be evaluated for a maximum of 4 (four) marks (Total 5x4=20marks).

(b) Students are required to attend and observe the proceedings of Lok Adalats, Family Courts, Tribunals and other ADR Systems. Each student shall record the above observations in the diary which will be assessed. Record submitted by the student shall be evaluated for 10 marks by the teacher concerned. The Records of the students duly certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University before the commencement of the theory examinations

**Viva- voce (20marks):** There shall be viva-voce examination on the above components. The Viva-voce Board consisting of (i) Principal of the College/the teacher concerned (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law, and (iii) an advocate with 10 years' experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.



**Note: Attendance of the students in all the four components of the paper (written examination, participation in simulation proceedings, submission of record and attendance in viva) shall be compulsory.**

**Suggested Readings:**

1. O.P. Tiwari: *The Arbitration and Conciliation Act* (2nd Edition): Allahabad Law Agency.
2. Johar's: *Commentary on Arbitration and Conciliation Act, 1996*: Kamal Law House.
3. Acharya N.K.: *Law relating to Arbitration and ADR*, Asia Law House, Hyderabad
4. Tripathi S.C.: *Arbitration, Conciliation and ADR*, Central Law Agency, Allahabad.
5. Avatar Singh: *Arbitration and Conciliation*, Eastern Law Book House, Lucknow.

## PROFESSIONAL ETHICS AND PROFESSIONAL ACCOUNTING SYSTEM

**Sub. Code: LLB 309**

**L -4, C -4**

### Course Objectives

- Understand the core principles of professional ethics in legal and business practices.
- Learn the rules and standards governing professional conduct in various industries.
- Study the importance of ethical decision-making in the workplace.
- Explore the structure and functioning of professional accounting systems.
- Apply ethical principles and accounting practices to real-world professional scenarios.

The written examination of this paper will be for 50 marks and the remaining 50 marks for record and *viva voce*. There shall be classroom instruction on the following topics:

**Unit-I:** Development of Legal Profession in India — The Advocates Act, 1961 — Right to Practice — a right or privilege? - Constitutional guarantee under Article 19(1) (g) and its scope — Enrolment and Practice — Regulation governing enrolment and practice — Practice of Law — Solicitors firm — Elements of Advocacy.

**Unit-II :** Seven lamps of advocacy — Advocates duties towards public, clients, court, and other advocates and legal aid ; Bar Council Code of Ethics.

**Unit-III:** Disciplinary proceedings — Professional misconduct — Disqualifications — Functions of Bar Council of India/State Bar Councils in dealing with the disciplinary proceedings — Disciplinary Committees -- Powers and functions - Disqualification and removal from rolls.

**Unit-IV:** Accountancy for Lawyers — Nature and functions of accounting — Important branches of accounting — Accounting and Law – Bar Bench Relations.

**Record (30 marks):** Each student shall write 50 selected opinions of the Disciplinary Committees of Bar Councils and 10 major judgments of the Supreme Court of India in the Record. The Record shall be evaluated for 30 marks by the teacher concerned. The Records of the students duly certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University before the commencement of the theory examinations.

**Viva- voce (20marks):** There shall be viva-voce examination on the above components. The Viva-voce Board consisting of (I) Principal of the College/the teacher concerned (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law, and (iii) an advocate with 10 years' experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.

**Note: All the three components of the paper (written examination, submission of record and attendance in viva) shall be compulsory.**

**Suggested Readings:**

1. Myneni S.R.: Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Asia Law House, Hyderabad.
2. Gupta S.P.: Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Asia Law House, Hyderabad.
3. Kailash Rai: Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Allahabad Law Agency.

# **Semester VI**

## English & Legal Language

Sub. Code: LLB 302

L -4, C -4

### Course Objectives

- Develop advanced proficiency in legal English for effective communication.
- Learn to draft and interpret complex legal documents and contracts.
- Enhance skills in legal writing, including memoranda, briefs, and petitions.
- Understand the use of legal terminology and language in different legal contexts.
- Apply legal language skills to practical situations in law practice and research.

### Unit I: Meaning and uses of legal terms

#### Commonly used Urdu words in courts

eqn~nbZ] tkfeu] tokcnkok] eqalfje] xokg] nkok] bDtkbZ] lihuk] gtkZuk] [kpkZ] jkthukek] fgckukek] oknh] izfroknh] bdjkjukek] dkfrc] btjk] et:c] eQ:j] fpV~Bhet:ch] rLdj] Fkkuk&gktk] jkstukepkvke] eqgfjZ] QnZcjkenxh] ekyeqdnek] dyecanc;ku] gyQukek] odkyrukek] fudkgukek] iSjksdkj] ltk;kchokjaV] [kpkZ , ikunku] esgj] gd "kqQk] x"r] ckfry] Qkfln] bfRryk] eqfYte] eqtfje] ltk;k¶rk] rkthjkr , fgan] eqofDdy] cSukek] c;kukgd&tkSft;r] olh;r] jgu] btc] [;kj&my&cqywx] fgtkur] oDQ] uQdk] f[kyor&my&lghg] gqnwn&,&njck] rLnhd] f"ukuk[r

#### Commonly used Latin terms in courts

Ab initio', Res judicata, Res- subjudice, Adhoc, Adinfinitum, Adinterim, Adjourn sine die, Ad litem, Advalorem, Alibi, Aliter, Almamater, Amicus Curiae, Animus , Animus possidendi, Alumini, Anti-meridiam, Bonafide, Bona Vacantia, Causecausans, Coram non judice, Corpus Possessionis, Custodia Legis, Composmentis, Cypress, Defacto, DeJure, Denovo, Donation mortis cause, Enventresamere, Enroute, Exofficio, Exgratia, Exparte, Ex post facto, Factum valet, Femesole, Filius nullius, In forma pauperis, Ibid, Inlimine, Inmemoriam, Inparimaterial, Intelligible differentia, Inter alia, Interse, Ipso jure, Intoto, Ipsofacto, In invitum, Inlocoparentis, Inpais, In pari delicto, potio est condition possidentis (or defendentis), In rem, Intervivos, Intra-vires, Justertii, Juscivile, Jusdivinum, Lex Fori, Lex Loci delicti, Lispendens, Locus standi, Malafide, Mens Rea, Modus operandi, Modus Vivendi, Non compos mentis, Nonfeasance, Nudum Pactum, Onus probandi, Pacta Sunt Servanda, Pari Passu, Pendente lite, Per annum, Per capita, Per diem, Per mensem, Per stripes, Persona non grata, Postmeridiam, Postmortem, Prima facie, Pro bono publica, Prorata, Protanto, Protem, Quasi-judicial, Quid pro quo, Ratiodecidenti, Raison d'etre, Res Gestae, Res integra, Res nullius, Sine qua non, Sinedie, Solatium, Stare decisis, Status quo, Sub-judice, Suppressovery, Scienter, Trespasser ab initio, Ultra-vires, Vice Versa, Vis-à-vis, Vis major

### Unit II: Legal maxims

1. Absoluta sententia expositore non indiget
2. A bundans cautela non nocet.
3. Actio personalis moritur cum persona

4. Actori incumbit onus probandi
5. Actus curiae neminem gravabit
6. Actus dei nemini facit injuriam
7. Actus reus
8. Actus legis nemini est damnosus
9. Actus non facit reum nisi mens sit rea
10. Ejusdem Generis
11. Exturpi causa non oritur actione
12. Noscitur a sociis
13. Novus actus interveniens
14. Respondent superior
15. Falsus in uno falsus in omnibus
16. Acquitus sequitur legem
17. Allegans contraria non est audiendus
18. Audi alteram partem
19. Caveat emptor
20. Damnum sine injuria
21. De minimis non curat lex
22. Dolus malus pactum se non servabit
23. Delegates non potest delegare
24. Fiat Justitia ruat caelum
25. Ignorantia legis neminem excusat
26. Injuria sine damno
27. Interest reipublicae ut sit finis litium
28. Lex non cogit ad impossibilia
29. Nemo dat quod non habet
30. Nemo debet esse iudex in propria causa
31. Quantum meruit
32. Qui approbat non reprobatur
33. Qui facit per alium per se
34. Res ipsa loquitur
35. Salus populi est Suprema Lex
36. Ubi jus ibi remedium
37. Vigilantibus non dormientibus jura subveniunt

### **Unit III: Paragraph & Precise Writing of Legal Texts**

### **Unit IV: Writing of Moot Memorials**

### **Unit V: Translate Hindi to English & English to Hindi of case laws**

#### **Suggested Reading:**

1. Myneni S.R., Legal language and Legal Writing, Central Law Agency, Allahabad.
2. Jain R.L., Legal Language, Central Law Agency, Allahabad.
3. Prasad Anirudh, Legal Language, Central Law Publications, Allahabad.

## INFORMATION TECHNOLOGY LAW

Sub. Code: LLB 304

L -4, C -4

### Course Objectives

- Understand the fundamental principles of information technology law.
- Explore the legal aspects of cybersecurity, data protection, and privacy.
- Study intellectual property issues related to technology, software, and digital content.
- Learn about e-commerce regulations and online contracts.
- Apply IT law principles to contemporary legal challenges in the digital world.

### Unit-I

**Concept of Information Technology and Cyber Space-** Interface of Technology and Law -Jurisdiction in Cyber Space and Jurisdiction in traditional sense - Internet Jurisdiction - Indian Context of Jurisdiction - Enforcement agencies - International position of Internet Jurisdiction - Cases in Cyber Jurisdiction

### Unit-II

**Information Technology Act, 2000** - Aims and Objects — Overview of the Act – Jurisdiction - Electronic Governance – Legal Recognition of Electronic Records and Electronic Evidence - Digital Signature Certificates - Securing Electronic records and secure digital signatures - Duties of Subscribers - Role of Certifying Authorities - Regulators under the Act - The Cyber Regulations Appellate Tribunal - Internet Service Providers and their Liability – Powers of Police under the Act – Impact of the Act on other Laws .

### Unit-III

**E-Commerce** - UNCITRAL Model - Legal aspects of E-Commerce - Digital Signatures - Technical and Legal issues - E-Commerce, Trends and Prospects - E-taxation, E-banking, online publishing and online credit card payment - Employment Contracts - Contractor Agreements, Sales, Re-Seller and Distributor Agreements, Non-Disclosure Agreements- Shrink Wrap Contract, Source Code, Escrow Agreements etc.

### Unit-IV

**Cyber Law and IPRs**-Understanding Copy Right in Information Technology - Software - Copyrights vs Patents debate - Authorship and Assignment Issues - Copyright in Internet - Multimedia and Copyright issues - Software Piracy –Patents - Understanding Patents - European Position on Computer related Patents - Legal position of U.S. on Computer related Patents - Indian Position on Computer related Patents –Trademarks - Trademarks in Internet - Domain name registration - Domain Name Disputes & WIPO -Databases in Information Technology - Protection of databases - Position in USA,EU and India

### Unit-V

**Cyber Crimes** - Meaning of Cyber Crimes – Different Kinds of Cyber crimes – Cyber crimes under IPC, Cr.P.C and Indian Evidence Law - Cyber crimes under the Information Technology Act,2000 - Cyber crimes under International Law - HackingChild Pornography, Cyber Stalking, Denial of service Attack, Virus Dissemination, Software Piracy,Internet Relay Chat (IRC) Crime, Credit Card Fraud, Net Extortion, Phishing etc - Cyber Terrorism - Violation of Privacy on Internet - Data Protection and Privacy

**Suggested Readings:**

1. Kamlesh N. & MuraliD.Tiwari(Ed), *IT and Indian Legal System*, Macmillan India Ltd, New Delhi
2. K.L.James, *The Internet: A User's Guide* (2003), Prentice Hall of India, New Delhi
3. Chris Reed, *Internet Law-Text and Materials*, 2nd Edition, 2005, Universal Law Publishing Co., New Delhi



## LAW RELATING TO WOMEN

Sub. Code: LLB 306

L -4, C -4

### Course Objectives

- Understand the legal protections and rights available to women under various laws.
- Explore the laws addressing gender-based violence and discrimination.
- Study the legal framework for women's rights in areas such as marriage, divorce, and inheritance.
- Learn about the role of laws in promoting gender equality and social justice.
- Apply legal principles related to women's rights to real-life situations and legal issues.

### Unit-I:

Historical background and status of women in ancient India — Constitutional Provisions and gender justice — Relevant provisions relating to women in Directive Principles of State Policy and Fundamental Duties etc. under the Indian Constitution.

### Unit-II:

Laws relating to marriage, divorce and succession and maintenance under the relevant personal laws with special emphasis on women — Special Marriage Act — Maintenance under Cr. P.C.

### Unit-III:

Special provisions relating to women under the Indian Evidence Act, 1872 — Offences against women under Indian Penal Code - outraging the modesty of women -sexual harassment – rape – bigamy - mock and fraudulent marriages – adultery - causing miscarriage - insulting women etc.

### Unit-IV:

Socio-Legal position of women and the law — Dowry Prohibition Act, 1961, Medical Termination of Pregnancy Act — Law relating to the Pre Natal Diagnostic Techniques (Regulation and Prevention of Misuse) and Sex selection — Immoral Traffic (Prevention) Act -- Law relating to domestic violence.

### Unit-V:

Relevant provisions relating to women under Maternity Benefit Act, 1961, Factories Act and other Labour & Industrial Laws — Position of Women under International instruments — Salient features of Convention for Elimination of all forms of Discrimination Against Women (CEDAW) — International Covenant on Civil and Political Rights — International Covenant on Social, Cultural and Economic Rights.

### Suggested Readings:

1. S.P. Sathé: *Towards Gender Justice*.
2. Dr. Vijay Sharma: *Protection to woman in Matrimonial home*
3. Dr. SarojiniSaxena: *Femijuris*(Law relating to Women in India)
4. Dr. ArchanaParsher: *Women and Social Reform*
5. Dr. Paras Diwan: *Dowry and protection to married women*
6. Mary Wollstonecraft: *A Vindication of the rights of women*.

## HUMAN RIGHTS LAW

Sub. Code: LLB 308

L -4, C -4

### Course Objectives

- Comprehend the key concepts and structures of human rights law.
- Analyse international and national legal protections for human rights.
- Investigate the roles of human rights institutions and enforcement processes.
- Learn about the legal remedies for addressing human rights violations.
- Apply human rights legal principles to current global issues and case studies.

### Unit-I

Meaning and definition of Human Rights - Evolution of Human Rights - Human Rights and Domestic Jurisdiction

### Unit-II

Adoption of Human Rights by the UN Charter - U.N. Commission on Human Rights - Universal Declaration of Human Rights - International Covenants on Human Rights( Civil and Political; Economic, Social and Cultural).

### Unit-III

Regional Conventions on Human Rights - European Convention on Human Rights - American Convention on Human Rights - African Charter on Human Rights(Banjul).

### Unit-IV

International Conventions on Human Rights - Genocide Convention, Convention against Torture, CEDAW, Child Rights Convention, Convention on Statelessness, Convention against Slavery, Convention on Refugees - International Conference on Human Rights(1968) - World Conference on Human Rights(1993).

### Unit-V

Human Rights Protection in India - Human Rights Commissions - Protection of Human Rights Act - National Human Rights Commission (NHRC) - State Human Rights Commissions - Human Right Courts in Districts.

### Suggested Readings:

1. P.R. Gandhi (ed): *Blackstone's International Human Rights Documents*, Universal Law Publishing Co. Delhi.
2. Richard B. Lillich and Frank C. Newman: *International Human Rights - Problems of Law and Policy*, Little Brown and Company, Boston and Toronto.
3. Frederick Quinn: *Human Rights and You*, OSCE/ ODIHR, Warsaw, Poland
4. T.S. Batra: *Human Rights – A Critique*, Metropolitan Book Company Pvt. Ltd., New Delhi.
5. Dr.U. Chandra: *Human Rights*, Allahabad Law Agency Publications, Allahabad.

## LAW OF INVESTMENTS AND SECURITIES

Sub. Code: LLB 310

L -4, C -4

### Course Objectives

- Grasp the core principles and frameworks of human rights law.
- Examine international and national legal tools that safeguard human rights.
- Understand the function of human rights bodies and enforcement mechanisms.
- Study the legal recourse available for violations of human rights.
- Apply human rights law to modern global challenges and legal situations.

### Unit-I:

Administration of Company Law in relation to issue of prospectus and shares -- membership and share capital -- Kinds of shares -- public issue of shares -- procedure for issue of shares -- allotment of shares -- transfer and transmission of shares.

### Unit-II:

Debentures - Kinds of Debentures and Charges – Dividend -- Inter-Corporate Loans and Investments.

### Unit-III:

Basic features of the Security Contracts (Regulation) Act, 1956 — Recognition of Stock Exchanges – Regulation of Contracts and option in securities — Listing of securities -- Guidelines for listing of shares / debentures.

### Unit-IV:

Basic features of the Security and Exchange Board of India Act, 1992 — Basic features of the Act — Establishment of SEBI -- Functions and Powers of SEBI -- Powers of the Central Government under the Act -- Guidelines for disclosure -- Investors Protection - SEBI Appellate Tribunal -- Appeals.

### Unit-V:

Non-Banking Financial Institutions - Classification and Law Relating to NFBCs - AP Protection of Depositors Act, 1999.

### Suggested Readings:

1. Avatar Singh: *Company Law*, 10th Edn. (Eastern Book Company, 1991).
2. *A Guide to Companies Act* by Ramaiah - Wadhwa Publications.
3. NavneetJyothi and Rajesh Gupta, *Practical Manual to Non Baking Financial Companies*, Taxman's Publications.
4. Ananta Raman: *Lectures on Company Law*, Wadhwa and Company.
5. Tandon M.P.: *Company Law*, Allahabad Law Agency, Allahabad.

## DRAFTING, PLEADINGS AND CONVEYANCING

**Sub. Code: LLB 312**

**L -1,P-6, C -4**

### Course Objectives

- Learn the essential principles and techniques of legal drafting.
- Understand the process of drafting pleadings for various types of legal cases.
- Explore the key components and legal requirements of conveyancing documents.
- Study the rules governing the preparation and filing of legal petitions and motions.
- Apply drafting, pleading, and conveyancing skills to real-life legal scenarios

Class-room instruction and simulation exercises on the following items shall be extended.

### Unit-I

**Drafting:** General Principles of Drafting and relevant Substantive Rules shall be taught.

### Unit-II

**Pleadings: (i)** Civil—Plaint, Written Statement, Interlocutory Application, Original Petition, Affidavit, Execution Petition, Memorandum of Appeal and Revision.

(ii) Petition under Article 226 and 32 of the Constitution of India - Drafting of Writ Petition and PIL Petition.

(iii) Criminal— Complaint, Criminal Miscellaneous Petition, Bail Application, Memorandum of Appeal and Revision.

### Unit-III

**Conveyancing:** Sale Deed, Mortgage Deed, Lease Deed, Gift Deed, Promissory Note, Power of Attorney, Will, Trust Deed

### Practical Exercises

Apart from teaching the relevant law, the course includes not less than 15 (fifteen) practical exercises in drafting of pleadings carrying a total of 45 marks (3 marks for each) and 15 (fifteen) exercises in conveyancing carrying another 45 marks (3 marks for each exercise) and remaining 10 marks for viva-voce.

These 30 exercises shall be recorded. Each student shall be served with different problems for the purpose of exercise. These exercises shall be assessed and marks may be allotted.

These exercises shall be evaluated by a common committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, O.U.; and (iii) an Advocate with 10 years' experience at the Bar. The same committee will also conduct viva-voce on the above concepts. The proceedings of the viva-voce shall be recorded.

**Note:**

- 1. Attendance of the students for viva-voce shall be compulsory.**
- 2. The above records certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University for Further Verification**

**Suggested Readings:**

1. R.N. Chaturvedi: *Pleadings and Conveyancing*, Central Law Publications.
2. De Souza: *Conveyancing*, Eastern Law House.
3. Tiwari: *Drafting, Pleading and Conveyancing*, Central Law Agency.
4. Mogha: *Indian Conveyancer*, Eastern Law House.
5. Mogha: *Law of Pleadings in India*, Eastern Law House.
6. Shiv Gopal: *Conveyancing, Precedents and Forms*, Eastern Book Company

## **MOOT COURTS, OBSERVATION OF TRIAL, PRE-TRIAL PREPARATIONS AND INTERNSHIP**

**Sub. Code: LLB 314**

**L -0, P-8, C -4**

### **Course Objectives**

- Understand the fundamentals of moot court practice and courtroom procedures.
- Learn the techniques for observing and analysing real court trials.
- Study the importance of pre-trial preparation, including case research and strategy development.
- Gain hands-on experience in legal practice through internships and exposure to real-world cases.
- Develop practical skills in legal argumentation, trial advocacy, and client representation.

This paper has three components of 30 marks each and viva-voce for 10 marks.

**(A) Moot Court (30 marks):** Every student is required to participate in at least three moot courts in the VI Semester with 10 marks for each. The moot court work will be on an assigned problem and it will be evaluated for 5 marks for written submissions and 5 marks for oral advocacy.

Marks will be given on the basis of written submission and oral advocacy. Written submissions shall include brief summary of facts, issues involved, provisions of laws and arguments, citation, prayer, etc. Marks for oral advocacy may be awarded for communication skills, presentations, language, provisions of law; authorities quoted, court manners, etc. Written Memorials submitted by the students shall be kept by the College for Further Verification.

The performance of student in the moot court shall be evaluated by a committee consisting of (i) Principal of the College (ii) an Advocate with 10 years' experience at the Bar; and (iii) the teacher concerned.

### **(B) Observance of Trial in two cases, one Civil and one Criminal (30 marks):**

Students are required to attend courts to observe at least one civil and one criminal case. They shall maintain a record and enter the various steps observed during their attendance on different days in the court assignment. The Court Observation Record submitted by the students should be evaluated by a committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, and (iii) an Advocate with 10 years' experience at the Bar and average be taken. Court attendance shall be compulsory and attendance has to be recorded in a register kept therefor. This may be carried under the supervision of a teacher of the college. This scheme will carry 30 marks.

### **(C) Interviewing Techniques and Pre-Trial Preparations and Internship Diary (30 marks):**

Each student should observe two 'interview sessions' of clients either in the Lawyer's Office or in the Legal Aid Office and record the proceedings in a diary, which will carry 15 marks.

Each student has to further observe the preparation of documents and court papers by the Advocate and the procedure for the filing of the suit / petition. This shall be recorded in the diary which will carry 15 marks.

The diary shall clearly indicate the dates on which the above observations are made and they shall be authenticated by the advocate concerned.

Evaluation of the above diary shall be made by the committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, O.U.; and (iii) an Advocate with 10 years' experience at the Bar and average be taken.

**(D)Viva-voce (10 marks):** There shall be viva-voce examination on all the above three components. The Viva-voce Board consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law; and (iii)an advocate with 10 years' experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.

**Note:**

- 1. Attendance of the students in all the four components of the paper shall be compulsory.**
- 2. The above records, diary certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University for Further Verification.**

**Suggested Readings:**

1. Dr. Kailash Rai: *Moot Court Pre-Trial Preparation and Participation in Trial Proceedings*, Central Law Publication.
2. AmitaDanda: *Moot Court for Interactive Legal Education*, Gogia Law Agency, Hyderabad.
3. Blackstone's: *Books of Moots*, Oxford University Press.
4. Mishra: *Moot Court Pre-Trial Preparation and Participation in Trial Proceedings*, Central Law, Allahabad.



## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Law and Constitutional Studies**

#### **Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Law (LLB) Three Year Programme Semester  
Pattern  
(w.e.f. session 2014-15)**

**Approved and adopted in the year 2014 (1<sup>st</sup> meeting of Board of  
Studies)**



## **Programme Educational Objectives (PEOs)**

**PEO 1** To provide students with a comprehensive understanding of legal principles, doctrines, and the framework of laws governing various fields.

**PEO 2** To develop the ability to critically analyze legal issues, interpret statutes, and apply legal reasoning to complex situations

**PEO 3** To instill ethical values and professional integrity, ensuring that graduates adhere to the highest standards of legal practice and contribute to social justice and equity

**PEO 4** To enhance oral and written communication skills, equipping students to present legal arguments persuasively and represent clients effectively in courts, tribunals, and other forums.

**PEO 5** To cultivate strong legal research skills and foster an attitude of lifelong learning, enabling students to stay updated with legal developments and contribute to academic and professional discourses.

**PEO 6** To prepare graduates to serve as legal professionals who address societal challenges, advocate for policy changes, and contribute to nation-building through leadership roles in the legal and judicial systems.

## **Programme Specific Objectives (PSO's)**

**PSO 1** To equip students with a thorough understanding of national and international legal systems, statutory laws, and judicial precedents

**PSO 2** To develop practical skills such as drafting legal documents, conducting negotiations, and preparing case strategies for litigation and alternative dispute resolution mechanisms

**PSO 3** To prepare students to use their legal knowledge for promoting social justice, providing legal aid to underprivileged sections of society, and contributing to the public interest.

**PSO 4** To enable students to critically evaluate laws and policies, suggest legal reforms, and participate in legislative drafting processes to address contemporary social, economic, and environmental issues.

**PSO 5** To provide opportunities for students to specialize in cutting-edge legal fields, such as intellectual property rights, cyber law, environmental law, or international trade law, catering to global demands.

**PSO 6** To prepare students for careers in the judiciary, government services, or corporate law by providing insights into procedural laws, administrative processes, and governance mechanisms.

## **Programme Outcome Objectives (POO's)**

**POO 1** Graduates will acquire in-depth knowledge of legal concepts, principles, and procedures, enabling them to interpret and apply laws effectively in practical scenarios

**POO 2** Graduates will demonstrate the ability to critically analyze legal issues, evaluate evidence, and develop reasoned arguments to solve complex legal problems.

**POO 3** Graduates will exhibit ethical conduct, professionalism, and a commitment to justice in their legal practice, adhering to the standards of the legal profession

**POO 4** Graduates will develop strong oral and written communication skills, enabling them to present legal arguments persuasively in courts, tribunals, and other professional settings.

**POO 5** Graduates will use their legal expertise to address societal challenges, uphold human rights, and advocate for marginalized communities, contributing to social equity and justice.

**POO 6** Graduates will demonstrate the ability to continuously update their legal knowledge and adapt to evolving legal landscapes, ensuring competence in the face of new challenges.

LL.B First Year

First Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 101	Law of Contract I	4	0	0	4
LLB 103	Family Law I (Hindu law)	4	0	0	4
LLB 105	Constitutional Law I	4	0	0	4
LLB 107	Law of Torts Including M.V. Act & Consumer Protection Laws	4	0	0	4
LLB-109 LLB-109A LLB-109B LLB-109C LLB-109D	English Spanish-I German-I Chinese-I French-I	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

Bachelor of Law (LL.B)Second Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 102	Law of Contract II	4	0	0	4
LLB 104	Family law II (Muslim Law)	4	0	0	4
LLB 106	Constitutional Law II	4	0	0	4
LLB 108	Law of Crimes (I.P.C.)	4	0	0	4
LLB 110	Environmental Law	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

## LL. B SECOND YEAR

### Third Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB-201	Jurisprudence	4	0	0	4
LLB-203	Law of Evidence	4	0	0	4
LLB-205	Law of Property	4	0	0	4
LLB-207	Public International Law	4	0	0	4
LLB-209	Intellectual Property Law	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

### Fourth Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 202	Administrative law	4	0	0	4
LLB 204	Company law	4	0	0	4
LLB 206	Labor Law I	4	0	0	4
LLB 208	Civil Procedure Code and Law of Limitation	4	0	0	4
LLB 210	Criminal Procedure Code and Law of Juvenile Justice and Probation of Offenders	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

**LL. B THIRD YEAR**

Fifth Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 301	Interpretation of Statutes	4	0	0	4
LLB 303	U.P. Land Laws	4	0	0	4
LLB 305	Law of banking and Negotiable Instruments	4	0	0	4
LLB 307	Alternate Dispute Resolution	2	0	8	6
LLB 309	Professional Ethics and Professional Accounting System	2	0	8	6
	Total	16	0	0	24

**Sixth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
LLB 302	English and Legal Language	4	0	0	4
LLB 304	Information Technology Law	4			4
	Optional (Choose any one from the following) –	4	0	0	4
LLB 306	a. Law Relating to Women				
LLB 308	b. Human Rights Law				
LLB 310	c. Law of Investment and Securities				
LLB 312	Drafting Pleading and Conveyancing	1		6	4
LLB 314	Moot Court, Observation of trial, Pre – Trial preparation and Internship	--	--	8	4
	Total	13	0	14	20

# **Semester-I**

## LAW OF CONTRACT-I

Sub. Code: LLB 101

L – 4, C – 4.

### Course Objectives

- Understand the basic principles of contract law.
- Learn the rules for forming valid contracts.
- Analyse remedies for breach of contract.
- Apply contract law to real-life scenarios
- Develop legal reasoning and research skills

### Unit I:

Definition and essentials of a valid Contract - Definition and essentials of a valid Offer - Definition and essentials of valid Acceptance - Communication of Offer and Acceptance - Revocation of Offer and Acceptance through various modes including electronic medium - Consideration - salient features - Exception to consideration -

### Unit-II :

Capacity of the parties - Effect of Minor's Agreement - Contracts with insane persons and persons disqualified by law - Concepts of Free Consent - Coercion - Undue influence - Misrepresentation - Fraud - Mistake - Lawful Object -

### Unit-III:

Discharge of Contracts - By performance - Appropriation of payments - Performance by joint promisors - Discharge by Novation - Remission - Accord and Satisfaction -

### Unit-IV:

Quasi Contract - Necessaries supplied to a person who is incapable of entering into a contract - Payment by an interested person - Liability to pay for non-gratuitous acts - Rights of finder of lost goods - Things delivered by mistake or coercion - Quantum meruit - Remedies for breach of contract -

### Unit-V:

Specific Relief - Recovering possession of property - Specific performance of the contract - Rectification of instruments - Rescission of contracts - Cancellation of instruments - Declaratory Decrees - Preventive Relief - Injunctions.

### Suggested Readings:

1. The Law of Contract by M. P. Tandon
2. Contract Law by Avtar Singh
3. The Law of Contract by R.K. Sinha
4. Contract Law by S.K. Kapoor
5. The Law of Contract by Pollock and Mulla
6. Contract Law: A Comparative Introduction by John Cartwright
7. Contract Law by Cheshire, Fifoot & Furmston
8. Law of Contract by Anson

## **FAMILY LAW–I (Hindu Law)**

**Sub. Code: LLB 103**

**L – 4, C – 4.**

### **Course Objectives**

- Understand the fundamental principles of Hindu Law.
- Learn the legal framework governing marriage and divorce.
- Study laws related to succession and inheritance.
- Analyse the rights and duties within Hindu joint families.
- Apply legal concepts to family disputes.

### **Unit-I:**

Sources of Hindu Law – Scope and application of Hindu Law – Schools of Hindu Law - Mitakshara and Dayabhaga Schools – Concept of Joint Family, Coparcenary, Joint Family Property and Coparcenary Property

### **Unit-II:**

Marriage - Definition - Importance of institution of marriage under Hindu Law – Conditions of Hindu Marriage.

### **Unit-III:**

**Matrimonial** Remedies under the Hindu Marriage Act, 1955 - Restitution of Conjugal Rights – Nullity of marriage –

### **Unit-IV:**

Concept of Adoption - Law of Maintenance - Law of Guardianship - Hindu Adoption and Maintenance Act, 1956 .

### **Unit-V:**

Succession – Intestate succession – Succession to the property of Hindu Male and Female; Dwelling House – Hindu Succession Act, 1956 as amended by the Hindu Succession (Andhra Pradesh Amendment) Act, 1986

### **Suggested Readings:**

1. Mulla's Hindu Law (Edited by M.P. Furmston)
2. Hindu Law by N.V. Paranjape
3. Modern Hindu Law by R.K. Sinha
4. Hindu Law: An Analytical Approach by N.V. Paranjape
5. Hindu Law: Principles and Precedents by A.B.K. Sharma
6. The Hindu Law of Marriage and Divorce by G.W. Sherring

## **Constitutional Law – I**

**Sub. Code: LLB 105**

**L – 4, C – 4.**

### **Course Objectives**

- Gain knowledge of the fundamental principles of the Constitution.
- Examine the fundamental rights and duties of individuals.
- Understand the roles and powers of the Legislature, Executive, and Judiciary.
- Explore the concept of separation of powers in governance.
- Study the importance and process of constitutional amendments.

### **Unit-I**

Constitution-Meaning and Significance - Evolution of Modern Constitutions -Classification of Constitutions-Indian Constitution - Historical Perspectives - Government of India Act, 1919 - Government of India Act, 1935 -

### **Unit-II**

Nature and Salient Features of Indian Constitution - Preamble to Indian Constitution - Union and its Territories-Citizenship -

### **Unit-III**

Right to Equality(Art.14-18) – Freedoms and Restrictions under Art.19 - Protection against Ex-post facto law - Guarantee against Double Jeopardy - Privilege against Self-incrimination

### **Unit-IV**

Rights against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights

### **Unit-V**

Directive Principles of State Policy – Significance – Nature – Classification - Application and Judicial Interpretation - Relationship between Fundamental Rights and Directive Principles

### **Suggested readings:**

1. Constitutional Law of India by Dr. J.N. Pandey
2. Constitutional Law by M.P. Jain
3. Constitutional Law of India by D.D. Basu
4. Indian Constitutional Law by V.N. Shukla
5. The Constitution of India by P.M. Bakshi
6. Introduction to the Constitution of India by D.D. Basu



# Law of Torts Including M.V. Act and Consumer Protection laws

Sub. Code: LLB 107

L – 4, C – 4.

## Course Objectives

- Learn the fundamental concepts and scope of tort law.
- Examine the legal rules governing liability for wrongful acts.
- Understand the compensation mechanisms under the Motor Vehicles Act.
- Explore consumer rights and protections under relevant laws.
- Apply tort law to practical situations and legal disputes.

## Unit-I:

Nature of Law of Torts - Definition of Tort - Elements of Tort - Development of Law of Torts in England and India - Wrongful Act and Legal Damage - *Damnum Sine Injuria* and *Injuria Sine Damnum* - Tort distinguished from Crime and Breach of Contract.

## Unit-II

General Defenses to an action in Torts – Vicarious Liability - Liability of the State for Torts – Defence of Sovereign Immunity – Joint Liability – Liability of Joint Tortfeasors – Rule of Strict Liability (*Rylands V Fletcher*) – Rule of Absolute Liability (*MC Mehta vs. Union of India*) .

## Unit-III

Specific Torts - Torts affecting the person - Assault - Battery - False Imprisonment - Malicious Prosecution - Nervous Shock - Torts affecting Immovable Property - Trespass to land - Nuisance - Public Nuisance and Private Nuisance

## Unit-IV

Defamation - Negligence - Torts against Business Relations - Injurious falsehood - Negligent Misstatement - Passing off - Conspiracy - Torts affecting family relations - Remedies - Judicial and Extra-judicial Remedies – Damage.

## Unit-V Consumer Laws:

Common Law and the Consumer - Duty to take care and liability for negligence - Product Liability - Consumerism - Consumer Protection Act, 1986 - Salient features of the Act - Definition of Consumer - Rights of Consumers - Defects in goods and deficiency in services – Unfair trade practices - Redressal .

## Suggested readings:

1. The Law of Torts by R.K. Bangia
2. Law of Torts by R.K. Sinha
3. Law of Torts by Salmond and Heuston
4. The Law of Torts by Winfield and Jolowicz
5. Law of Torts by V.K. Ahuja
6. Law of Torts by G.P. Tripathi

## English & Legal language

Sub. Code: LLB 109

L – 4, C – 4.

### Course Objectives

- Develop proficiency in English for effective legal communication.
- Enhance skills in legal drafting and interpretation.
- Understand the use of precise language in legal contexts.
- Improve comprehension of legal terminology and concepts.
- Strengthen research and writing abilities for legal purposes.

### Unit-I

Sentence, Phrase and clause, Noun, Pronoun, verb, Adverb and Adjectives, Preposition and conjunctions, Articles and modals, Punctuation and Capital Letter, One word substitution, Synonyms and Antonyms, Note making, .

### Unit-II

Sources of Law, Distinction between civil and criminal law, Law and Custom, Law and morals, Law of crimes and Law of Torts, Substantive law and procedural law, Public law and private law, Law of contract and Law of torts, Law and fact, Law and equity.

**(A) Terms-Meaning and Usage:** Complaint, Written Statement, Plaintiff, Defense, Petition, Appeal, Magistrate, Judge Court, Tribunal, Divorce, Judicial Separation, Litigation, Public, Private, Legal, Illegal, Monogamy, Bigamy, Polygamy, Will Deed, Agency, Agreement, Bail, Bailable, Non-Bailable, Bailment, Minor, Misstatement, Pledge. Amicus Curie, Extradition, Forfeiture,

**(B) Legal,** Inalienable, infanticide, Judgment debtor, Jurisprudence, Laches, Legacy, Letters of Administration, License, Moratorium, Notary Public, Null and Void, Privilege of Witness, Prosecution, Punishment, Preponderance of Probabilities, Void and Voidable, Ab initio, Ab intra, Ad hoc, Ad interim, Ad Volorem, Bona fides, Corpus juris civilis, De facto, De novo, Detenu, De jure, Ex officio, Ex parte, En route, Ex post facto, Impane, Inter alia, Jure divino, Jure Humane, Locus standi, Mala fide, Modus operandi, PariPassu, Status quo, Sub judice, Subpoena.

### (C) Commonly used Urdu words in courts

eqn~nbZ] tkfeu] tokcnkok] eqalfje] xokg] nkok] bDtkbZ] lihuk] gtkZuk] [kpkZ] jkthukek] fgckukek] oknh] izfroknh] bdjkjukek] dkfrc] btjk] et:c] eQ:j] fpV~Bhet:ch] rLdj] Fkkuk&gk] jkstukepkvke] eqgfjZj] QnZcjkenxh] ekyeqdnek] dyecanc;ku] gyQukek] odkyrukek] fudkgukek] iSjksdkj] ltk;kchokjaV] [kpkZ , ikunku] esgj] gd "kqQk] x"r] ckfry] Qkfln] bfRryk] eqfYte] eqtfje] ltk;k[rk] rkthjkr , fgan] eqofDdy] cSukek] c;kukgd&tkSft;r] olh;r] jgu] btc] [;kj&my&cqywx] fgtkur] oDQ] uQdk] f[kyor&my&lghg] gqnwn&,&njck] rLnhd] f"ku[k[r

### (D) Commonly used Latin terms in courts

Ab initio', Res judicata, Res– subjudice, Adhoc, Adinfinitum, Adinterim, Adjourn sine die, Ad litem, Advalorem, Alibi, Aliter, Almamater, AmicusCuriae, Animus, Animus possidendi, Alumini, Anti-meridiam, Bonafide, BonaVacantia, Causecausans, Coram non

judice, Corpus Possessionis, Custodia Legis, Composmentis, Cypress, Defacto, DeJure, Denovo, Donation mortis cause, Enventresamere, Enroute, Exofficio, Exgratia, Exparte, Ex post facto, Factum valet, Femesole, Filius nullius, In forma pauperis, Ibid, Inlimine, Inmemoriam, Inparimaterial, Intelligible differentia, Inter alia, Interse, Ipso jure, Intoto, Ipsofacto, In invitum, Inlocoparentis, Inpais, In pari delicto, potiores condition possidentis (or defendentis), In rem, Intervivos, Intra-vires, Justertii, Jus civile, Jus divinum, Lex Fori, Lex Loci delicti, Lis pendens, Locus standi, Malafide, Mens Rea, Modus operandi, Modus Vivendi, Non compos mentis, Nonfeasance, Nudum Pactum, Onus probandi, Pacta Sunt Servanda, Pari Passu, Pendente lite, Per annum, Per capita, Per diem, Per mensem, Per stripes, Persona non grata.

### Unit III: Legal maxims

1. Absoluta sententia expositore non indiget
2. A bundanscautela non nocet.
3. Actio-personalior moritur-cum persona
4. Actori incumbit onus probandi
5. Actus curiae neminem gravabit
6. Actus dei nemini facit injuriam
7. Actus reus
8. Actus legis nemini est damnosus
9. Actus non-facit reum nisi mens sit rea
10. Actio Personalis Moritur Cum Persona.
11. Delegatus Non potest Delegare
12. Ejusdem Generis
13. Exturpi causa non oritur actione
14. Noscitur a sociis
15. Non-Execusat
16. Novus actus interveniens
17. Respondent superior
18. Falsus in uno falsus in omnibus
19. Acquitia sequitur legem
20. Allegans contraria non est audiendus
21. Audi alteram partem
22. Caveat emptor
23. Damnum sine injuria
24. De minimis non curat lex
25. Dolus malus pactum se non servabit
26. Delegates non-potest delegare
27. Fiat Justitia ruat caelum
28. Ignorantia legis neminem excusat
29. Ignorantia facti excusat ignorantia Juris
30. Injuria sine damno
31. Interest republicae ut sit finis litium
32. Lex non cogit ad impossibilia
33. Nemo dat quod non habet

35. Quantum meruit
36. Qui approbat non-reprobat
37. Qui facit per alium per-se
38. Res ipsa loquitur
39. Salus populi est Suprema Lex
40. Ubi-jus ibi-remedium
41. Vigilantibus non-dormientibus jura subveniunt

**Unit IV: (A) Paragraph & Precise Writing of Legal Texts  
(B) Translate Hindi to English & English to Hindi of case laws**

**Suggested Reading:**

1. Myneni S.R., Legal language and Legal Writing, Central Law Agency, Allahabad.
2. Jain R.L., Legal Language, Central Law Agency, Allahabad.
3. Prasad Anirudh, Legal Language, Central Law Publications, Allahabad.

## Spanish-I

**Sub. Code: LLB-109A**

**L – 4, C – 4.**

### **Course Objectives**

- Build a foundation in basic Spanish vocabulary and grammar.
- Develop listening and speaking skills for everyday conversations.
- Learn to read and comprehend simple Spanish texts.
- Practice writing basic sentences and paragraphs in Spanish.
- Gain cultural insights into Spanish-speaking regions.

### **Unit 1: Introduction to Spanish**

Overview of the Spanish language and its global significance, Alphabet and pronunciation, Basic greetings and introductions

### **Unit 2: Basic Grammar and Vocabulary**

Nouns, articles, and gender, Common adjectives and their agreement with nouns, Essential vocabulary: family, colours, numbers

### **Unit 3: Present Tense Verbs**

Introduction to regular verbs (AR, ER, IR), Conjugation patterns and usage  
Practical exercises and dialogues

### **Unit 4: Common Expressions and Questions**

Essential phrases for everyday conversation, Forming questions and negation  
Role-playing dialogues

### **Suggested Readings:**

1. Madrigal's Magic Key to Spanish" by Margarita Madrigal
2. A classic introductory book that simplifies grammar and vocabulary, making it accessible for beginners.
3. "Practice Makes Perfect: Spanish Verb Tenses" by Dorothy Richmond
4. Focuses on mastering verb tenses with clear explanations and exercises.
5. "Easy Spanish Step-By-Step" by Barbara Bregstein
6. A structured approach to learning Spanish, emphasizing grammar and vocabulary in a logical progression.
7. "Living Language Spanish" (Complete Course)
8. A comprehensive language course that includes audio components and a variety of exercises.

# German-I

**Sub. Code: LLB-109B**

**L – 4, C – 4.**

## **Course Objectives**

- Acquire basic German vocabulary and grammar skills.
- Develop the ability to engage in simple conversations in German.
- Learn to read and understand basic German texts.
- Practice writing short sentences and paragraphs in German.
- Explore cultural aspects of German-speaking countries.

## **Unit 1: Introduction to German**

German alphabet and pronunciation, Basic greetings and introductions, Pronunciation drills, Icebreaker introductions

## **Unit 2: Numbers and Colours**

Numbers 1-100, Basic colours and their usage, Number games, Colour identification exercises

## **Unit 3: Everyday Vocabulary**

Family members, Common nouns (e.g., household items, animals) Create a family tree, Vocabulary flashcard games

## **Unit 4: Basic Grammar and Sentence Structure**

Introduction to articles (definite and indefinite), Subject-verb-object structure, Sentence formation exercises, Group writing tasks

## **Suggested Readings:**

1. "German Made Simple: Learn to Speak and Understand German Quickly and Easily"  
Author: Arnold Leitner
2. A straightforward introduction to the language, covering essential vocabulary and grammar.
3. "German for Dummies"
4. Author: Wendy Foster
5. "The Everything Learning German Book"  
Author: Julie Gutin
6. "Practice Makes Perfect: Complete German Grammar"
7. Author: Ed Swick
8. A comprehensive workbook that reinforces grammar concepts with exercises and explanations.

## Chinese-I

**Sub. Code: LLB-109C**

**L – 4, C – 4.**

### **Course Objectives**

- Build a foundation in essential Chinese vocabulary and grammar.
- Improve listening and speaking abilities for basic Chinese conversations.
- Learn to read and write simple Chinese characters.
- Practice constructing basic sentences and dialogues in Chinese.
- Explore the culture and traditions of Chinese-speaking regions.

### **Unit 1: Introduction to Chinese**

Pinyin and pronunciation, Basic greetings and self-introduction, Pronunciation practice  
Icebreaker introductions

### **Unit 2: Numbers and Dates**

Numbers 1-100, Days of the week and months, Number games, Calendar exercises

### **Unit 3: Everyday Vocabulary**

Family members, Common nouns (e.g., animals, objects), Family tree project  
Vocabulary flashcards

### **Unit 4: Basic Grammar and Sentence Structure**

Subject-verb-object structure, Introduction to measure words, Sentence formation exercises  
Simple writing tasks

### **Suggested Readings:**

1. "Integrated Chinese" (Textbook + Workbook)
  - a. Authors: Tao-chung Yao, Yuehua Liu, et al.
  - b. A comprehensive series that covers speaking, reading, and writing. It includes cultural notes and exercises.
2. "Chinese Made Easier"
  - a. Authors: Maureen S. W. D. H. Wong, et al.
  - b. Focuses on conversational skills with a gradual introduction to reading and writing.
3. "New Practical Chinese Reader"
  - a. Authors: Liu Xun
  - b. A popular series that integrates language and cultural elements, with a focus on conversational skills.
4. "Reading & Writing Chinese"
  - a. Author: William McNaughton
  - b. A guide to learning characters, with clear explanations and practice exercises.

## **French-I**

**Sub. Code: LLB-109D**

**L – 4, C – 4.**

### **Course Objectives**

- Acquire basic French vocabulary and grammar essentials.
- Enhance speaking and listening skills for everyday French conversations.
- Develop reading comprehension of simple French texts.
- Practice writing basic French sentences and paragraphs.
- Explore the culture and customs of French-speaking regions.

### **Unit 1: Daily Routines**

Common verbs (aller, être, avoir), Talking about daily activities

### **Unit 2: Food and Drink**

Vocabulary related to food, Expressing likes and dislikes

### **Unit 3: Clothing and Shopping**

Vocabulary for clothing, Shopping dialogue and role-play

### **Unit 4: Directions and Transportation**

Asking for and giving directions, Vocabulary for transportation

### **Suggested Readings:**

1. Easy French Step-By-Step" by Myrna Bell Rochester
2. A clear, gradual approach to learning French grammar and vocabulary.
3. "French for Dummies" by Dodi-Katrin Schmidt and Michelle M. Williams
4. Practice Makes Perfect: Complete French Grammar" by Annie Heminway
5. Comprehensive grammar explanations with exercises for practice.
6. "Fluent in French: The Most Complete Study Guide to Learn French" by Frederic Bibard
7. Covers vocabulary, grammar, and cultural insights



## **Semester-II**

## Law of Contract - II

Sub. Code: LLB 102

L – 4, C – 4.

### Course Objectives

- Understand the concepts of contract performance and breach.
- Study the different types of contracts and their legal implications.
- Examine the rules surrounding contract termination and discharge.
- Explore the remedies available for contract breach and enforcement.
- Apply advanced contract law principles to real-world scenarios.

### Unit-I:

Indemnity and Guarantee - Contract of Indemnity, definition - Rights of Indemnity holder - Liability of the indemnified - Contract of Guarantee - Definition of Guarantee - Essential characteristics of Contract of Guarantee - Distinction between Indemnity and Guarantee - Kinds of Guarantee - Rights and liabilities of Surety - Discharge of surety. Contract of Bailment - Definition of bailment - Essential requisites of bailment.

### Unit-II:

Contract of Agency - Definition of Agent - Creation of Agency - Rights and duties of Agent - Delegation of authority - Personal liability of agent.

### Unit-III:

Contract of Sale of Goods - Formation of contract - Subject matter of sale - Conditions and Warranties - Express and implied conditions and warranties

### Unit-IV:

Property - Possession and Rules relating to passing of property - Sale by non-owner - *Nemo dat quad non habet* - Delivery of goods - Rights and duties of seller and buyer before and after sale.

### Unit-V:

Contract of Partnership - Definition and nature of partnership - Formation of partnership- Test of partnership - Partnership and other associations - Registration of firm - Effect of non-registration - Relations of partners - Rights and duties of partners - Property of firm - Relation of partners to third parties.

### Suggested Readings:

1. Anson's *Law of Contract*, 25th Ed. 1998, Oxford University Press, London.
2. Venkatesh Iyyer: *The Law of Contracts and Tenders*, Gogia & Company Hyderabad.
3. Cheshire & Fifoot: *Law of Contract*, Butterworth, London, 1976.
4. Mulla: *The Indian Contract Act*, N.M. Tripathi (P) Ltd. Bombay, 1984.
5. G.C.V. Subba Rao: *Law of Contracts*, S. Gogia & Co., Hyderabad, 1995
6. Krishnan Nair: *Law of Contracts*, S. Gogia & Co. Hyderabad, 1995.
7. Avtar Singh: *Law of Contracts*, Eastern Book Company, Lucknow, 1998.
8. A Ramaiah's *Sale of Goods Act*, 4th Ed. 1998, The Law Book Co., Allahabad.
9. Benjamin's *Sale of Goods*, 1st Ed. 1978, Sweet & Maxwell, London.
10. P.S. Atiyah: *Sale of Goods Act*, 9th Ed. 1997, Universal Book Traders,

## Family Law – II (Muslim Law)

Sub. Code: LLB 104

L – 4, C – 4.

### Course Objectives

- Understand the basic principles and sources of Muslim personal law.
- Study the laws governing marriage, divorce, and maintenance under Muslim law.
- Examine the rules of inheritance and succession in Muslim communities.
- Analyse the rights and duties of Muslim family members.
- Apply Muslim law principles to practical family law issues.

### Unit-I:

Origin and development of Muslim Law - Sources of Muslim Law - Schools of Muslim Law - Difference between the Sunni and Shia Schools – Sub-schools of Sunni Law - Operation and application of Muslim Law - Conversion to Islam - Effects of conversion - Law of Marriage, nature of Muslim Marriage.

### Unit-II:

Divorce - Classification of divorce - different modes of Talaq - Legal consequences of divorce - Dissolution of Muslim Marriage Act, 1939 - Maintenance, Principles of maintenance, Persons entitled to maintenance.

### Unit-III:

Parentage - Maternity and Paternity - Legitimacy and acknowledgment - Guardianship - Meaning - Kinds of guardianship - Removal of guardian - Difference between Shia and Sunni Law. Gift - Definition of Gift - Requisites of valid gift - Gift formalities - Revocation of gift - Kinds of gift.

### Unit-IV:

Waqf \_ Definition - Essentials of Waqf - Kinds of Waqf – Creation of Waqf - - Revocation of Waqf - Salient features of the Waqf Act, 1995 – Mutawalli - Who can be Mutawalli - Powers and duties of Mutawalli - Removal of Mutawalli and Management of Waqf property. Succession.

### Unit-V:

Special Marriage Act, 1954 - Salient features of Indian Divorce Act, 1869 - Domicile - Maintenance to dependents/ Spouses - Intestate succession of Christians under the Indian Succession Act, 1925.

### Suggested Readings:

1. Tahir Mahmood: *The Muslim Law of India*, 1980, Law Book Company, Allahabad.
2. Aquil Ahmed: *Text Book of Mohammadan Law*, 5th Edition 1992, Central Law Agency, Allahabad.
3. Prof. G.C.V. Subba Rao: *Family Law in India*, 6th Edition, 1993, S.Gogia & Company, Hyderabad.
4. Asaf A.A.Fyzee: *Outlines of Mohammadan Law*, 4th Edition, 1999, Oxford University Press, Delhi.

## Constitutional Law – II

Sub. Code: LLB 106

L – 4, C – 4.

### Course Objectives

- Understand the concept of federalism and distribution of powers in the Constitution.
- Study the structure and functions of various constitutional bodies.
- Analyse the role of the judiciary in interpreting the Constitution.
- Examine the relationship between fundamental rights and public policy.
- Explore the process and significance of constitutional amendments.

### Unit-I

Legislature under Indian Constitution - Union and State Legislatures - Composition, Powers, Functions and Privileges - Anti-Defection Law - Executive under Indian Constitution - President

### Unit-II

Judiciary under Constitution - Supreme Court - Appointment of Judges, Powers and Jurisdiction - High Courts

### Unit-III

CentreState Relations - Legislative, Administrative and Financial Relations - Cooperation and Coordination between the Centre and States

### Unit-IV

Liability of State in Torts and Contracts - Freedom of Interstate Trade, Commerce and Inter course - Services under the State

### Unit-V

Emergency – Need of Emergency Powers - Different kinds of Emergency - National, State and Financial emergency

### Suggested Readings:

1. M.P.Jain, *Indian Constitutional Law*, Wadhwa & Co, Nagpur
2. V.N.Shukla, *Constitution of India*, Eastern Book Company, Lucknow
3. Granville Austin, *Indian Constitution-Cornerstone of a Nation*, OUP, New Delhi
4. H.M.Seervai, *Constitutional Law of India* (in 3 Volumes), N.M.Tripathi, Bombay
5. G.C.V.Subba Rao, *Indian Constitutional Law*, S.Gogia & Co., Hyderabad
6. B.Shiva Rao, *Framing of India's Constitution* (in 5 Volumes), Indian Institute of Public Administration, New Delhi
7. J.N.Pandey, *Constitutional Law of India*, Central Law Agency, Allahabad

## LAW OF CRIMES

Sub. Code: LLB 108

L – 4, C – 4.

### Course Objectives

- Understand the key principles and categories of criminal law.
- Study the elements of criminal offenses and defences.
- Examine the criminal justice system, including police, prosecution, and courts.
- Analyse the procedures for trial and punishment in criminal cases.
- Apply criminal law principles to real-life case scenarios.

### Unit-I:

Concept of crime - Definition and meaning of crime - Distinction between crime and tort - Stages of crime - Intention, Preparation, Attempt and Commission of Crime - Elements of Crime - *Actus Reus and Mensrea* - Codification of Law of Crimes in India - Application of the Indian Penal

### Unit-II:

General exceptions - Abetment - Criminal Conspiracy - Offences against the State

### Unit-III:

Offences affecting human body (offences affecting human life) Culpable Homicide and Murder – Hurt and Grievous Hurt - Wrongful restraint and Wrongful confinement

### Unit-IV:

Offences affecting the public health, safety, convenience, decency and morals - Offences against Property - Theft - Extortion - Robbery & Dacoity - Cheating - Mischief - Criminal Trespass

### Unit-V:

Offences by or relating to public servants - False Evidence and Offences against Public Justice - Offences relating to documents

### Suggested Readings:

1. Ratan Lal and Dhiraj Lal: *Indian Penal Code*, Wadhwa & Co., 2000.
2. Achutan Pillai: *Criminal Law*, Butterworth Co., 2000.
3. Gour K.D.: *Criminal Law - Cases and Materials*, Butterworth Co., 1999.
4. Kenny's: *Outlines of Criminal Law*, (1998 Edition)

## Environmental Law

Sub. Code: LLB 110

L – 4, C – 4.

### Course Objectives

- Understand the key principles and framework of environmental law.
- Study national and international regulations on environmental protection.
- Examine the legal aspects of environmental pollution and conservation.
- Explore the roles of governmental and non-governmental organizations in environmental law.
- Apply environmental law concepts to contemporary issues and case studies.

### Unit-I

The meaning and definition of environment – Ecology - Ecosystems-Biosphere - Biomes - Ozone depletion - Global Warning - Climatic changes - Need for the preservation, conservation and protection of environment

### Unit-II

Common Law remedies against pollution - trespass, negligence, and theories of Strict Liability & Absolute Liability - Relevant provisions of I.P.C. and Cr.P.C. and C.P.C., for the abatement of public nuisance in pollution cases

### Unit-III

The law relating to the preservation, conservation and protection of forests, wild life and endangered species, marine life, coastal ecosystems and lakes etc. - Prevention of cruelty towards animals - The law relating to prevention and control of water pollution - Air Pollution - Environment pollution control mechanism.

### Unit-IV:

Art. 48A and Art. 51A(g) of the Constitution of India - Right to wholesome environment - Right to development - Restriction on freedom of trade, profession, occupation for the protection of environment - Immunity of Environment legislation from judicial scrutiny(Art.31C) .

### Unit-V

International Environmental Regime - Transactional Pollution - State Liability - Customary International Law - Liability of Multinational Corporations/Companies - Stockholm Declaration on Human Environment, 1972 - The role of UNEP for the protection of environment - Ramsar Convention 1971 – Bonn Convention (Migratory Birds) 1992

### Suggested Readings:

1. Paras Diwan: *Studies on Environmental Cases*.
2. S.N. Jain (ed.): *Pollution Control and the Law*.
3. Armin Rosencranz and Shyam Divan: *Environmental Law and Policy in India*.
4. A. Agarwal (ed.): *Legal Control of Environmental Pollution*
5. Chetan Singh Mehta: *Environmental Protection and Law*
6. V.K. Krishna Iyer: *Environment Pollution and Law*
7. Shah: *Environmental Law*
8. Paras Diwan: *Environmental Law and Policy in India*,1991
9. Dr. N. Maheshwara Swamy, *Environmental Law*, Asia Law House, Hyderabad.

## **Semester-III**

## JURISPRUDENCE

**Sub. Code: LLB 201**  
**Course Objectives**

**L – 4, C – 4.**

- Explore the fundamental concepts and theories of law.
- Analyse the nature and sources of legal authority and norms.
- Study the relationship between law, morality, and justice.
- Examine different schools of jurisprudential thought and their impact.
- Apply jurisprudential principles to contemporary legal issues.

### **Unit-I:**

Meaning and Definition of Jurisprudence — General and Particular Jurisprudence - Elements of Ancient Indian Jurisprudence — Schools of Jurisprudence — Analytical, Historical, Philosophical and Sociological Schools of Jurisprudence. Theories of Law — Meaning and Definition of Law — The

### **Unit-II:**

Sources of Law — Legal and Historical Sources — Legislation - Definition of legislation - Classification of legislation- Supreme and Subordinate Legislation - Direct and Indirect Legislation - Principles of Statutory Interpretation. Precedent — Definition of Precedent — Kinds of Precedent — *Stare Decisis* — Original and Declaratory Precedents — Authoritative and Persuasive Precedents. Custom – Definition of Custom

### **Unit-III:**

Persons — Nature of personality — Legal Status of Lower Animals, Dead Persons and Unborn persons — Legal Persons — Corporations — Purpose of Incorporation — Nature of Corporate Personality - Rights and Duties.

### **Unit-IV:**

Obligation — Nature of Obligation — Obligation arising out of Contract, Quasi Contract, trust and breach of obligation etc. — Liability — Nature and kinds of liability — Acts — *Mens Rea* — Intention and Motive — Relevance of Motive.

### **Unit-V:**

Ownership — Definition and kinds of Ownership - Possession — Elements of Possession - Relation between Ownership and Possession — Possessory Remedies — Property — Meaning — Kinds of Property — Modes of Acquisition of Property — Legal Sanctions - Meaning of Sanction — Classification of Sanctions — Civil and Criminal Justice.

### **Suggested Readings:**

1. Salmond: *Jurisprudence*, Universal Publishers 12th Edn. 1966.
2. Rama Jois, *Legal and Constitutional History of India*, Universal Law Publications, Delhi.
3. N.V. Pranjape – Jurisprudence
4. S.R. Dhyeni - Jurisprudence



## LAW OF EVIDENCE

Sub. Code: LLB 203

L – 4, C – 4.

### Course Objectives

- Grasp the basic principles and rules governing evidence in law.
- Learn about different types of evidence and their acceptability in court.
- Explore the roles and procedures involving witnesses, including examination and cross-examination.
- Understand the concepts of burden of proof and legal presumptions.
- Apply evidentiary rules to real-life legal cases and scenarios.

### Unit-I:

The Indian Evidence Act, 1872 — Salient features of the Act – Meaning and kinds of Evidence — Interpretation clause — May Presume, shall presume and Conclusive proof - Fact, Fact in issue and Relevant facts — Distinction between Relevancy and Admissibility - Doctrine of *Res Gestae* — Motive, preparation and conduct.

### Unit-II:

Admissions & Confessions: General Principles concerning Admissions — Differences between "Admission" and "Confession" — Confessions obtained by inducement, threat or promise – Confessions made to police officer - Statement made in the custody of a police officer leading to the discovery of incriminating material — Admissibility of Confessions made by one accused person against co-accused.

Dying Declarations and their evidentiary value — Other Statements by persons who cannot be called as Witnesses.

### Unit-III:

Relevancy of Judgments — Opinion of witnesses — Expert's opinion — Opinion on Relationship especially proof of marriage — Facts which need not be proved — Oral and Documentary Evidence - General Principles concerning oral evidence and documentary evidence — Primary and Secondary evidence — Modes of proof of execution of documents.

### Unit-IV:

Rules relating to Burden of Proof - Presumption as to Dowry Death — Estoppel — Kinds of estoppel.

### Unit-V:

Competency to testify — Privileged communications - Testimony of Accomplice — Examination in Chief, Cross examination and Re-examination — Leading questions — Lawful questions in cross examination — Compulsion to answer questions put to witness — Hostile witness — Impeaching the credit of witness.

### Suggested Readings:

1. Batuk Lal: *The Law of Evidence*, 13th Edition, Central Law Agency, Allahabad, 1998.
2. M. Munir: *Principles and Digest of the Law of Evidence*, 10th Edition (in 2 vols), Universal Book Agency, Allahabad, 1994.
3. Vepa P. Saradhi: *Law of Evidence* 4th Edn. Eastern Book Co., Lucknow, 1989.
4. Avtar Singh: *Principles of the Law of Evidence*, 11th Edn. Central Law Publications.
5. V. Krishnama Chary: *The Law of Evidence*, 4th Edn. S.Gogia & Company, Hyderabad

## LAW OF PROPERTY

**Sub. Code: LLB 205**

**L – 4, C – 4.**

### **Course Objectives**

- Understand the fundamental principles of property law.
- Study the different types of property, including movable and immovable.
- Learn about the legal aspects of ownership, transfer, and possession of property.
- Examine rights related to property, such as easements, licenses, and mortgages.
- Apply property law concepts to practical legal scenarios and disputes.

### **Unit-I:**

**Meaning** and concept of property — Kinds of property — Transfer of property — Transferable and non-transferable property — Who can transfer — Operation of transfer — Mode of transfer — Conditional transfer — Void and unlawful conditions.

### **Unit-II:**

Doctrine of Election — Covenants — Transfer by ostensible owner — Doctrine of Feeding the Grant by Estoppel — Doctrine of Lis Pendens — Fraudulent Transfer — Doctrine of Part-performance.

### **Unit-III:**

Sale - Essential features — Mode of Sale — Rights and liabilities of parties. Mortgage - Kinds of Mortgages.

### **Unit-IV:**

Lease — Essential features — Kinds of leases — Rights and liabilities of lessor and lessee — Termination of lease — forfeiture — Exchange.

### **Unit-V:**

Easements — Definition of easement — Distinction between Lease and License — Dominant and Servient Tenements. Acquisition of property through testamentary succession.

### **Suggested Readings:**

1. Mulla: *Transfer of Property*, Butterworths Publications.
2. Subba Rao GCV: *Commentaries on the Transfer of Property Act*.
3. Krishna Menon: *Law of Property*.
4. Upadhyaya's *Common Matrix of Transfer of Property*

## PUBLIC INTERNATIONAL LAW

Sub. Code: LLB 207

L – 4, C – 4.

### Course Objectives

- Understand the foundational principles and sources of international law.
- Study the rights and responsibilities of states under international law.
- Explore the role of international organizations in global governance.
- Analyse the legal aspects of international treaties and agreements.
- Apply public international law to current global issues and conflicts.

### Unit-I:

Definition, Nature, Scope and Importance of International Law — Relation of International Law to Municipal Law.

### Unit-II:

State Recognition — State Succession — Responsibility of States for International delinquencies —

### Unit-III:

Position of Individual in International Law — Nationality — Extradition — Asylum — Privileges and Immunities of Diplomatic Envoys

### Unit-IV:

The Legal Regime of the Seas – Evolution of the Law of the Sea – Freedoms of the High Seas – Common Heritage of Mankind – United Nations Convention on the Law of the Sea – Legal Regime of Airspace – Important Conventions relating to Airspace – Paris, Havana, Warsaw and Chicago Conventions – Five Freedoms of Air – Legal Regime of Outer space – Important Conventions such as Outer space Treaty,

### Unit-V:

International Organizations — League of Nations and United Nations — International Court of Justice —International Criminal Court.

### Suggested Readings:

1. S.K. Kapoor, *Public International Law*, Central Law Agencies, Allahabad.
  2. H.O. Agarwal, *International Law and Human Rights*, Central Law Publications, Allahabad.
- S.K. Verma, *An Introduction to Public International Law*, Prentice Hall of India

## INTELLECTUAL PROPERTY RIGHTS

Sub. Code: LLB 209

L – 4, C – 4.

### Course Objectives

- Grasp the key concepts and types of intellectual property rights.
- Understand the legal protections for patents, copyrights, trademarks, and designs.
- Learn the procedures for registering and enforcing intellectual property rights.
- Explore issues of infringement and the available legal remedies.
- Apply intellectual property law to practical business and legal situations.

### Unit-I:

Meaning, Nature, Classification and protection of Intellectual Property — The main forms of Intellectual Property — Copyright, Trademarks, Patents, Designs (Industrial and Layout).

### Unit-II:

Introduction to the leading International instruments concerning Intellectual Property Rights — The Berne Convention — Universal Copyright Convention — The Paris Union — Patent Co-operation Treaty.

### Unit-III:

Select aspects of the Law of Copyright in India — The Copy Right Act, 1957 - Historical evolution — Meaning of copyright — Copyright in literary, dramatic and musical works, computer programmes and cinematograph films — Neighbouring rights — Rights of performers and broadcasters, etc. — Ownership and Assignment of copyright — Author's special rights — Notion of infringement — Criteria of infringement.

### Unit-IV:

Intellectual Property in Trademarks and the rationale of their protection - The Trade Marks Act, 1999 — Definition of Trademarks — Distinction between Trademark and Property Mark - Registration — Passing off — Infringement of Trademark — Criteria of Infringement — Remedies. The Designs Act, 2000 — Definition and characteristics of Design — Law in India.

### Unit-V:

Patents — Concept of Patent — Historical overview of the Patents Law in India — Patentable Inventions — Kinds of Patents — Procedure for obtaining patent — The Patents Act, 1970 — Rights and obligations of a patentee — Term of patent protection — Use and exercise of rights — Exclusive Marketing Rights.

### Suggested Readings:

1. P. Narayanan: *Patent Law*, Eastern Law House, 1995.
2. Roy Chowdhary, S.K. & Other: *Law of Trademark, Copyrights, Patents and Designs*, Kamal Law House, 1999.
3. Dr. G.B. Reddy, *Intellectual Property Rights and the Law* 5th Ed. 2005 Gogia Law Agency.
4. John Holyoak and Paul Torremans: *Intellectual Property Law*.
5. B.L. Wadhwa: *Intellectual Property Law*, Universal Publishers, 2nd Ed. 2000.
6. W.R. Cornish: *Intellectual Property Law*, Universal Publishers, 3rd Ed. 2001.

## **Semester-IV**

## ADMINISTRATIVE LAW

**Sub. Code: LLB 202**

**L – 4, C – 4.**

### **Course Objectives**

- Understand the principles and scope of administrative law.
- Study the powers and functions of administrative agencies.
- Examine the legal framework governing administrative decisions and actions.
- Explore the mechanisms for judicial review of administrative actions.
- Apply administrative law concepts to real-world governmental issues.

### **Unit-I:**

Nature and scope of Administrative Law — Meaning, Definition and Evolution of Administrative Law— Reasons for the growth of Administrative Law — Relationship between Administrative Law and Constitutional Law.

### **Unit-II:**

Basic concepts of Administrative Law — Rule of Law — **Interpretation** of Dicey's Principle of Rule of Law.

### **Unit-III:**

Classification of Administrative functions — Legislative, Quasi-judicial, Administrative and Ministerial functions — Delegated Legislation — Meaning, Reasons for the growth and Classification of delegated legislation.

### **Unit-IV:**

Judicial Control of Administrative Action - Grounds of Judicial Control — Principles of Natural Justice.

### **Unit-V:**

Remedies available against the State — Writs — Lokpal and Lok Ayukta — Liability of the State in Torts and Contracts — Rule of Promissory Estoppel — Administrative Tribunals .

### **Suggested Readings:**

1. Griffith and Street: *Principles of Administrative Law*.
2. H.W.R.Wade: *Administrative Law*, Oxford Publications, 8th Edn. 2000, London.
3. De Smith: *Judicial Review of Administrative Action*, Sweet and Maxwell, 1998.
4. S.P. Sathe: *Administrative Law*, Butterworths, 6th Edn. 1998.
5. I.P.Massey: *Administrative Law*, Eastern Book Company, 5th Edn. 2001

## COMPANY LAW

Sub. Code: LLB 204

L – 4, C – 4.

### Course Objectives

- Grasp the basics of company formation and the various types of business structures.
- Understand the roles and responsibilities of company directors, shareholders, and other parties involved.
- Learn about the laws that regulate the management and functioning of companies.
- Explore the legal processes related to corporate governance, mergers, and acquisitions.
- Apply the principles of company law to real-life business and legal situations.

### Unit-I:

Definition and attributes of Company — Distinction between Partnership Firm and Company — Kinds of Companies including Multinational Companies — Advantages and Disadvantages of Incorporation

### Unit-II:

Promoters and Registration — Pre-incorporation contracts — Memorandum of Association — Articles of Association.

### Unit-III:

Prospectus — Members — Shareholders — Share Capital — Shares and Dividends — Debentures —

### Unit-IV:

Director, Manager and Secretary — Meetings — Majority powers and minority rights.

### Unit-V:

Modes of winding up of companies — Consequences of winding up

### Suggested Reading:

1. Company Law by Avtar Singh
2. Company Law by M.C. Kuchhal
3. Company Law by S.M. Shah
4. Company Law by V. Balachandran
5. Principles of Company Law by Gower & Davies
6. Company Law by B. V. L. Reddy
7. Company Law: A Handbook by R. S. S. Suryanarayana

## LABOUR LAWS– I

Sub. Code: LLB 206

L – 4, C – 4.

### Course Objectives

- Understand the key principles of labour law and employment regulations.
- Learn about the rights and duties of employees and employers.
- Study the legal framework governing labour contracts, wages, and working conditions.
- Explore dispute resolution mechanisms in labour law, including trade unions and collective bargaining.
- Apply labour law principles to real-world workplace scenarios and legal issues.

### Unit-I

Trade Unions: History of Trade Union Movement - The Trade Union Act 1926 – Definitions - Registration – Rights and Liabilities of Registered Trade Unions – Immunities.

### Unit-II

Prevention and Settlement of Industrial Disputes in India - The role of State in Industrial Relations – The Industrial Disputes Act 1947 - Definition of industry - Industrial Dispute – Individual Dispute.

### Unit-III

Authorities under the ID Act – Works committee – Conciliation - Court of inquiry - Labour Courts-Tribunal – Powers and functions of authorities - Voluntary Arbitration - Provisions under Chapter V-A & V- B of the Act- Alteration of conditions of service – Management rights of action during pendency of proceedings – Recovery of money due from employer.

### Unit-IV

Standing Orders -Concept and Nature of Standing Orders – scope and coverage- Certification process – its operation and binding effect – Modification and Temporary application of Model Standing Orders.

### Unit-V

Disciplinary Proceedings in Industries - Charge sheet – Explanation – Domestic enquiry - Enquiry officer – Enquiry report – Punishment.

### Suggested Readings:

1. Srivastava: *Law of Trade Unions*, Eastern Book Company, Lucknow
- 2.. Goswami: *Labour and Industrial Law*, Central Law Agency.
3. R.F. Rustomji : *Law of Industrial Disputes* : Asia Publishing House, Mumbai
4. S.N. Misra : *Labour and Industrial Law*
5. J.N. Malik: *Trade Union Law*
6. Khan& Khan: *Labour Law*, Asia Law House, Hyderabad
7. S.C. Srivastava: *Industrial Relations and Labour Law*, Vikas Publishing House



## CIVIL PROCEDURE CODE AND LAW OF LIMITATION

**Sub. Code: LLB 208**

**L – 4, C – 4.**

### **Course Objectives**

- Understand the key provisions of the Civil Procedure Code and its application in legal proceedings.
- Study the stages of civil litigation, including filing suits and conducting trials.
- Learn about the rules governing the service of summons, pleadings, and evidence in civil cases.
- Explore the principles of limitation, including time limits for filing suits and appeals.
- Apply civil procedure and limitation laws to practical legal scenarios and case management.

### **Unit-I:**

Codification of Civil Procedure and Introduction to CPC — Principal features of the Civil Procedure Code — Suits — Parties to Suit — Framing of Suit — Institution of Suits — Bars of Suit - Doctrines of *Sub Judice* and *Res Judicata* — Place of Suing — Transfer of suits.

### **Unit-II:**

Pleadings — Contents of pleadings — Forms of Pleading — Striking out / Amendment of Pleadings - Plaint— Essentials of Plaint - Return of Plaint—Rejection of Plaint—Production and marking of Document.

### **Unit-III:**

Appearance and Examination of parties & Adjournments — *Ex-parte* Procedure — Summoning and Attendance of Witnesses — Examination — Admissions — Production, Impounding, Return of Documents — Hearing — Affidavit — Judgment and Decree — Concepts of Judgment, Decree, and Interim Orders and Stay — Injunctions — Appointment of Receivers and Commissions — Costs -- Execution — Concept of Execution — General Principles of Execution — Power of Execution — Power of Executing Courts — Procedure for Execution .

### **Unit-IV:**

Suits in Particular Cases — Suits by or against Government — Suits relating to public matters;— Suits by or against minors, persons with unsound mind, - Suits by indigent persons -- Interpleader suits — Incidental and supplementary proceedings - Appeals, Reference, Review and Revision.

### **Unit-V:**

Law of Limitation — Concept of Limitation — Object of limitation - General Principles of Limitation — Extension — Condonation of delay — Sufficient Cause — Computation of limitation -- Acknowledgment and Part-payment.

### **Suggested Readings:**

1. Mulla: *Code of Civil Procedure*: Tripathi (Abridged Edition), 11th Edn.(StudentEdition) Edited by P.M. Bakshi, Bombay, 1985.
2. A.N. Saha: *Code of Civil Procedure*.
3. C.K. Takwani: *Civil Procedure*, 4th Edn. Eastern Book Co., Lucknow, 1974.
4. B.B. Mitra: *Limitation Act*, 17th Edn. Eastern Law House, Calcutta, 1974, Allahabad.
5. Sanjiva Row: *Limitation Act*, 7th Edn. (in 2 Vols), Law Book Co., Allahabad,
6. Sanjiva Row: *Code of Civil Procedure*, 3rd Edn. (in 4 Vols), Law Book Co., Allahabad.
7. *AIR Commentaries on Limitation Act*, W.W. Chitaley, AIR Ltd., Nagpu

## **CRIMINAL PROCEDURE CODE AND LAW OF JUVENILE JUSTICE AND PROBATION OF OFFENDERS**

**Sub. Code: LLB 210**

**L – 4, C – 4.**

### **Course Objectives**

- Grasp the key provisions and procedures of the Criminal Procedure Code (CrPC).
- Understand the steps involved in criminal investigations, arrests, and trials under the CrPC.
- Study the legal protections and processes for juveniles in the criminal justice system.
- Learn about probation laws and practices aimed at rehabilitating offenders.
- Apply CrPC and juvenile justice principles to practical legal scenarios involving offenders.

### **Unit-I:**

The Code of Criminal Procedure, 1973 : The rationale of Criminal Procedure — The importance of fair trial — Constitutional Perspectives : Articles 14, 20 & 21 — The organization of Police, Prosecutor and Defense Counsel — Pre-trial Process — Arrest — Distinction between “cognizable” and “non-cognizable” offences — Steps to ensure presence of accused at trial -- Warrant and Summons cases — Arrest with and without Warrant.

### **Unit-II:**

Search and Seizure — Search with and without warrant — Police search during investigation — General Principles of Search — Seizure.

### **Unit-III :**

Trial Process: Commencement of Proceedings — Dismissal of Complaint — Bail, Bailable and Non-bailable Offences — Cancellation of Bails — Anticipatory Bail — General Principles concerning Bail Bond — Preliminary pleas to bar trial — Jurisdiction — Time Limitations — Pleas of *Autrefois Acquit* and *Autrefois Convict* — Fair Trial — Concept of fair trial — Presumption of innocence — Venue of trial — Jurisdiction of Criminal Courts — Rights of accused.

### **Unit-IV:**

Judgment: Form and content -- Summary trial — Post-conviction orders in lieu of punishment — Modes of providing judgment copy — appeals, review and revisions.

### **Unit-V:**

Probation and Parole: Authority granting Parole — Supervision — Conditional release -- suspension of sentence — Procedure under Probation of Offenders Act, 1958 -- Salient features of the Act. Juvenile Justice System -- Juvenile Justice (Care and Protection of Children) Act of 2000 -- Procedure under Juvenile Justice...Act — Treatment and Rehabilitation of Juveniles.

### **Suggested Readings:**

1. Kelkar R.V.: *Criminal Procedure*, 3rd Edn. Eastern Book Co., Lucknow, 1993.
2. Ratanlal and Dhirajlal: *The Code of Criminal Procedure*, 15th Edn. Wadhwa & Co.,
3. Padala Rama Reddi: *The Code of Criminal Procedure*, 1973, Asia Law House, Hyderabad.
4. Prof. S.N. Misra: *The Code of Criminal Procedure*, Central Law Agency.
5. M.P. Tandon: *Criminal Procedure Code*, Allahabad Law Agency.  
Shoorvir Tyage: *The Code of Criminal Procedure*, Allahabad Law Agency

# **Semester-V**

## Interpretation of Statutes

**Sub. Code: LLB 301**

**L – 4, C – 4.**

### **Course Objectives**

- Understand the fundamental principles and methods of interpreting statutes.
- Learn about the various rules and techniques used in statutory interpretation.
- Study the role of judicial decisions in interpreting laws and resolving ambiguities.
- Examine the relationship between statutory provisions and legislative intent.
- Apply statutory interpretation techniques to real-life legal cases and issues.

### **Unit-I:**

— Classification of Statues — Meaning and Definition of Interpretation — General Principles of Interpretation.

### **Unit-II**

Grammatical Rule of Interpretation — Golden Rule of Interpretation.

### **Unit-III:**

Interpretation of Penal Statutes and Statutes of Taxation — Beneficial Construction — Construction to avoid conflict with other provisions.

### **Unit-IV:**

External Aids to Interpretation — Statement of objects of legislation, Legislative debates, identification of purpose sought to be achieved through legislation.

### **Unit-V:**

Effect of Repeal — Effect of amendments to statutes — Conflict between parent legislation and subordinate legislation.

### **Suggested Readings:**

1. Vepa P. Sarathi: *Interpretation of Statutes*, Eastern Book Co, 4th Edition, 1976.
2. Chatterjee: *Interpretation of Statutes*.
3. G.P. Singh: *Principles of Statutory Interpretation*, Wadhwa and Company, 8th Ed., 2001.

## UTTAR PRADESH LAND LAWS

**Sub. Code: LLB 303**

**L-4, C-4**

### **Course Objectives**

- Understand the key principles and provisions of land laws in Uttar Pradesh.
- Study the legal framework governing land ownership, transfer, and registration.
- Learn about land revenue systems, including assessments and collection procedures.
- Explore the rights and responsibilities of landowners, tenants, and other stakeholders.
- Apply Uttar Pradesh land laws to practical land disputes and legal issues.

### **Unit I: Introduction**

Interpretation Clause, Objects and Clause of UP Zamindari Abolition and Land Reforms Act 1950,

### **Unit II: Classes and Rights of Tenure Holder**

Bhumidhar with Transferable Rights, Bhumidhar with Non-Transferable Rights, Asami,.

### **Unit III: Succession**

General Order of Succession, Succession as per strips, Critical Approach to Law of Succession.

### **Unit IV: Ejectment**

Ejectment of Tenure Holder from the Land of Public Utility, Ejectment of Trespasser, Ejectment of Bhumidhar, Ejectment of Asami.

### **Unit V: UP Land Revenue Act, 1901**

Authorities under the Act, Procedure of Collecting Land Revenue, Bar on Jurisdiction of Civil Courts,

### **Leading Cases For Detail Study**

- \*Abdul Saeed And Another Vs State Of Uttar Pradesh & Others
- \*Smt. Mainia Vs Dy. Director Consolidation
- \*Satyendra Singh Vs State Of Up
- \*Lalsa Vs State Of Up
- \*InduBhushan Vs State Of Up

### **Suggested Reading:**

1. Maurya R.R., Uttar Pradesh Land Laws, Central Law Publications, Allahabad.
2. Singh C.P., Uttar Pradesh Land Laws, Central Law Agency, Allahabad.

## LAW OF BANKING AND NEGOTIABLE INSTRUMENTS

**Sub. Code: LLB 305**

**L -4, C -4**

### **Course Objectives**

- Grasp the basic principles and regulations governing banking law.
- Study the roles, duties, and obligations of banks and financial institutions.
- Understand the legal aspects of negotiable instruments like cheques, promissory notes, and bills of exchange.
- Explore the processes of transferring, negotiating, and enforcing negotiable instruments.
- Apply banking law and negotiable instrument principles to practical financial situations and disputes.

### **Unit-I:**

History of the Banking Regulation Act — Salient features — Banking Business and its importance in modern times.

### **Unit-II:**

Relationship between Banker and Customer — Debtor and Creditor Relationship — Fiduciary Relationship — Trustee and Beneficiary.

### **Unit-III:**

Cheques — Crossed Cheques — Account Payee — Banker's Drafts — Dividend Warrants — Postal order and money orders — Travelers cheques and circular notes.

### **Unit-IV:**

The Paying Banker — Statutory protection to Bankers — Forgeries—Collecting Banker.

### **Unit-V:**

Banker's lien and set off. -- Advances - Pledge - Land - Stocks - Shares - Life Policies.

### **Suggested Readings:**

1. Tannan: *Banking Law & Practice in India*, 18th Edn., Orient Law House, New Delhi.
2. Avtar Singh: *Negotiable Instruments*, 3rd Edn., Eastern Book Company, Lucknow, 1997.
3. P.N.Varshney: *Banking Law & Practice*, 17th Edn. Sultan Chand & Sons, New Delhi.
4. Taxman: *Law of Banking*, India Law House

## ALTERNATE DISPUTE RESOLUTION

Sub. Code: LLB 307

L -4, C -4

### Course Objectives

- Grasp the fundamental concepts and techniques of alternative dispute resolution (ADR).
- Explore different ADR methods such as mediation, arbitration, and negotiation.
- Understand the legal framework surrounding ADR and its enforceability.
- Examine the benefits and limitations of resolving disputes outside traditional court proceedings.
- Apply ADR practices to practical situations and conflict resolution cases.

The written examination of this paper will be for 50 marks and the remaining 50 marks for record and *viva voce*. There shall be classroom instruction on the following topics:

### Unit-I:

Alternate Dispute Resolution — Characteristics — Advantages and Disadvantages—Unilateral — Bilateral — Triadic (Third Party) Intervention — Techniques and processes – Negotiation.

### Unit-II:

The Arbitration and Conciliation Act, 1996 — Historical Background and Objectives of the Act — Definitions of Arbitration, Arbitrator, Arbitration Agreement -- Appointment of Arbitrator — Termination of Arbitrator -- Proceedings in Arbitral Tribunal -- Termination of Proceedings — Arbitral Award -- Setting aside of Arbitral Award — Finality and Enforcement of Award — Appeals — Enforcement of Foreign Awards.

### Unit-III:

Other Alternative Dispute Resolution Systems —Tribunals -- Lokpal and Lokayukta — Lok Adalats — Family Courts.

### Practical Exercises (30 marks)

(a) The students are required to participate in 5 (five) simulation proceedings relating to Arbitration, Conciliation, Mediation and Negotiation. Participation in each such simulation proceeding shall be evaluated for a maximum of 4 (four) marks (Total 5x4=20marks).

(b) Students are required to attend and observe the proceedings of Lok Adalats, Family Courts, Tribunals and other ADR Systems. Each student shall record the above observations in the diary which will be assessed. Record submitted by the student shall be evaluated for 10 marks by the teacher concerned. The Records of the students duly certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University before the commencement of the theory examinations

**Viva- voce (20marks):** There shall be viva-voce examination on the above components. The Viva-voce Board consisting of (i) Principal of the College/the teacher concerned (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law, and (iii) an advocate with 10 years' experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.

**Note: Attendance of the students in all the four components of the paper (written examination, participation in simulation proceedings, submission of record and attendance in viva) shall be compulsory.**

**Suggested Readings:**

1. O.P. Tiwari: *The Arbitration and Conciliation Act* (2nd Edition): Allahabad Law Agency.
2. Johar's: *Commentary on Arbitration and Conciliation Act, 1996*: Kamal Law House.
3. Acharya N.K.: *Law relating to Arbitration and ADR*, Asia Law House, Hyderabad
4. Tripathi S.C.: *Arbitration, Conciliation and ADR*, Central Law Agency, Allahabad.
5. Avatar Singh: *Arbitration and Conciliation*, Eastern Law Book House, Lucknow.



## PROFESSIONAL ETHICS AND PROFESSIONAL ACCOUNTING SYSTEM

**Sub. Code: LLB 309**

**L -4, C -4**

### **Course Objectives**

- Understand the core principles of professional ethics in legal and business practices.
- Learn the rules and standards governing professional conduct in various industries.
- Study the importance of ethical decision-making in the workplace.
- Explore the structure and functioning of professional accounting systems.
- Apply ethical principles and accounting practices to real-world professional scenarios.

The written examination of this paper will be for 50 marks and the remaining 50 marks for record and *viva voce*. There shall be classroom instruction on the following topics:

**Unit-I:** Development of Legal Profession in India — The Advocates Act, 1961 — Right to Practice — a right or privilege? - Constitutional guarantee under Article 19(1) (g) and its scope — Enrolment and Practice.

**Unit-II :** Seven lamps of advocacy — Advocates duties towards public, clients, court, and other advocates and legal aid.

**Unit-III:** Disciplinary proceedings — Professional misconduct — Disqualifications — Functions of Bar Council of India/State Bar Councils in dealing with the disciplinary proceedings.

**Unit-IV:** Accountancy for Lawyers — Nature and functions of accounting — Important branches of accounting .

**Record (30 marks):** Each student shall write 50 selected opinions of the Disciplinary Committees of Bar Councils and 10 major judgments of the Supreme Court of India in the Record. The Record shall be evaluated for 30 marks by the teacher concerned. The Records of the students duly certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University before the commencement of the theory examinations.

**Viva- voce (20marks):** There shall be viva-voce examination on the above components. The Viva-voce Board consisting of (I) Principal of the College/the teacher concerned (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law, and (iii) an advocate with 10 years' experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.

**Note: All the three components of the paper (written examination, submission of record and attendance in viva) shall be compulsory.**

**Suggested Readings:**

1. Myneni S.R.: Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Asia Law House, Hyderabad.
2. Gupta S.P.: Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Asia Law House, Hyderabad.
3. Kailash Rai: Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Allahabad Law Agency.

# **Semester VI**

**Course Objectives**

- Develop advanced proficiency in legal English for effective communication.
- Learn to draft and interpret complex legal documents and contracts.
- Enhance skills in legal writing, including memoranda, briefs, and petitions.
- Understand the use of legal terminology and language in different legal contexts.
- Apply legal language skills to practical situations in law practice and research.

**Unit I: Meaning and uses of legal terms**

**Commonly used Urdu words in courts**

eqn~nbZ] tkfeu] tokcnkok] eqalfje] xokg] nkok] bDtkbZ] lihuk] gtkZuk] [kpkZ] jkthukek] fgckukek] oknh] izfroknh] bdjkjukek] dkfrc] btjk] et:c] eQ:j] fpV~Bhet:ch] rLdj] Fkkuk&ggtk] jkstukepkvke] eqgfjZj] QnZcjkenxh] ekyeqdnek] dyecanc;ku] gyQukek] odkyruek] fudkgukek] iSjksdkj] ltk;kchokjaV] [kpkZ , ikunku] esgj] gd "kqQk] x"r] ckfry] Qkfln] bfRryk] eqfYte] eqtfje] ltk;k¶rk] rkthjkr , fgan] eqofDdy] cSukek] c;kukgd&tkSft;r] olh;r] jgu] btc] [;kj&my&cqywx] fgtkur] oDQ] uQdk] f[kyor&my&lghg] gqnwn&,&njck] rLnhd] f"uk[r

**Commonly used Latin terms in courts**

Ab initio', Res judicata, Res- subjudice, Adhoc, Adinfinitum, Adinterim, Adjourn sine die, Ad litem, Advalorem, Alibi, Aliter, Almamater, Amicus Curiae, Animus , Animus possidendi, Alumini, Antimeridiam, Bonafide, Bona Vacantia, Causecausans, Coram non judice, Corpus Possessionis, Custodia Legis, Composmentis, Cypress, Defacto, DeJure, Denovo, Donation mortis cause, Enventresamere, Enroute, Exofficio, Exgratia, Exparte, Ex post facto, Factum valet, Femesole, Filius nullius, In forma pauperis, Ibid, Inlimine, Inmemoriam, Inparimaterial, Intelligible differentia, Interalia, Interse, Ipsojure, Intoto, Ipsofacto, Ininvitum, Inlocoparentis, Inpais, Inpari delicto, potio rest condition possidentis (or defendentis), In rem, Intervivos, Intra-vires, Justertii, Juscivile, Jusdivinum, LexFori, Lex Loci delicti, Lispendens, Locusstandi, Malafide, MensRea, Modusoperandi, Modus Vivendi, Non compos mentis, Nonfeasance, Nudum Pactum, Onus probandi, Pacta Sunt Servanda, Pari Passu, Pendente lite, Per annum, Per capita, Per diem, Per mensem, Per stripes, Persona non grata.

**Unit II: Legal maxims**

1. Absoluta sententia expositore non-indiget
2. A bundanscautela non nocet.
3. Actio-personalismi moritur-cum persona
4. Actori incumbit onus probandi
5. Actus curiae neminem gravabit
6. Actus dei nemini facit injuriam
7. Actus reus
8. Actus legis nemini est damnosus

9. Actus non-facit reum nisi mens sit rea
10. Ejusdem Generis
11. Exturpi causa non oritur actione
12. Noscitur a sociis
13. Novus actus interveniens
14. Respondent superior
15. Falsus in uno falsus in omnibus
16. Acquitus sequitur legem
17. Allegans contraria non est audiendus
18. Audi alteram partem
19. Caveat emptor
20. Damnum sine injuria
21. De minimis non curat lex
22. Dolus malus pactum se non servabit
23. Delegates non potest delegare
24. Fiat Justitia ruat caelum

### **Unit III: Paragraph & Precise Writing of Legal Texts**

### **Unit IV: Writing of Moot Memorials**

#### **Suggested Reading:**

1. Myneni S.R., Legal language and Legal Writing, Central Law Agency, Allahabad.
2. Jain R.L., Legal Language, Central Law Agency, Allahabad.
3. Prasad Anirudh, Legal Language, Central Law Publications, Allahabad.

## INFORMATION TECHNOLOGY LAW

Sub. Code: LLB 304

L -4, C -4

### Course Objectives

- Understand the fundamental principles of information technology law.
- Explore the legal aspects of cybersecurity, data protection, and privacy.
- Study intellectual property issues related to technology, software, and digital content.
- Learn about e-commerce regulations and online contracts.
- Apply IT law principles to contemporary legal challenges in the digital world.

### Unit-I

**Concept of Information Technology and Cyber Space-** Interface of Technology and Law -Jurisdiction in Cyber Space and Jurisdiction in traditional sense - Internet Jurisdiction - Indian Context of Jurisdiction.

### Unit-II

**Information Technology Act, 2000** - Aims and Objects — Overview of the Act – Jurisdiction - Electronic Governance – Legal Recognition of Electronic Records and Electronic Evidence - Digital Signature Certificates - Securing Electronic records and secure digital signatures - Duties of Subscribers - Role of Certifying Authorities - Regulators under the Act - The Cyber Regulations Appellate Tribunal.

### Unit-III

**E-Commerce** - UNCITRAL Model - Legal aspects of E-Commerce - Digital Signatures - Technical and Legal issues - E-Commerce, Trends and Prospects - E-taxation, E-banking, online publishing and online credit card payment - Employment Contracts - Contractor Agreements, Sales, Re-Seller and Distributor Agreements.

### Unit-IV

**Cyber Law and IPRs**-Understanding Copy Right in Information Technology - Software - Copyrights vs Patents debate - Authorship and Assignment Issues - Copyright in Internet - Multimedia and Copyright issues - Software Piracy –Patents - Understanding Patents - European Position on Computer related Patents - Legal position of U.S. on Computer related Patents - Indian Position on Computer related Patents –Trademarks - Trademarks in Internet.

### Unit-V

**Cyber Crimes** - Meaning of Cyber Crimes – Different Kinds of Cybercrimes – Cybercrimes under IPC, Cr.P.C and Indian Evidence Law - Cybercrimes under the Information Technology Act,2000 - Cybercrimes under International Law.

### Suggested Readings:

1. Kamlesh N. & MuraliD.Tiwari(Ed), *IT and Indian Legal System*, Macmillan India Ltd, New Delhi
2. K.L.James, *The Internet: A User's Guide* (2003), Prentice Hall of India, New Delhi
3. Chris Reed, *Internet Law-Text and Materials*, 2nd Edition, 2005, Universal Law Publishing Co., New Delhi

## LAW RELATING TO WOMEN

Sub. Code: LLB 306

L -4, C -4

### Course Objectives

- Understand the legal protections and rights available to women under various laws.
- Explore the laws addressing gender-based violence and discrimination.
- Study the legal framework for women's rights in areas such as marriage, divorce, and inheritance.
- Learn about the role of laws in promoting gender equality and social justice.
- Apply legal principles related to women's rights to real-life situations and legal issues.

### Unit-I:

Historical background and status of women in ancient India — Constitutional Provisions and gender justice.

### Unit-II:

Laws relating to marriage, divorce and succession and maintenance under the relevant personal laws with special emphasis on women.

### Unit-III:

Special provisions relating to women under the Indian Evidence Act, 1872 — Offences against women under Indian Penal Code - outraging the modesty of women -sexual harassment – rape – bigamy - mock and fraudulent marriages – adultery - causing miscarriage - insulting women etc.

### Unit-IV:

Socio-Legal position of women and the law — Dowry Prohibition Act, 1961, Medical Termination of Pregnancy Act — Law relating to the Pre Natal Diagnostic Techniques (Regulation and Prevention of Misuse) and Sex selection.

### Unit-V:

Relevant provisions relating to women under Maternity Benefit Act, 1961, Factories Act and other Labour & Industrial Laws — Position of Women under International instruments — Salient features of Convention for Elimination of all forms of Discrimination Against Women (CEDAW) — International Covenant on Civil and Political Rights.

### Suggested Readings:

1. S.P. Sathe: *Towards Gender Justice*.
2. Dr. Vijay Sharma: *Protection to woman in Matrimonial home*
3. Dr. Sarojini Saxena: *Femijuris*(Law relating to Women in India)
4. Dr. Archana Parsher: *Women and Social Reform*
5. Dr. Paras Diwan: *Dowry and protection to married women*
6. Mary Wollstonecraft: *A Vindication of the rights of women*.

## HUMAN RIGHTS LAW

Sub. Code: LLB 308

L -4, C -4

### Course Objectives

- Comprehend the key concepts and structures of human rights law.
- Analyse international and national legal protections for human rights.
- Investigate the roles of human rights institutions and enforcement processes.
- Learn about the legal remedies for addressing human rights violations.
- Apply human rights legal principles to current global issues and case studies.

### Unit-I

Meaning and definition of Human Rights - Evolution of Human Rights - Human Rights and Domestic Jurisdiction

### Unit-II

Adoption of Human Rights by the UN Charter - U.N. Commission on Human Rights - Universal Declaration of Human Rights.

### Unit-III

Regional Conventions on Human Rights - European Convention on Human Rights - American Convention on Human Rights.

### Unit-IV

International Conventions on Human Rights - Genocide Convention, Convention against Torture, CEDAW, Child Rights Convention, Convention on Statelessness, Convention against Slavery, Convention on Refugees.

### Unit-V

Human Rights Protection in India - Human Rights Commissions - Protection of Human Rights Act - National Human Rights Commission (NHRC).

### Suggested Readings:

1. P.R. Gandhi (ed): *Blackstone's International Human Rights Documents*, Universal Law Publishing Co. Delhi.
2. Richard B. Lillich and Frank C. Newman: *International Human Rights - Problems of Law and Policy*, Little Brown and Company, Boston and Toronto.
3. Frederick Quinn: *Human Rights and You*, OSCE/ ODIHR, Warsaw, Poland
4. T.S. Batra: *Human Rights – A Critique*, Metropolitan Book Company Pvt. Ltd., New Delhi.
5. Dr.U. Chandra: *Human Rights*, Allahabad Law Agency Publications, Allahabad.



## LAW OF INVESTMENTS AND SECURITIES

Sub. Code: LLB 310

L -4, C -4

### Course Objectives

- Grasp the core principles and frameworks of human rights law.
- Examine international and national legal tools that safeguard human rights.
- Understand the function of human rights bodies and enforcement mechanisms.
- Study the legal recourse available for violations of human rights.
- Apply human rights law to modern global challenges and legal situations.

### Unit-I:

Administration of Company Law in relation to issue of prospectus and shares -- membership and share capital.

### Unit-II:

Debentures - Kinds of Debentures and Charges – Dividend -- Inter-Corporate.

### Unit-III:

Basic features of the Security Contracts (Regulation) Act, 1956 — Recognition of Stock Exchanges – Regulation of Contracts and option in securities.

### Unit-IV:

Basic features of the Security and Exchange Board of India Act, 1992 — Basic features of the Act — Establishment of SEBI -- Functions and Powers of SEBI -- Powers of the Central Government under the Act -- Guidelines for disclosure -- Investors Protection.

### Unit-V:

Non-Banking Financial Institutions - Classification and Law Relating to NFBCs.

### Suggested Readings:

1. Avatar Singh: *Company Law*, 10th Edn. (Eastern Book Company, 1991).
2. *A Guide to Companies Act* by Ramaiah - Wadhwa Publications.
3. NavneetJyothi and Rajesh Gupta, *Practical Manual to Non Baking Financial Companies*, Taxman's Publications.
4. Ananta Raman: *Lectures on Company Law*, Wadhwa and Company.
5. Tandon M.P.: *Company Law*, Allahabad Law Agency, Allahabad.

## **DRAFTING, PLEADINGS AND CONVEYANCING**

**Sub. Code: LLB 312**

**L -1,P-6, C -4**

### **Course Objectives**

- Learn the essential principles and techniques of legal drafting.
- Understand the process of drafting pleadings for various types of legal cases.
- Explore the key components and legal requirements of conveyancing documents.
- Study the rules governing the preparation and filing of legal petitions and motions.
- Apply drafting, pleading, and conveyancing skills to real-life legal scenarios

Class-room instruction and simulation exercises on the following items shall be extended.

### **Unit-I**

**Drafting:** General Principles of Drafting and relevant Substantive Rules shall be taught.

### **Unit-II**

**Pleadings: (i)** Civil—Plaint, Written Statement, Interlocutory Application, Original Petition, Affidavit, Execution Petition, Memorandum of Appeal and Revision.

(ii) Petition under Article 226 and 32 of the Constitution of India - Drafting of Writ Petition and PIL Petition.

### **Unit-III**

**Conveyancing:** Sale Deed, Mortgage Deed, Lease Deed, Gift Deed, Promissory Note.

### **Practical Exercises**

Apart from teaching the relevant law, the course includes not less than 15 (fifteen) practical exercises in drafting of pleadings carrying a total of 45 marks (3 marks for each) and 15 (fifteen) exercises in conveyancing carrying another 45 marks (3 marks for each exercise) and remaining 10 marks for viva-voce.

These 30 exercises shall be recorded. Each student shall be served with different problems for the purpose of exercise. These exercises shall be assessed and marks may be allotted.

These exercises shall be evaluated by a common committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, O.U.; and (iii) an Advocate with 10 years' experience at the Bar. The same committee will also conduct viva-voce on the above concepts. The proceedings of the viva-voce shall be recorded.

### **Note:**

- 1. Attendance of the students for viva-voce shall be compulsory.**
- 2. The above records certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University for Further Verification**

**Suggested Readings:**

1. R.N. Chaturvedi: *Pleadings and Conveyancing*, Central Law Publications.
2. De Souza: *Conveyancing*, Eastern Law House.
3. Tiwari: *Drafting, Pleading and Conveyancing*, Central Law Agency.
4. Mogha: *Indian Conveyancer*, Eastern Law House.
5. Mogha: *Law of Pleadings in India*, Eastern Law House.
6. Shiv Gopal: *Conveyancing, Precedents and Forms*, Eastern Book Company

## **MOOT COURTS, OBSERVATION OF TRIAL, PRE-TRIAL PREPARATIONS AND INTERNSHIP**

**Sub. Code: LLB 314**

**L -0, P-8, C -4**

### **Course Objectives**

- Understand the fundamentals of moot court practice and courtroom procedures.
- Learn the techniques for observing and analysing real court trials.
- Study the importance of pre-trial preparation, including case research and strategy development.
- Gain hands-on experience in legal practice through internships and exposure to real-world cases.
- Develop practical skills in legal argumentation, trial advocacy, and client representation.

This paper has three components of 30 marks each and viva-voce for 10 marks.

**(A) Moot Court (30 marks):** Every student is required to participate in at least three moot courts in the VI Semester with 10 marks for each. The moot court work will be on an assigned problem and it will be evaluated for 5 marks for written submissions and 5 marks for oral advocacy.

Marks will be given on the basis of written submission and oral advocacy. Written submissions shall include brief summary of facts, issues involved, provisions of laws and arguments, citation, prayer, etc. Marks for oral advocacy may be awarded for communication skills, presentations, language, provisions of law; authorities quoted, court manners, etc. Written Memorials submitted by the students shall be kept by the College for Further Verification.

The performance of student in the moot court shall be evaluated by a committee consisting of (i) Principal of the College (ii) an Advocate with 10 years' experience at the Bar; and (iii) the teacher concerned.

**(B) Observance of Trial in two cases, one Civil and one Criminal (30 marks):**

Students are required to attend courts to observe at least one civil and one criminal case. They shall maintain a record and enter the various steps observed during their attendance on different days in the court assignment. The Court Observation Record submitted by the students should be evaluated by a committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, and (iii) an Advocate with 10 years' experience at the Bar and average be taken. Court attendance shall be compulsory and attendance has to be recorded in a register kept therefor. This may be carried under the supervision of a teacher of the college. This scheme will carry 30 marks.

**(C) Interviewing Techniques and Pre-Trial Preparations and Internship Diary (30 marks):**

Each student should observe two 'interview sessions' of clients either in the Lawyer's Office or in the Legal Aid Office and record the proceedings in a diary, which will carry 15 marks.

Each student has to further observe the preparation of documents and court papers by the Advocate and the procedure for the filing of the suit / petition. This shall be recorded in the diary which will carry 15 marks.

The diary shall clearly indicate the dates on which the above observations are made and they shall be authenticated by the advocate concerned.

Evaluation of the above diary shall be made by the committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, O.U.; and (iii) an Advocate with 10 years' experience at the Bar and average be taken.

**(D)Viva-voce (10 marks):** There shall be viva-voce examination on all the above three components. The Viva-voce Board consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law; and (iii)an advocate with 10 years' experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.

**Note:**

- 1. Attendance of the students in all the four components of the paper shall be compulsory.**
- 2. The above records, diary certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University for Further Verification.**

**Suggested Readings:**

1. Dr. Kailash Rai: *Moot Court Pre-Trial Preparation and Participation in Trial Proceedings*, Central Law Publication.
2. AmitaDanda: *Moot Court for Interactive Legal Education*, Gogia Law Agency, Hyderabad.
3. Blackstone's: *Books of Moots*, Oxford University Press.
4. Mishra: *Moot Court Pre-Trial Preparation and Participation in Trial Proceedings*, Central Law, Allahabad.



**Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

**School of Law and Constitutional Studies**

**Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Law (BA LLB) Five Year Integrated Programme (Semester Pattern)**

**(w.e.f. session 2014-15)**

**Revised and approved in the year 2022 (17<sup>th</sup> meeting Board of Studies)**

## **PEO**

### **Programme Educational Objectives (PEO's)**

- **PEO 1** Legal Expertise: Provide foundational knowledge of law and social sciences.
- **PEO 2** Professional Skills: Develop competence for diverse legal careers.
- **PEO 3** Ethics and Leadership: Cultivate ethical values and leadership in advocacy.
- **PEO 4** Lifelong Learning: Promote research and continuous education in law.
- **PEO 5** Social Responsibility: Encourage contributions to justice and societal welfare.

## **PSO**

### **Programme Specific Objectives (PSO's)**

- **PSO 1** Develop a comprehensive understanding of substantive and procedural laws, constitutional principles, and their application to address complex legal issues in diverse contexts.
- **PSO 2** Integrate knowledge of humanities, social sciences, and law to analyze societal problems, foster critical thinking, and promote social justice.
- **PSO 3** Prepare for diverse legal careers by fostering skills in legal research, drafting, advocacy, and negotiation, while adhering to ethical and professional standards.
- **PSO 4** Cultivate an understanding of law as an instrument of social change, promoting equality, human rights, and sustainability in legal practices and policymaking.
- **PSO 5** Equip students to navigate the global legal environment, adapt to evolving legal challenges, and pursue continuous professional development to meet emerging societal needs.

## **POO**

### **Programme Outcome Objectives (POO's)**

- **POO 1** To acquire and apply legal knowledge to the complex socio-legal problems.
- **POO 2** To make students eligible to practice law in courts and industry.
- **POO 3** To engender professional skills required for legal practice such as argument, pleading, drafting, conveyancing etc.
- **POO 4** To conduct themselves with the highest professional ethics standards in legal profession
- **POO 5** To develop skills in legal research, legal reasoning and aptitude, and apply it during the Programme and profession.

## **TEACHING SCHEME**

### **BA.LL.B First Year**

**(First Semester)**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
BL – 101	English – I	4	0	0	4
BL-101A	Communication Skills in English-I				
BL-101B	Personality Development-I				
BL-101C	Soft Skills-I				
BL103	History – I	4	0	0	4
BL103A	Sociology-I				
BL103B	Understanding Contemporary Social Issues - I				
BL-103	Social Institutions In India-I				
BL – 105	Political Science – I	4	0	0	4
BL-105A	Society and Gender-I				
BL-105B	Comparative Politics-I				
BL-105C	Political Theories-I				
BL – 107	Law of Torts Including M. V. Act & Consumer Protection Laws	4	0	0	4
BL – 109	Law of Contract – I	4	0	0	4
BL-111	Economics – I	4	0	0	0
BL-111A	Indian Economy-I				
BL-111B	Economics of Money and Banking/				
BL-111C	Principle of Sustainable Finance-I				
	Total	24	0	0	24

**Second Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
BL – 102	English – II	4	0	0	4
BL-102A	Communication Skills in English II				
BL-102B	Personality Development-II				
BL-102C	Soft Skills-II				
BL – 104	History – II	4	0	0	4
BL-104A	Sociology-II				
BL-104B	Understanding Contemporary Social Issues-II				
BL-104C	Social Institutions In India-II				
BL – 106	Political Science – II	4	0	0	4
BL-106A	Society and Gender-II				
BL-106B	Comparative Politics-II				
BL-106C	Political Theories-II				



BL – 108	Constitutional Law – I	4	0	0	4
BL – 110	Law of Contract – II	4	0	0	4
BL—112	Economics – II	4	0	0	0
BL—112A	Indian Economy-II				
BL—112B	Economics of Money and Banking-II				
BL—112C	Principles of Sustainable Finance-II				
	Total	24	0	0	24

**BA.LL.B Second Year**

**Third Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
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BL –201	Constitutional Law – II	4	0	0	4
BL –203	Legal Methods	4	0	0	4
BL –205 BL –205A BL –205B BL –205C	Political Science – III Society and Gender-III Comparative Politics-III Political Theories-III	4	0	0	4
BL –207	History – III/ Sociology-III/Understanding Contemporary Social Issues-III/Social Institutions In India-III	4	0	0	4
BL –209 BL-209A BL-209B BL-209C	Microeconomics –I Economic Sociology-I Economic Geography-I Economic History-I	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

#### Fourth Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-202	Human Rights Law	4	0	0	4
BL-204	Legal History	4	0	0	4
BL-206	Law of Evidence	4	0	0	4
BL-208	Law of Crimes (I.P.C.)	4	0	0	4
BL-210 BL-210A BL-210B BL-210C	Microeconomics- II Economic Sociology-II Economic Geography-II Economic History-II	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

**BA,LL.B Third Year**

**Fifth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-301 BL-301A BL-301B BL-301C BL-301D	Hindi-I Spanish-I German-I Chinese-I French-I	4	0	0	4
BL-303	Family Law-I (Hindu Law)	4	0	0	4
BL -305	Civil Procedure Code and Law of Limitation	4	0	0	4
BL-307	Criminal Procedure Code and Law of Juvenile Justice and Probation of Offenders	4	0	0	4
BL-309 BL-309A BL-309B	Macroeconomics I Economic Anthropology-I Political Economy-I	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

**BA, LLB Third Year**

**Sixth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL302 BL302A BL302B BL302C BL302D	Hindi-II Spanish-II German-II Chinese-II French-II	4	0	0	4
BL-304	Family Law-II (Muslim Law)	4	0	0	4
BL-306	Legal Language and Legal Writing	4	0	0	4
BL-308	Public International Law	4	0	0	4
BL-310 BL-310A BL-310B	Macroeconomics II Economic Anthropology- II Political Economy-II	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

**BA,LL.B Fourth Year**

**Seventh Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-401	Labor Law-I	4	0	0	4
BL-403	Jurisprudence	4	0	0	4
BL-405	Company Law	4	0	0	4
BL-407	Administrative Law	4	0	0	4
BL-409	(Clinical Paper) Alternate Dispute Resolution	2	0	8	6
	Skill Enhancement Course: Practical (Qualifying course)				
BL-409A	Data Analysis-1				
BL-409B	Computer Programming-1				
BL-409C	Python Programming-1				
BL409D	Leadership and Management-1				
	<b>Total</b>	<b>18</b>	<b>0</b>	<b>8</b>	<b>22</b>

**Eighth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-402	Labor Law-II	4	0	0	4
BL-404	U.P. Land Laws	4	0	0	4
BL-406	Intellectual Property Law	4	0	0	4
BL-406A	Research Methodology				
BL-406B	Publication Ethics and Emerging Trends in Research				
BL-408	Interpretation of Statutes	2	0	0	4
BL-410	Clinical Paper- II: Professional Ethics and Professional Accounting System	2	0	8	6
	<b><u>Skill Enhancement Course: Practical (Qualifying course)</u></b>				
BL-410A	Data Analysis-II				

BL-410B	Computer Programming-II				
BL-410C	Python Programming-II				
BL-410D	Leadership and Management-II				
	<b>Total</b>	<b>18</b>	<b>0</b>	<b>8</b>	<b>22</b>

**BA.LL.B Fifth Year**

**Ninth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-501	Law of Taxation Law	4	0	0	4

BL-505	Environmental Law	4	0	0	4
BL-505A	Public Relations				
BL-505B	Global Politics				
BL-505C	Introduction to Sociology				
BL-507	Law of Banking & Negotiable Instruments	4	0	0	4
BL-509	Clinical Paper-III Drafting, Pleading and Conveyance	2	0	8	6
BL-509A	Body Language-I				
BL-509B	Presentation Skills-I				
BL-509C	Effective Writing Skills-I				
BL-503	Law of Property <b>Total</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
	<b>Total</b>	<b>18</b>	<b>0</b>	<b>8</b>	<b>22</b>

**Tenth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-502	Clinical paper-IV Moot Court, Observation of Trial & Pre Trial Preparation	2	0	8	6
BL-502A	Body Language-II				
BL-502B	Presentation Skills-II				
BL-502C	Effective Writing Skills-II				
BL- 504	Internship ( Lawyer/Law Firms)	4	0	12	10
	<b>Total</b>	<b>6</b>	<b>0</b>	<b>20</b>	<b>16</b>

# **SEMESTER I**

## ENGLISH- I

Subject code: BL -101

L-4, C-4

### Course Objective

- I. Develop Proficiency in English Language Skills
- II. Enhance students' abilities in reading, writing, speaking, and listening in English.
- III. Improve vocabulary and grammar to support effective communication and comprehension.
- IV. Foster an understanding of both formal and informal language usage.

### Unit I:

**Functional Grammar:** Grammar and Vocabulary (as contained in the first two sections of “Better your English – I) \*

**Oral:** Students should be made to speak grammatically correct short sentences using proper vocabulary.

### Unit II:

**Communication:** Meaning, Nature and Importance of Communication, Barriers to Effective Communication, Channels of Communication, Flow of Communication –Downward, Upward, Lateral or Horizontal, Diagonal or Cross-wise.

**Oral:** Students should be asked to speak on different aspects of communication for if the students cannot communicate properly; the purposes of teaching communication are not fulfilled.

### Unit III:

**Requisites of Sentence writing:** Essentials of good sentence construction, sentence structure, kinds of sentence.

**Oral:** Practice in the class regarding sentence construction, use of words in a sentence by filling in the gaps etc.



## **Unit IV:**

### **Reading cultural texts:**

#### **Short- Stories:**

1. Eyes are not here – Ruskin Bond (Non- detailed study)
2. Renunciation – Rabindra Nath Tagore (Non- detailed study)

**ORAL:** Discussion in detail, Critical appreciation, grammatical exercises and making student read the stories and essay so that they develop the reading habits with proper stress, intonation, pronunciation & rhythm.

#### **Suggested Readings**

- **Wren and Martin's High School English Grammar and Composition"** by P.C. Wren & H. Martin
- A comprehensive guide for understanding grammar rules and improving language skills.
- **"A Practical English Grammar"** by A.J. Thomson & A.V. Martinet
- Offers in-depth explanations of English grammar, with exercises for practice.
- **"The Elements of Style"** by William Strunk Jr. and E.B. White
- A concise book on the principles of clear, concise, and effective writing.
- **"English Vocabulary in Use"** by Michael McCarthy and Felicity O'Dell
- A practical guide for improving vocabulary, especially useful for non-native speakers.
- **"The Norton Anthology of English Literature"** by Stephen Greenblatt

# Communication Skills in English

**Subject Code: BL- 101 A**

**L-4, C-4**

## **Course Objectives:**

- To develop proficiency in English communication for academic and professional purposes.
- To enhance listening, speaking, reading, and writing skills.
- To foster confidence in public speaking and group communication.
- To enable effective use of English in diverse social and professional contexts.

## **Unit I: Fundamentals of Communication**

Definition, Process, and Types of Communication  
Barriers to Communication and Overcoming Them  
Essentials of Effective Communication  
Verbal vs. Non-Verbal Communication

## **Unit II: Listening and Speaking Skills**

Listening: Active vs. Passive Listening, Note-Taking Techniques  
Speaking: Pronunciation, Accent, Intonation, and Fluency  
Conversational Skills: Formal and Informal Interactions  
Public Speaking: Speech Preparation, Delivery, and Presentation Skills

## **Unit III: Reading Skills**

Types of Reading: Skimming, Scanning, and Intensive Reading  
Comprehension Strategies  
Critical Reading: Identifying Main Ideas, Arguments, and Logical Flow  
Reading for Professional Purposes: Reports, Articles, and Official Documents

## **Unit IV: Writing Skills**

Basic Grammar and Sentence Structure  
Paragraph Writing: Unity, Coherence, and Cohesion  
Formal Writing: Letters, Emails, and Memos  
Creative Writing: Essays, Stories, and Articles  
Academic Writing: Reports and Research Papers

## **Unit V: Professional Communication**

Resume Writing and Cover Letters  
Group Discussions and Interviews  
Business Communication: Reports, Proposals, and Minutes of Meetings  
Etiquette in Digital Communication: Emails and Social Media

**Suggested Books:**

1. "Communication Skills" by Sanjay Kumar and Pushp Lata
2. "Developing Communication Skills" by Krishna Mohan and Meera Banerji
3. "Business Communication" by Meenakshi Raman and Prakash Singh
4. "Effective Communication Skills" by Dale Carnegie
5. "English Grammar in Use" by Raymond Murphy (for grammar support)

# Personality Development I

**Subject Code: BL- 101B**

**L-4, C-4**

## **Course Objectives:**

- Understand the key components of personality and self-concept.
- Develop effective communication and interpersonal skills.
- Enhance emotional intelligence and self-regulation.
- Foster goal-setting and time management skills.
- Promote self-reflection and personal growth strategies.

## **UNIT 1: Introduction to Personality Development**

Definition and importance of personality development

Components of personality: traits, values, and beliefs

Self-assessment: Understanding your personality type

## **UNIT 2: Self-Awareness**

Identifying strengths and weaknesses

Understanding personal values and beliefs

Practice: Journaling for self-reflection

## **UNIT 3: Effective Communication**

Verbal and non-verbal communication skills

Active listening and feedback

Practice: Communication exercises and role-plays

## **UNIT4: Emotional Intelligence**

Components of emotional intelligence: self-awareness, self-regulation, empathy, social skills

Practice: Emotional awareness activities

## **Suggested Readings:**

- "How to Win Friends and Influence People" by Dale Carnegie  
A classic on interpersonal skills, focusing on building relationships and effective communication.
- "The 7 Habits of Highly Effective People" by Stephen R. Covey  
This book offers principles for personal effectiveness and holistic development.
- "Mindset: The New Psychology of Success" by Carol S. Dweck  
Explores the concept of fixed vs. growth mindsets and how they influence personal development.

## Soft Skills –I

**Subject Code: BL- 101 C**

**L-4, C-4**

### **Course Objectives:**

By the end of this course, participants will be able to:

- Demonstrate effective verbal and non-verbal communication skills.
- Collaborate effectively in diverse teams.
- Apply critical thinking and problem-solving techniques in various scenarios.
- Adapt to changing environments and manage stress.
- Recognize and manage emotions to enhance interpersonal relationships.

### **UNIT 1: Introduction to Soft Skills**

Definition and importance of soft skills

Overview of key soft skills in personal and professional contexts

### **UNIT 2: Communication Skills**

Verbal and non-verbal communication

Active listening techniques

Role-playing exercises to practice communication

### **UNIT 3: Teamwork and Collaboration**

Building effective teams

Roles and responsibilities within a team

Group activities to enhance collaboration

### **UNIT 4: Problem-Solving and Critical Thinking**

Problem identification and analysis

Creative thinking techniques

### **Suggested Readings**

1. "Emotional Intelligence 2.0" by Travis Bradberry and Jean Greaves - This book focuses on understanding and improving emotional intelligence, a key component of effective interpersonal skills.
2. "Crucial Conversations: Tools for Talking When Stakes Are High" by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler - It offers strategies for communicating effectively in high-stakes situations.
3. "How to Win Friends and Influence People" by Dale Carnegie - A classic that covers principles of effective communication and relationship-

# History I

Subject Code: BL -103

L 4, C 4

## Course Objective

- Familiarize students with key historical events: Gain an understanding of important events, figures, and movements in history from various time periods and regions.
- Explore historical themes: Analyse themes such as political systems, economic structures, social movements, wars, ideologies, and cultural developments.
- Study different historical periods and contexts: Understand the causes, consequences, and significance of historical events in different cultural, geographical, and temporal contexts.

### Unit 1

1. Indus Valley Civilization:- Sources of Information Social life, Religious life, Town planning.
2. Vedic Period:- Social, Religious Condition,
- 3:- Varna Ashram System.
- 4:- Status of Women.

### Unit 2

1. Jainism:- Causes for the Religious Upheaval,
- 2:- Teaching of Mahavira & Principal of Jainism.
- 3:- Buddhism:- Rise and Growth,
- 4:- Doctrines of Buddhism, Causes of Downfall.

### Unit 3

- 1:- Mauryan Period:- Art and Architecture Gandhar Art,
- 2:- Mathura Art
- 3:- Gupta Period:- Art, Architecture and Culture.

### Unit 4

- 1:- Post Gupta Temple Architecture.
- 2:- Sculpture and Painting.
- 3:- Rise and Growth of Political Ideas in Ancient India with Special Reference to Kautilya and Manu.

### Unit 5

- 1:- Concept of State and Government in Ancient India.
- 2:- Concept of Justice and Law in Ancient India.

# Sociology-I

**Subject Code: BL- 103 A**

**L-4, C-4**

## **Course Objectives:**

- To introduce students to the foundational concepts and theories of sociology.
- To develop an understanding of the relationship between society, individuals, and institutions.
- To examine social phenomena through sociological perspectives.
- To foster critical thinking about social issues and their relevance to law and society.

## **Unit I: Introduction to Sociology**

Definition, Nature, and Scope of Sociology

Importance and Application of Sociology in Legal Studies

Sociology as a Science: Positivism and its Critique

Relationship with Other Social Sciences

## **Unit II: Basic Concepts**

Society: Characteristics and Types (Tribal, Rural, Urban)

Community, Association, and Institution

Social Structure and Social System

Social Groups: Primary, Secondary, and Reference Groups

## **Unit III: Socialization and Culture**

Socialization: Process, Agents, and Importance

Culture: Meaning, Elements, and Characteristics

Cultural Relativism and Ethnocentrism

Social Norms, Values, and Beliefs

## **Unit IV: Social Stratification**

Definition and Features of Social Stratification

Theories of Social Stratification: Functionalist, Conflict, and Interactionist Perspectives

Forms of Stratification: Caste, Class, Gender, and Race

Social Mobility: Types and Factors Affecting Mobility

## **Unit V: Social Change and Social Control**

Social Change: Meaning, Characteristics, and Factors

Theories of Social Change: Evolutionary, Functionalist, and Conflict

Social Control: Meaning, Types, and Agencies (Formal and Informal)

Law as an Instrument of Social Control and Social Change

## **Suggested Books:**

1. "Sociology" by Anthony Giddens
2. "Introduction to Sociology" by Haralambos and Holborn

3. "Sociology: Principles of Sociology with an Introduction to Social Thought" by C.N. Shankar Rao
4. "An Introduction to Sociology" by Vidya Bhushan and D.R. Sachdeva
5. "Society: An Introductory Analysis" by MacIver and Page

### **Understanding Contemporary Social Issues-I**

**Subject Code: BL- 103 B**

**L-4, C-4**



## **Course Objectives:**

- To provide insights into contemporary social issues and their impact on individuals and society.
- To analyse the causes, consequences, and possible solutions to current societal challenges.
- To develop a sociological understanding of global and local issues through critical perspectives.
- To explore the role of law, policy, and governance in addressing these issues.

### **Unit I: Understanding Social Issues**

Definition, Nature, and Characteristics of Social Issues  
Approaches to Study Social Issues: Sociological, Political, and Economic  
Interconnection of Social Issues with Culture, Politics, and Economy  
Role of Media in Shaping Perceptions of Social Issues

### **Unit II: Poverty and Inequality**

Concept of Poverty: Absolute and Relative Poverty  
Causes and Consequences of Poverty  
Dimensions of Inequality: Economic, Social, and Political  
Government Policies and Programs to Address Poverty and Inequality

### **Unit III: Gender Issues**

Gender Disparities: Patriarchy, Gender Roles, and Stereotypes  
Violence Against Women: Domestic Violence, Harassment, and Trafficking  
LGBTQ+ Rights and Inclusion  
Legal Frameworks and Movements for Gender Equality

### **Unit IV: Unemployment and Education**

Unemployment: Types, Causes, and Impact on Society  
Education and its Role in Social Development  
Issues in Education: Inequality, Dropouts, and Access to Quality Education

### **Unit V: Health and Environment**

Public Health Issues: Malnutrition, Epidemics, and Mental Health  
Environmental Degradation: Deforestation, Pollution, and Climate Change  
Sustainable Development Goals (SDGs) and Global Environmental Efforts  
Role of Law and Policy in Addressing Health and Environmental Challenges

## **Suggested Books:**

1. "Social Problems in India" by Ram Ahuja
2. "Contemporary Social Problems and Issues" by R.M. MacIver and Charles Page
3. "Modernization of Indian Tradition" by Yogendra Singh
4. "Poverty and Famines" by Amartya Sen

5. "Gender Trouble" by Judith Butler

# Social Institutions in India-I

Subject Code: BL- 103 C

L-4, C-4

## Course Objectives:

- To understand the concept, structure, and significance of social institutions in India.
- To analyse the traditional and contemporary roles of various social institutions.
- To examine the changing dynamics of these institutions in the context of modernization and globalization.
- To explore the interrelation of social institutions with law and governance.

## Unit I: Introduction to Social Institutions

Definition, Features, and Functions of Social Institutions

Types of Social Institutions: Family, Religion, Education, Economy, and Polity

Interdependence of Social Institutions

Role of Social Institutions in Indian Society

## Unit II: Family and Kinship

Types of Family: Joint, Nuclear, and Extended Families

Functions and Changing Patterns of Family in India

Kinship: Meaning, Types, and Kinship System in India

Challenges to Family and Kinship: Urbanization, Industrialization, and Migration

## Unit III: Marriage in India

Marriage as a Social Institution: Definitions and Functions

Forms of Marriage: Monogamy, Polygamy, Endogamy, and Exogamy

Customs and Practices Related to Marriage in India

Contemporary Issues: Dowry, Inter-caste and Interfaith Marriages, and Live-in Relationships

## Unit IV: Religion and Caste

Role of Religion in Indian Society: Unity and Diversity in Practices

Major Religious Traditions in India: Hinduism, Islam, Christianity, Sikhism, and Others

Caste System: Origin, Features, and Functions

Caste and Social Mobility: Sanskritization, Westernization, and Reservation Policies

## Unit V: Political and Economic Institutions

Traditional vs. Modern Political Systems in India

Role of Panchayat Raj and Local Governance

Economic Institutions: Land Tenure Systems, Joint Stock Companies, and Cooperatives

Impact of Liberalization, Privatization, and Globalization on Social Institutions

## Suggested Books:

1. "Indian Society: Institutions and Change" by N. Jayaram
2. "Social Change in Modern India" by M.N. Srinivas

3. "Caste in Modern India and Other Essays" by M.N. Srinivas
4. "Family and Kinship in India" by Patricia Uberoi
5. "Religion and Society Among the Coorgs of South India" by M.N. Srinivas

## POLITICAL SCIENCE-I

Sub. Code: BL -105

L-4, C-4

### Course Objective

- Compare political systems across different countries: Understand and compare the political institutions, processes, and cultures in different nations, analysing how context influences the functioning of political systems.
- Study political regimes and transitions: Examine different types of political regimes, such as democratic and authoritarian systems, and analyse how regimes change over time through processes like revolutions, coups, or democratic reforms.
- Investigate political development: Understand the challenges and opportunities faced by countries in the process of political development, democratization, and governance.
- Promote understanding of citizenship: Develop an understanding of the rights and responsibilities of citizens within political systems and how they engage with and influence the political process.

### Unit I: Basic Concepts

Concepts: Politics and Political Science, Nature and scope, Political Thought, Political Theory, Political Philosophy, Political Ideology

### Unit II: Approaches to the study of Political Science

Normative, Historical, Behavioural Relation of Political Science with other Social Sciences

### Unit III: Concept of State

State: Meaning, Elements, Theories of origin of State

### Unit IV: Concepts and types of

Sovereignty, Liberty, Equality

### Unit V: Concepts and types of:

Justice, Citizenship ,

### Suggested Readings:

1. Political Theory, Asirvatham, S.Chand.
2. O.P. Gauba, An Introduction to Political Theory, Macmillan
3. J.C. Johari, Principle of Modern Political Science, Sterling, Delhi.
4. Andrew Heywood, Politics, Palgrave Foundation, New York.
5. S. P. Varma, Modern Political Theory, New Delhi, Vikas .
6. C.E.M Joad, Political Theory, Oxford: Clarendon Press

## **Society and Gender-I**

**Subject Code: BL- 105 A**

**L-4, C-4**

### **Course Objectives:**

- To understand the concept of gender and its social construction.
- To explore the relationship between gender and various social institutions.
- To analyse the impact of patriarchy, gender roles, and stereotypes on individuals and society.
- To examine the intersectionality of gender with caste, class, and other social categories.
- To introduce students to feminist theories and movements.

### **Unit I: Understanding Gender**

Concept of Gender: Difference between Sex and Gender

Gender as a Social Construct

Masculinity and Femininity: Characteristics and Expectations

Intersectionality: Gender, Caste, Class, and Ethnicity

### **Unit II: Theories of Gender**

Feminist Theories: Liberal, Radical, Marxist, and Socialist Feminism

Postmodern Feminism and Queer Theory

Patriarchy: Meaning, Characteristics, and Impact on Society

Critique of Gender Binaries

### **Unit III: Gender and Social Institutions**

Family: Gender Roles and Division of Labor

Education: Gender Disparities and Access to Opportunities

Workplace: Gender Discrimination, Glass Ceiling, and Pay Gap

Media: Representation of Gender in Films, Advertisements, and Social Media

### **Unit IV: Gender and Violence**

Understanding Gender-Based Violence: Types and Forms (Domestic Violence, Sexual Harassment, and Honor Crimes)

Laws and Policies Addressing Gender-Based Violence in India

Role of Civil Society and NGOs in Combating Gender Violence

Cultural Practices and Their Impact on Gender (Dowry, Female Infanticide, and Child Marriage)

## **Unit V: Gender and Social Change**

Role of Feminist Movements in India and Abroad

Legal and Policy Frameworks for Gender Equality in India (Reservations, Maternity Benefits, and Workplace Policies) Role of Education, Technology, and Social Media in Challenging Gender Stereotypes ,Case Studies of Inspirational Women Leaders and Gender Activists

### **Suggested Books:**

1. "Gender and Society in India" by T.K. Oommen and C.N. Venugopal
2. "Gender: The Basics" by Hilary M. Lips
3. "Patriarchy and the Subordination of Women" by Kamla Bhasin
4. "The Second Sex" by Simone de Beauvoir
5. "Gender Trouble" by Judith Butler
6. "Feminism in India" by Maitrayee Chaudhuri

# Comparative Politics-I

**Subject Code: BL- 105 A**

**L-4, C-4**

## **COURSE OBJECTIVES**

- Analyse global political systems.
- Compare democratic and authoritarian regimes.
- Study political institutions globally.
- Understand political culture and behaviour.
- Develop comparative analytical skills

### **Unit 1: Introduction to Comparative Politics**

Definition and Scope of Comparative Politics

Understanding Comparative Politics as a Subfield of Political Science

Evolution of Comparative Politics as a Discipline

Importance of Comparative Analysis

Significance of Studying Different Political Systems

Approaches to Comparative Politics (Institutionalism, Behaviourism, Structuralism)

### **Unit 2: Approaches and Methods in Comparative Politics**

Traditional vs. Modern Approaches

Institutional and Legal Approaches

Behaviourism and Post-Behaviourism

Contemporary Approaches

Structural-Functional Approach

Political Economy Approach

Dependency and World Systems Theory

Methods of Comparative Analysis

Case Study Method

Comparative Historical Analysis

Quantitative and Qualitative Methods

### **Unit 3: Political Systems and Typologies**

Types of Political Systems

Democratic Systems

Authoritarian and Totalitarian Regimes

Classification of Political Systems

Presidential vs. Parliamentary Systems

Federal vs. Unitary Systems

Hybrid Regimes

Semi-Presidential Systems



#### **Unit 4: Political Culture and Political Socialization**

Political Culture

Definition and Components of Political Culture

Types of Political Culture (Parochial, Subject, Participant)

Political Culture in Different Regimes (Democratic, Authoritarian)

Political Socialization

Agents of Socialization (Family, Education, Media, Political Parties)

Impact of Political Socialization on Political Behavior

#### **Unit 5: Module 5: Political Parties and Party Systems**

Political Parties

Definition and Functions of Political Parties

Evolution of Party Systems

Party Systems

One-Party, Two-Party, and Multi-Party Systems

Cleavages and Party Formation

The Role of Ideology in Party Politics

#### **Suggested Readings:**

- **"Comparative Politics: An Introduction"** by Rod Hague and Martin Harrop
- **"Essentials of Comparative Politics"** by Patrick H. O'Neil
- **"Comparative Government and Politics"** by Rod Hague and Martin Harrop
- **"The Political System"** by David Easton
- **"Patterns of Democracy"** by Arend Lijphart
- **"Democracy and Its Critics"** by Robert Dahl

## **POLITICAL THEORIES -1**

**Subject Code: BL- 105 C**

**L-4, C-4**

### **COURSE OBJECTIVES**

- To introduce students to classical and modern political theory.
- To analyse the evolution of political thought from ancient to modern times.
- To engage with the ideas of key political theorists and their relevance today.
- To critically examine the concepts of power, justice, freedom, and governance.

### **Unit 1: Introduction to Political Theory**

**What is Political Theory?** Definition, Nature, and Scope

**Normative vs Empirical Political Theory**

**Key Concepts in Political Theory:** Power, Authority, Justice, Liberty, Equality, Democracy, State

### **Unit 2: Ancient & Classical Political Thought**

Plato: The Republic, Ideal State, Philosopher-King, Justice

Aristotle: Politics, Classification of Governments, Citizenship, Virtue, Best Political Systems

Cicero and Roman Political Thought: The mixed constitution, Law and Justice

Confucianism and Eastern Political Thought: Moral governance, hierarchy, and virtue

### **Unit 3: Medieval Political Thought**

St. Augustine: City of God, Concept of the State, Justice in a Christian context

St. Thomas Aquinas: The relationship between the church and state, Natural Law

Islamic Political Thought: Al-Farabi, Ibn Khaldun - Ideal ruler, Justice, Philosophy of history

#### **Unit 4: Renaissance and Early Modern Political Thought**

Niccolò Machiavelli: Realism, political power, and statecraft

Thomas Hobbes: Social contract, state of nature, absolute sovereignty

John Locke: Natural rights, property, limited government, and constitutionalism

#### **Unit 5: Liberalism and Utilitarianism**

Jeremy Bentham: Utilitarianism and the principle of utility

Critique of natural rights theory

#### **Suggested Readings:**

1. Sabine, George H. A History of Political Theory
2. Ebenstein, William. Great Political Thinkers
3. Nelson, Brian. Western Political Thought
4. Plato. The Republic
5. Hobbes, Thomas. Leviathan
6. Locke, John. Two Treatises of Government
7. Marx, Karl and Friedrich Engels. The Communist Manifest

## Law of Torts Including M.V. Act and Consumer Protection laws

Sub. Code: BL – 107

L – 4, C – 4.

### Course Objectives

- Introduce the fundamentals of tort law, provide students with an overview of what torts are and their role in civil law.
- This includes understanding the difference between torts and crimes, as well as the purpose of tort law in compensating victims and deterring harmful conduct.
- Examine different types of torts: Explore various categories of torts, including intentional torts (e.g., battery, assault, false imprisonment), negligence (e.g., duty of care, breach, causation), and strict liability torts (e.g., product liability).
- Study tort elements: Understand the elements that must be proven to establish a tort claim, such as the existence of a duty, breach of duty, causation, and damages.

### Unit-I:

Nature of Law of Torts - Definition of Tort - Elements of Tort - Development of Law of Torts in England and India - Wrongful Act and Legal Damage - Damnum Sine Injuria and Injuria Sine Damnum - Tort distinguished from Crime and Breach of Contract - General Principles of Liability in Torts - Fault - Wrongful intent - Malice - Negligence - Liability without fault - Statutory liability - Parties to proceedings.

### Unit-II

General Defenses to an action in Torts – Vicarious Liability - Liability of the State for Torts – Defense of Sovereign Immunity – Joint Liability – Liability of Joint Tortfeasors – Rule of Strict Liability (Rylands V Fletcher) – Rule of Absolute Liability (MC Mehta vs. Union of India) – Occupiers liability – Extinction of liability – Waiver and Acquiescence – Release – Accord and Satisfaction - Death.

### Unit-III

Specific Torts - Torts affecting the person - Assault - Battery - False Imprisonment - Malicious Prosecution - Nervous Shock - Torts affecting Immovable Property - Trespass to land - Nuisance - Public Nuisance and Private Nuisance - Torts relating to movable property – Liability arising out of accidents (Relevant provisions of the Motor Vehicles Act).

### Unit-IV

Defamation - Negligence - Torts against Business Relations - Injurious falsehood - Negligent Misstatement - Passing off - Conspiracy - Torts affecting family relations - Remedies - Judicial and Extra-Judicial Remedies – Damages – Kinds of Damages – Assessment of Damages – Remoteness of damage - Injunctions - Death in relation to tort - Actioperationalismoritur cum persona.

**Unit-V Consumer Laws:**

Common Law and the Consumer - Duty to take care and liability for negligence - Product Liability - Consumerism - Consumer Protection Act, 1986 - Salient features of the Act - Definition of Consumer.

**Suggested Readings:**

1. Winfield & Jolowicz: Law of Tort, XII edition, Sweet and Maxwell, London, 1984.
2. Salmond and Heuston: Law of Torts, XX edition, 2nd Indian reprint, Universal Book traders, New Delhi, 1994.
3. RamaswamyIyer: The Law of Torts, VII edition (Bombay, 1995).
4. Achutan Pillai: Law of Tort, VIII edition, Eastern Book Company, Lucknow, 1987.
5. Durga Das Basu: The Law of Torts, X edition, Prentice Hall of India, New Delhi, 1998.
6. RatanLal& Dhirajlal: The Law of Torts, 22nd edition, Wadhwa& Company Nagpur, 1992.

## LAW OF CONTRACT-I

Sub. Code: BL--109

L – 4, C – 4.

### Course Objectives

- To provide students with a foundational understanding of contract law, including the principles, rules, and regulations that govern the formation, performance, and enforcement of contracts.
- To equip students with the skills to analyze the essential elements of a contract, such as offer, acceptance, consideration, intention to create legal relations, and capacity to contract.
- To enable students to understand the rights and obligations of parties involved in a contract, including performance, breach, and the remedies available under contract law, such as damages, specific performance, and rescission. Exploring Special Types of Contracts:
- To introduce students to various types of contracts governed by the Contract Act, such as contracts of sale, contracts of agency, contracts of partnership, contracts for services, and contracts involving negotiable instruments.

### Unit I:

Definition and essentials of a valid Contract - Definition and essentials of a valid Offer - Definition and essentials of valid Acceptance - Communication of Offer and Acceptance - Revocation of Offer and Acceptance through various modes including electronic medium - Consideration - salient features - Exception to consideration - **Doctrine of Privity of Contract - Exceptions to the privity of contract - Standard form of Contract.**

### Unit-II:

Capacity of the parties - Effect of Minor's Agreement - Contracts with insane persons and persons disqualified by law - Concepts of Free Consent - Coercion - Undue influence - Misrepresentation - Fraud - Mistake - Lawful Object - Immoral agreements and various heads of public policy - illegal agreements - **Uncertain agreements - Wagering agreements - Contingent contracts - Void and Voidable contracts.**

### Unit-III:

Discharge of Contracts - By performance - Appropriation of payments - Performance by joint promisors - Discharge by Novation - Remission - Accord and Satisfaction - Discharge by impossibility of performance (Doctrine of Frustration) - **Discharge by Breach - Anticipatory Breach - Actual breach.**

**Unit-IV:**

Quasi Contract - Necessaries supplied to a person who is incapable of entering into a contract - Payment by an interested person - Liability to pay for non-gratuitous acts - Rights of finder of lost goods - Things delivered by mistake or coercion - Quantum meruit - Remedies for breach of contract - Kinds of damages - liquidated and unliquidated damages and penalty - Duty to mitigate.

**Unit-V:**

Specific Relief - Recovering possession of property - Specific performance of the contract - Rectification of instruments - Rescission of contracts.

**Suggested Readings:**

1. Anson: Law of Contract, Clarendon Press, Oxford, 1998.
2. Krishnan Nair: Law of Contract, S.Gogia & Co., Hyderabad 1995.
3. G.C.V. Subba Rao: Law of Contract, S.Gogia & Co., Hyderabad 1995.
4. T.S.VenkatesaIyer: Law of Contract, revised by Dr. Krishnama Chary,
5. S. Gogia & Co.
6. Avtar Singh: Law of Contract, Eastern Book Company, Lucknow, 1998.

## ECONOMICS – I

**Subject Code: BL – 111**

**L 4, C 4**

### Course Objective

- Introduce fundamental economic concepts: Understand the basic principles of economics, such as scarcity, opportunity cost, supply and demand, and the role of incentives in decision-making.
- Distinguish between microeconomics and macroeconomics:
- Learn the difference between microeconomic analysis (which focuses on individual markets, firms, and consumer behavior) and macroeconomic analysis (which focuses on broader economic phenomena like inflation, unemployment, and national economic growth).
- Examine economic systems: Explore the characteristics of different economic systems (market economies, command economies, mixed economies) and how they allocate resources.

**UNIT – I** Economics as a science and its relevance to law, Economics as a basis of Social Welfare and Social Justice, Free Enterprises, **Planned Economics and mixed Economics.**

**UNIT – II** General principles of Economics: Demand and Supply, Business Organizations, Labour and Wages, **Capital and Money, Savings, Consumption, Investment.**

**UNIT – III** Markets – Determination of Prices, International comparisons of development strategies and experiences, **Theories of economic growth and problems of development.**

**UNIT – IV** Control of Monopolies and prevention of economic concentration, Monopolies, **Monopolistic competition, Oligopoly.**

**UNIT – V** Banking and Fiscal Policy: Resource mobilization and fiscal resources – **Taxation – The role of Credit and Banking System.**

### Suggested Reading:

1. **Alfred W. Stonier and Douglas C. Hague:** The Essentials of Economics (London, 1955).
2. Economics – An Introductory Analysis (International Students Edition) 1961.
3. **Fredrlute Lewis:** Theory of Economic Growth, India Publishing House, 1970.
4. **C.T. Kurien:** Planning, Poverty and Social Transformation, 1926.
5. **M. Dipton:** Why Poor People stay poor Urban Bias in World Development, 1980.
6. **Myrdal, Gunnar:** The Challenges of World Poverty, 1971.
7. **Mahbub Ul Haq:** The Poverty: Certain Choices for the third World, 1976.
8. **Council, Campbell:** Economics (New York: Mc. Graw Hill Mark CB).

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# **Indian Economy-I**

**Subject Code: BL – 111A**

**L 4, C 4**

## **Course Objectives:**

- To understand the structure and characteristics of the Indian economy.
- To analyze the economic development of India since independence.
- To explore the key sectors of the Indian economy and their contributions.
- To critically examine government policies and their impact on economic growth.

## **Unit I: Introduction to the Indian Economy**

- Characteristics of the Indian Economy: A Developing Economy
- Demographic Features and Their Impact on Economic Development
- Natural Resources and Their Utilization in Economic Growth
- Economic Systems: Capitalism, Socialism, and Mixed Economy

## **Unit II: Economic Planning and Development**

- Evolution of Economic Planning in India: Five-Year Plans
- Objectives, Achievements, and Failures of Planning in India
- NITI Aayog: Structure and Role in Policy Formulation
- Sustainable Development Goals (SDGs) and India's Progress

## **Unit III: Agriculture in the Indian Economy**

- Role and Importance of Agriculture in India's Economic Development
- Land Reforms and Green Revolution: Achievements and Challenges
- Agricultural Marketing and Policies
- Current Issues: MSP, Farm Laws, and Food Security

## **Unit IV: Industry and Service Sector**

- Industrial Development in India: Public vs. Private Sector
- Role of MSMEs in Economic Growth
- Make in India and Industrial Policy Reforms
- Growth and Challenges of the Service Sector: IT, Tourism, and Healthcare

## **Unit V: Poverty, Unemployment, and Inequality**

- Poverty: Causes, Measurement, and Government Schemes
- Unemployment: Types, Causes, and Measures to Reduce Unemployment
- Economic Inequality in India: Regional and Income Disparities
- Role of Government and NGOs in Alleviating Poverty and Inequality

**Suggested Books:**

1. **"Indian Economy" by Ramesh Singh**
2. **"Indian Economy: Performance and Policies" by Uma Kapila**
3. **"The Indian Economy: Problems and Prospects" by Bimal Jalan**
4. **"India's Economy in the 21st Century" by Raj Kapila and Uma Kapila**
5. **"Indian Economy Since Independence" by A. Vaidyanathan**

## **Economics of Money and Banking (BL-111B)**

**Subject Code: BL – 111B**

**L 4, C 4**

### **Course Objectives:**

- To understand the fundamental concepts of money, banking, and monetary systems.
- To analyse the role of money in the economy and its impact on economic activities.
- To examine the structure, functions, and role of banks and financial institutions.
- To explore the interplay between monetary policy and the banking system in economic development.

### **Unit I: Introduction to Money**

- Evolution of Money: Barter System to Digital Money
- Definition, Functions, and Characteristics of Money
- Types of Money: Commodity Money, Fiat Money, and Cryptocurrency
- The Role of Money in the Economy: Classical and Keynesian Perspectives

### **Unit II: Money Supply and Demand**

- Measurement of Money Supply: M1, M2, M3, and M4
- Determinants of Money Demand: Transaction, Precautionary, and Speculative Motives
- Theories of Money: Quantity Theory of Money, Fisher and Cambridge Equations
- Factors Influencing Money Supply: Role of Central Bank and Commercial Banks

### **Unit III: Banking System in India**

- Structure of the Indian Banking System: Public, Private, and Cooperative Banks
- Functions and Roles of Commercial Banks
- Banking Regulations in India: Role of the Reserve Bank of India (RBI)
- Non-Banking Financial Institutions (NBFIs): Types and Functions

### **Unit IV: Central Banking and Monetary Policy**

- Role and Functions of a Central Bank
- Objectives and Instruments of Monetary Policy: Repo Rate, Reverse Repo Rate, CRR, and SLR
- Inflation Targeting and Monetary Policy Framework in India
- Relationship between Monetary Policy and Economic Stability

## **Unit V: Money Market and Financial System**

- Money Market: Features, Instruments, and Functions
- Capital Market vs. Money Market: Differences and Importance
- Financial Intermediaries: Role and Impact on Economic Growth
- Global Financial Systems and Emerging Trends: Cryptocurrencies and Digital Banking

### **Suggested Books:**

1. **"Economics of Money, Banking, and Financial Markets" by Frederic S. Mishkin**
2. **"Monetary Economics" by Suraj B. Gupta**
3. **"Money and Banking" by R.S. Sayers**
4. **"Indian Financial System" by M.Y. Khan**
5. **"Modern Banking Theory and Practice" by K.C. Shekhar and Lekshmy Shekhar**

# **Principle of Sustainable Finance-I (BL-111C)**

**Subject Code: BL – 111C**

**L 4, C 4**

## **Course Objectives:**

- To understand the fundamental principles of sustainable finance and its relevance in the modern economy.
- To explore the role of finance in promoting environmental, social, and governance (ESG) objectives.
- To analyse frameworks, strategies, and instruments used in sustainable finance.
- To assess the impact of sustainable finance on corporate performance and societal well-being.

## **Unit I: Introduction to Sustainable Finance**

- Definition, Scope, and Importance of Sustainable Finance
- Principles of Sustainability: Environmental, Social, and Governance (ESG) Factors
- Evolution of Sustainable Finance: Global Trends and Drivers
- The Role of Finance in Achieving the Sustainable Development Goals (SDGs)

## **Unit II: Environmental Finance**

- Green Finance: Concepts and Instruments (Green Bonds, Climate Funds, etc.)
- Financing Renewable Energy Projects and Low-Carbon Technologies
- Impact of Climate Change on Financial Markets
- Regulatory Frameworks and Standards for Environmental Finance

## **Unit III: Social and Governance Aspects of Finance**

- Socially Responsible Investing (SRI): Principles and Practices
- Corporate Social Responsibility (CSR) and its Financial Implications
- Governance in Financial Institutions: Transparency, Accountability, and Ethics
- Diversity, Equity, and Inclusion in Financial Decision-Making

## **Unit IV: Sustainable Investment Strategies**

- ESG Integration in Investment Decision-Making
- Risk Assessment in Sustainable Investments: Climate and Social Risks
- Measuring ESG Performance: Metrics and Reporting Standards (GRI, SASB, TCFD)
- The Role of Technology in Advancing Sustainable Finance (FinTech and GreenTech)

## **Unit V: Challenges and Opportunities in Sustainable Finance**

- **Barriers to Sustainable Financing: Market, Policy, and Institutional Challenges**
- **Financing Circular Economy and Sustainable Infrastructure**
- **Innovations in Sustainable Finance: Impact Investing and Social Bonds**
- **Case Studies of Successful Sustainable Finance Projects**

### **Suggested Books:**

1. **"Principles of Sustainable Finance" by Dirk Schoemaker and Willem Schramade**
2. **"Sustainable Investing: Revolutions in Theory and Practice" by Cary Krosinsky and Nick Robins**
3. **"Green Finance and Sustainability" by Magdalena Ziolo and Beata Ziółkowska**
4. **"Environmental Finance: A Guide to Environmental Risk Assessment and Financial Products" by Sonia Labatt and Rodney R. White**
5. **"Sustainable Finance: The Risks and Opportunities That (Some) Banks Ignore" by Molly Scott Cato**

# **SEMESTER II**

## ENGLISH II

Sub. Code: BL 102

L-4, C-4

### Course Objectives

- I. Borrowing from Other Languages: Over its history, English has borrowed words and influences from many languages, including Latin, Old Norse, French, Dutch, and others. This has contributed to its rich vocabulary.
- II. Simplification of Grammar: Over time, English grammar has become simpler. For example, Old English had more cases, gendered nouns, and verb conjugations, many of which have disappeared in Modern English.
- III. Influence of Literature: Writers like Shakespeare, Chaucer, and Milton not only helped shape the language with their creative use of vocabulary and grammar, but they also preserved it for future generations.
- IV. Colonialism and Globalization: British colonialism spread English across the world, and today, English is a global lingua franca, spoken by millions of people as a first or second language.

**Unit-I: Foundation Grammar:** Reading and Writing (as contained in the last two sections of “Better your English – I”) \*.

**ORAL:** Students should be made to read passages and answer the questions asked for.

**Unit II: Technical Communication:** Nature, Origin and Development, Scope and Significance, Forms of Technical Communication, Differences Between Technical Communication and General Communication.

**ORAL:** Make the students speak on the points relevant to Technical Communication.

**Unit III: The Structure of sentence:** Sentences: Simple, Compound and Complex, Transformation of Sentence: Simple to Complex and vice-versa, Simple to Compound and vice – versa, Interrogative to Assertive and to Negative and vice – versa.

**ORAL:** Make the students answer questions on different types of sentences and transformation.

**Unit IV:**

**Reading Cultural Texts:**

**Short – Story:** (Non detailed study).

1. The Lament – Anton Chekov.
2. Barbers’ Trade Union – R. K. Narayan.



**ORAL:** Discussion in detail, critical appreciation, grammatical exercises and making students read the stories and essays so that they may develop the reading habits with proper stress, intonation, pronunciation & rhythm.

**Text Books:**

1. Better your English – I, A Workbook for student, Macmillan India, New Delhi.
2. Singh R. P, An Anthology of English Short Stories –O.U.P., N. Delhi.
3. Singh R.P, An Anthology of English Essay –. O.U.P., N. Delhi.

**Reference Books:**

1. Raman Meenakshi & Sharma Sangeeta, Technical Communication Principle & Practice - O.U.P., N. Delhi.
2. Mohan Krishna & Banerji Meera – Developing Communication Skill – Macmillan India Ltd: N. Delhi.

## **Communication Skills in English II (BL-102 A)**

**Subject Code: BL – 102A**

**L 4, C 4**

### **Course Objectives:**

- To enhance advanced communication skills in English for academic, professional, and social contexts.
- To develop proficiency in written and spoken English with a focus on clarity and coherence.
- To foster critical thinking and analytical skills through effective reading and writing practices.
- To build confidence in delivering presentations, debates, and group discussions.

### **Unit I: Advanced Writing Skills**

- Essay Writing: Structure, Types, and Techniques
- Business Writing: Emails, Reports, and Proposals
- Writing Summaries and Abstracts
- Note-Making and Note-Taking Techniques

### **Unit II: Reading and Comprehension**

- Advanced Reading Strategies: Skimming, Scanning, and Critical Reading
- Analysing Literary and Non-Literary Texts
- Reading for Inference and Interpretation
- Vocabulary Building: Idioms, Phrasal Verbs, and Collocations

### **Unit III: Speaking Skills**

- Public Speaking: Structure and Delivery
- Debates and Group Discussions: Techniques and Practice
- Impromptu Speaking and Extempore
- Pronunciation and Accent Neutralization

### **Unit IV: Listening Skills**

- Listening for Specific Information and Gist
- Understanding Tone, Context, and Speaker's Intent
- Active Listening in Academic and Professional Settings
- Audio-Visual Aids for Listening Practice

### **Unit V: Professional Communication and Soft Skills**

- Preparing for Interviews: Techniques and Mock Practice

- **Presentation Skills: Using Visual Aids Effectively**
- **Workplace Communication: Meetings, Negotiations, and Feedback**
- **Non-Verbal Communication: Body Language and Etiquette**

**Suggested Books:**

1. **"Effective Communication Skills" by MTD Training**
2. **"English for Academic Purposes" by R.R. Jordan**
3. **"Business Communication: Process and Product" by Mary Ellen Guffey and Dana Loewy**
4. **"Cambridge English Skills: Real Listening and Speaking (Levels 3 and 4)" by Sally Logan and Craig Thaine**
5. **"Word Power Made Easy" by Norman Lewis**

## **Personality Development II (BL-102 B)**

**Subject Code: BL – 102B**

**L 4, C 4**

### **Course Objectives:**

- Understand the key components of personality and self-concept.
- Develop effective communication and interpersonal skills.
- Enhance emotional intelligence and self-regulation.
- Foster goal-setting and time management skills.

### **UNIT 1: Building Confidence and Self-Esteem**

- Understanding the impact of self-esteem on personality
- Techniques for boosting confidence
- Practice: Positive affirmations and visualization

### **UNIT 2: Goal Setting and Motivation**

- Smart goals: setting achievable objectives
- Motivation techniques and maintaining focus
- Practice: Goal-setting workshop

### **UNIT 3: Time Management and Organization**

- Importance of time management in personal development
- Techniques for prioritizing tasks
- Practice: Creating a personal time management plan

### **UNIT 4: Interpersonal Skills and Relationship Building**

- Understanding interpersonal dynamics
- Strategies for effective networking and relationship management

## **Suggested Readings**

1. "How to Win Friends and Influence People" by Dale Carnegie  
A classic on interpersonal skills, focusing on building relationships and effective communication.
2. "The 7 Habits of Highly Effective People" by Stephen R. Covey  
This book offers principles for personal effectiveness and holistic development.
3. "Mindset: The New Psychology of Success" by Carol S. Dweck  
Explores the concept of fixed vs. growth mindsets and how they influence personal development.
4. "Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman  
Discusses the importance of emotional intelligence in personal and professional success.

## **Soft Skills –II (BL-102 C)**

**Subject Code: BL – 102C**

**L 4, C 4**

### **Course Objectives:**

By the end of this course, participants will be able to:

1. Demonstrate effective verbal and non-verbal communication skills.
2. Collaborate effectively in diverse teams.
3. Apply critical thinking and problem-solving techniques in various scenarios.
4. Adapt to changing environments and manage stress.
5. Recognize and manage emotions to enhance interpersonal relationships.

### **UNIT 1: Introduction to Soft Skills**

- Definition and importance of soft skills
- Overview of key soft skills in personal and professional contexts

### **UNIT 2: Communication Skills**

- Verbal and non-verbal communication
- Active listening techniques
- Role-playing exercises to practice communication

### **UNIT 3: Teamwork and Collaboration**

- Building effective teams
- Roles and responsibilities within a team
- Group activities to enhance collaboration

### **UNIT 4: Problem-Solving and Critical Thinking**

- Problem identification and analysis
- Creative thinking techniques

## **Suggested Readings**

1. "Emotional Intelligence 2.0" by Travis Bradberry and Jean Greaves - This book focuses on understanding and improving emotional intelligence, a key component of effective interpersonal skills.
2. "Crucial Conversations: Tools for Talking When Stakes Are High" by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler - It offers strategies for communicating effectively in high-stakes situations.
3. "How to Win Friends and Influence People" by Dale Carnegie - A classic that covers principles of effective communication and relationship-building.
4. "The 7 Habits of Highly Effective People" by Stephen R. Covey - While broader in scope, it emphasizes personal development and interpersonal effectiveness.

## History-II

Sub. Code: BL 104

L 4, C 4

### Course Objectives

- I. Engage in historical analysis: Develop the ability to interpret primary and secondary sources, assess historical evidence, and identify bias or limitations in sources.
- II. Conduct historical research: Learn to find, evaluate, and interpret historical sources, including documents, artifacts, and secondary literature.
- III. Write coherent historical essays: Develop skills in writing clear, evidence-based arguments, using proper historical methodology and citation.
- IV. Present historical arguments: Organize research findings effectively and present them in both written and oral formats, including formal essays, presentations, and reports.

### UNIT -1:

- Babur: Invasion, Conquests, Personality.
- Humayun: Struggle, Exile, Restoration.
- Shershah suri: Civil, Military and Revenue Administration Achievements.
- Akbar: Conquests, Rajput Policy, Deccan Policy, Revenue Administration, Mansabdari system.

### UNIT -2

- Jahangir: Deccan Policy, Influence of Nurjahan, Character of Nurjahan
- Shahjahan & Aurangzeb: Early Career, Religious Policy, Rajput policy.
- William Bentink and his policies.
- Dalhousie and his policies.

### UNIT -3

- Economic charges: Land Revenue Settlements, Permanent Settlements, Ryotware, Mahalwari System.
- Revolt of 1857: Causes, Nature, Ideology, Programme, Leadership, Peoples Participation, Failure and Impact.

### UNIT-4

- Policies of Lord Canning, Lytton, Ripon and Curzan.
- The acts- 1858, 1892, 1919 and 1935.
- Emergence of organized Nationalism formation of Indian National Congress and its programme.
- Moderates: Extremists, Swadeshi, Revolutionary Movements.



## UNIT-5

- Gandhian: Movements, Non-Co-operation, Civil Disobedience, Quit India
- Pre- Partition Politics: Simon Commission, August Offer, Cripps Mission, Cabinet Plan.

### Suggested Readings

- **A History of Modern Europe"** by John Merriman
- Overview of European history from the Renaissance to modern times.
- **"The History of the World"** by J.M. Roberts
- A global perspective on world history and key events.
- **"Modern World History: 1750 to the Present"** by Duiker & Spielvogel
- Focuses on political, economic, and social developments since 1750.
- **"The Origins of the First World War"** by James Joll
- Analyzes the causes of World War I.
- **"History of the French Revolution"** by Georges Lefebvre
- In-depth study of the French Revolution and its effects.

# Sociology-II BL 104 A

**Subject Code: BL – 104A**

**L 4, C 4**

## **Course Objectives:**

- To understand advanced concepts in sociological theory and research.
- To analyse social institutions, structures, and systems.
- To explore contemporary issues related to social change, inequality, and globalization.
- To develop critical thinking skills through the study of social problems and the role of sociology in addressing them.

## **Unit 1: Sociological Theories and Perspectives**

- **1.1 Classical Sociological Theories:**
  - Auguste Comte, Karl Marx, Max Weber, Émile Durkheim, and Herbert Spencer.
  - Key concepts: Social order, social change, materialism, rationalization, the division of labor.
- **1.2 Modern Sociological Theories:**
  - Structural Functionalism (Talcott Parsons, Robert K. Merton).
  - Conflict Theory (Karl Marx, C. Wright Mills).
  - Symbolic Interactionism (George Herbert Mead, Erving Goffman).
  - Feminist Theory (Simone de Beauvoir, Judith Butler, bell hooks).
- **1.3 Post-Modern and Post-Structuralist Approaches:**
  - Michel Foucault, Pierre Bourdieu, Jacques Derrida.

## **Unit 2: Social Institutions**

- **2.1 Family and Kinship Systems:**
  - Types of families (nuclear, extended, single-parent).
  - Kinship: Functions, descent systems, marriage norms.
  - Changing roles of family in modern societies.
- **2.2 Education and Socialization:**
  - The role of education in socializing individuals.
  - Theories of education: Functionalist, conflict, and symbolic interactionist perspectives.

- Education inequalities: Class, caste, and gender disparities.
- **2.3 Religion and Society:**
  - Theories of religion: Functionalism (Durkheim), Conflict Theory (Marx), and Weber's interpretation.
  - Secularization and religious pluralism in contemporary societies.
  - Religion's role in social cohesion, conflict, and change.
- **2.4 Political Systems:**
  - Theories of power, authority, and the state (Weber, Marx).
  - Social movements: Causes, types, and impacts.
  - Democracy, citizenship, and political participation.

### **Unit 3: Social Stratification and Inequality**

- **3.1 Theories of Social Stratification:**
  - Karl Marx: Class and conflict.
  - Max Weber: Class, status, and party.
  - Functionalist theories of stratification (Davis and Moore).
- **3.2 Social Class and Caste Systems:**
  - Social mobility and class stratification.
  - Caste system in India: Traditional and contemporary perspectives.
  - Class in capitalist societies.
- **3.3 Gender, Race, and Ethnicity:**
  - Gender roles and inequality.
  - Feminist theories: Liberal, Marxist, and Radical feminism.
  - Race and ethnicity: Social construction of race and racial inequality.
- **3.4 Poverty and Marginalization:**
  - Theories of poverty: Structural and cultural explanations.
  - Poverty in the global south.
  - Social exclusion and its consequences.

## **Unit 4: Social Change and Development**

- **4.1 Theories of Social Change:**
  - Evolutionary theories of social change.
  - Conflict theories: Marxist perspectives on change.
  - Theories of modernization and dependency.
- **4.2 Development and Underdevelopment:**
  - Theories of development: Modernization vs. dependency theory.
  - The role of colonialism and globalization in shaping development.
  - Sustainable development and the Global South.
- **4.3 Urbanization and Industrialization:**
  - The process of urbanization: Causes and consequences.
  - Industrialization and its social impacts.
  - Urban social problems: Housing, unemployment, and inequality.

## **Unit 5: Contemporary Social Issues**

- **5.1 Crime, Deviance, and Social Control:**
  - Theories of crime: Functionalist, Conflict, and Symbolic Interactionist approaches.
  - Crime and deviance in contemporary societies.
  - The role of institutions in controlling deviance.
- **5.2 Health, Medicine, and Society:**
  - Sociology of health and illness.
  - Health disparities and their social causes.
  - The medicalization of society.
- **5.3 Globalization and Its Social Impacts:**
  - Theories of globalization: Cultural, economic, and political dimensions.
  - Impact of globalization on local cultures and economies.
  - Global social inequalities and transnational issues.

**Suggested Books:**

- Weber, M. (1978). *Economy and Society: An Outline of Interpretive Sociology*. University of California Press.
- Giddens, A. (2013). *Sociology* (8th ed.). Polity Press.
- Haralambos, M., Holborn, M., & Heald, R. (2013). *Sociology: Themes and Perspectives* (8th ed.). HarperCollins.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Haralambos, M., & Holborn, M. (2008). *Sociology: Themes and Perspectives* (7th ed.). HarperCollins Publishers.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Haralambos, M., Holborn, M., & Heald, R. (2013). *Sociology: Themes and Perspectives* (8th ed.). HarperCollins Publishers.
- Ritzer, G. (2017). *Sociological Theory* (9th ed.). McGraw-Hill Education.

## **Understanding Contemporary Social Issues-II (BL 104B)**

**Subject Code: BL – 104B**

**L 4, C 4**

### **Course Objectives:**

- To understand the social, political, and economic roots of contemporary issues.
- To analyze the impact of social problems on individuals and societies.
- To develop an ability to think critically about social issues and their global implications.
- To explore policy responses and social movements aimed at addressing social challenges.
- To foster an understanding of how global issues, intersect with local contexts.

### **Unit 1: Social Inequality and Discrimination**

#### **1. Theories of Social Inequality:**

- Structural-functionalism vs. conflict theory.
- Marxist analysis of class and power.
- Theories of stratification: Weber, Davis and Moore.

#### **2. Social Inequality:**

- Class, caste, and race-based inequality.
- Gender inequality: Feminist perspectives and the gender pay gap.
- The role of education and occupation in perpetuating inequality.

#### **3. Discrimination and Marginalization:**

- Racial and ethnic discrimination.
- Discrimination based on disability, sexuality, and age.
- Social exclusion and its effects on marginalized communities.

### **Unit 2: Globalization and Its Social Impacts**

#### **1. Understanding Globalization:**

- Definitions and key concepts: Economic, cultural, and political globalization.
- Theories of globalization: Modernization theory, world-systems theory, and dependency theory.

#### **2. Economic Globalization:**

- The global economy: Trade, multinational corporations, and economic policies.
- The impact of global economic practices on inequality and poverty.
- Financial crises and global economic interdependence.

#### **3. Cultural and Social Effects of Globalization:**

- Cultural homogenization and cultural imperialism.
- Global media, technology, and social change.
- Migration, transnational communities, and diasporas.

### **Unit 3: Environmental Issues and Social Change**

#### **1. Environmental Degradation:**

- Climate change: Causes, consequences, and global warming.
- Pollution, deforestation, and loss of biodiversity.
- The role of industrialization and consumer culture in environmental destruction.

#### **2. Sustainable Development:**

- The concept of sustainability: Economic, social, and environmental dimensions.
- Sustainable development goals (SDGs) and global efforts.
- Environmental justice and the unequal distribution of environmental harm.

#### **3. Social Movements and the Environment:**

- Environmental movements: Greenpeace, Fridays for Future, and local activism.
- Global environmental conferences and agreements (e.g., Paris Agreement).
- The role of media, advocacy, and policy in promoting sustainability.

### **Unit 4: Health and Social Issues**

#### **1. Health Inequalities:**

- The social determinants of health: Class, race, and access to care.
- Health disparities between countries (Global North vs. Global South).
- The impact of socio-economic status, education, and occupation on health outcomes.

#### **2. Mental Health:**

- The social construction of mental illness.
- Mental health stigma and the impact on treatment.
- Mental health policies and global mental health initiatives.

#### **3. Public Health and Social Movements:**

- The role of public health campaigns in addressing epidemics (e.g., HIV/AIDS, COVID-19).
- Global health issues: Access to healthcare and the impact of global health organizations (WHO).
- Social responses to pandemics and healthcare system challenges.

### **Unit 5: Crime, Deviance, and Social Control**

#### **1. Theories of Crime and Deviance:**

- Functionalist, conflict, and symbolic interactionist theories.
- Deviance and social norms: Labelling theory, strain theory, and conflict theory of crime.
- The relationship between inequality and criminal behaviour.

#### **2. Criminal Justice Systems:**

- Policing, incarceration, and the role of the state in managing crime.
- Mass incarceration and its socio-economic consequences.

- Juvenile delinquency and restorative justice.

**3. Social Control and Surveillance:**

- The role of surveillance in modern societies (e.g., CCTV, social media).
- Foucault's concept of panopticism and the state's control over individuals.
- Privacy, civil liberties, and the ethics of surveillance.

Unit 6: Social Movements and Activism

**1. Theories of Social Movements:**

- Resource mobilization theory.
- Political opportunity structures.
- New social movements: Environmental, feminist, and human rights movements.

**2. Activism in the Digital Age:**

- Social media's role in organizing protests and global movements (e.g., #MeToo, Black Lives Matter).
- Digital activism and online protests.
- The role of hashtags, crowdfunding, and viral campaigns.

**3. Global and Local Movements:**

- The influence of global movements on local politics (e.g., anti-globalization, anti-austerity protests).
- The role of international organizations and grassroots movements in promoting change.

**Suggested Books:**

- Tarrow, S. (2011). *Power in Movement: Social Movements and Contentious Politics* (3rd ed.). Cambridge University Press.
- Castells, M. (2012). *Networks of Outrage and Hope: Social Movements in the Internet Age*. Polity Press.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Merton, R. K. (1968). *Social Theory and Social Structure*. Free Press.



## **Social Institutions in India-II (BL 104C)**

**Subject Code: BL – 104C**

**L 4, C 4**

### **Course Objectives:**

- To understand the historical development and significance of social institutions in India.
- To critically analyse the functioning and transformation of key social institutions in contemporary India.
- To explore the relationship between various social institutions and their impact on societal norms and values.
- To evaluate the impact of modernization, globalization, and policy interventions on social institutions.
- To assess the role of social institutions in shaping issues like inequality, gender, and class in India.

### **Unit 1: The Family and Kinship System in India**

#### **1. Traditional Family Structures:**

- The joint family system in India: History, structure, and significance.
- Kinship networks: Types, roles, and importance in traditional societies.
- Changes in family structure due to urbanization and modernization.

#### **2. Family Roles and Gender:**

- Patriarchy in Indian families: Socialization and division of labour.
- Role of women in the family: Empowerment and challenges.
- Changing roles of men and women in contemporary Indian families.

#### **3. Marriage and Kinship in Modern India:**

- Arranged marriage system and its evolution.
- Inter-caste and inter-religious marriages.
- Impact of globalization and media on marriage norms.

### **Unit 2: The Caste System and Social Stratification**

#### **1. Historical Development of Caste:**

- The origin and evolution of the caste system in India.
- The role of caste in social stratification and its impact on Indian society.
- Caste-based inequalities and the role of religion in sustaining the caste system.

#### **2. Caste in Contemporary India:**

- Caste in the modern Indian economy and politics.
- Affirmative action policies: Reservation system and its impact on caste dynamics.
- Changing role of caste in urban and rural settings.

#### **3. Caste and Social Movements:**

- The role of social reform movements: Brahmi Samaj, Arya Samaj, and Dalit movements.

- Modern Dalit activism and the struggle for caste equality.

### **Unit 3: Religion and Society in India**

#### **1. Religious Diversity and Secularism:**

- India as a land of religious diversity: Major religions and their influence on social life.
- Secularism in India: Theoretical perspectives and practical challenges.
- The role of religion in Indian politics and identity.

#### **2. Religious Institutions and Practices:**

- The role of temples, mosques, churches, and gurdwaras in shaping social behavior.
- Religious rituals and festivals: Their role in community building and social cohesion.
- Modernization and its impact on traditional religious practices.

#### **3. Religious Conflict and Social Change:**

- Communalism, religious intolerance, and inter-religious conflicts in India.
- Role of religion in social movements: Hindu revivalism, Islamic movements, and Christian missionary activities.
- Secularization and its challenges in modern India.

### **Unit 4: The Education System in India**

#### **1. Historical Evolution of Education in India:**

- Traditional education systems: Gurukuls, Madrasas, and indigenous learning.
- Colonial education and its impact on Indian society.
- The rise of modern education: The role of the British and post-independence education reforms.

#### **2. Challenges in the Education System:**

- Access to education: Rural-urban divide, caste, and gender disparities.
- Quality of education: Infrastructure, curriculum, and teacher training.
- Policies for educational reforms: Right to Education Act and skill development programs.

#### **3. Higher Education and Globalization:**

- The growth of higher education institutions: Universities, technical institutes, and research centres.
- Globalization and the rise of private educational institutions.
- Brain drain and the global competition in education.

## **Unit 5: The Political System and Governance in India**

### **1. Constitution and Democracy:**

- The Indian Constitution: Its significance, provisions, and challenges.
- The structure of Indian democracy: Political parties, elections, and the functioning of Parliament.
- Federalism, state vs. central power, and political decentralization.

### **2. Politics of Caste, Class, and Identity:**

- Caste-based politics and the role of affirmative action.
- Role of class and identity politics in shaping electoral outcomes.
- The rise of regional political parties and their impact on national politics.

### **3. Challenges in Indian Governance:**

- Corruption, governance deficits, and policy paralysis.
- Political dynasties and their impact on democracy.
- Social movements and their influence on political change.

### **Suggested Books:**

- Brass, P. R. (1990). *The Politics of India Since Independence*. Cambridge University Press.
- Jain, A. K. (1999). *Indian Politics and Government*. India: Vikas Publishing.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Thorat, S., & P. Sudarshan (2005). *Dalits and the State: Contemporary Indian Issues*. Oxford University Press.
- Desai, A. R. (1996). *Social Background of Indian Nationalism*. Popular Prakashan.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Madan, T. N. (1991). *Religion in India*. Oxford University Press.
- Nandy, A. (2004). *The Intimate Enemy: Loss and Recovery of Self Under Colonialism*. Oxford University Press.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.

## Political Science-II

Sub. Code: BL 106

L 4, C 4

### Course Objectives

- Build on foundational knowledge by exploring more complex political ideologies and theories, including liberalism, conservatism, socialism, feminism, nationalism, and post-colonialism.
- Examine political institutions in-depth: Analyse the structure, functions, and interactions of political institutions such as legislatures, executives, judiciaries, political parties, and interest groups.
- Explore comparative politics: Compare political systems and regimes across different countries, understanding the factors that shape political stability, democratic governance, and authoritarianism.
- Study political participation: Investigate how individuals and groups participate in political processes through voting, protests, advocacy, and other forms of political action

### Unit-I: Government

Government, Organization of Government: Legislature, Executive, Judiciary

### Unit- II: Forms of Government

Dictatorship, Democracy (Features, Merits, Demerits)

### Unit III: Forms of Government

Unitary, Federal (Features, Merits, Demerits)

### Unit IV: Forms of Government

Parliamentary, Presidential (Features, Merits, Demerits)

### **Suggested Readings:**

1. Asirvatham , Political Theory, S. Chand & Company.
2. A.C. Kapoor, Principles of Political Science, S. Chand & Company.
3. Pennock and Smith, Political Science- An Introduction. Macmillan (New York)
4. Caramani, Daniele, Comparative Politics, Oxford University Press.
5. Viotti and Kauppi, International Relations, Ch. 10, Pearson.
6. Held, D. and McGrew, A. eds., The Global Transformations Reader Polity Press,  
Cambridge.

## **Society and Gender (BL 106A)**

**Subject Code: BL – 106A**

**L 4, C 4**

### **Course Objectives:**

- To understand the social construction of gender and its impact on various aspects of society.
- To critically analyse gender inequalities in the family, workplace, education, and politics.
- To explore the concept of intersectionality and its application in understanding gender relations.
- To examine global and local feminist movements and their impact on societal change.
- To assess contemporary issues related to gender, such as sexual harassment, gender-based violence, and LGBTQ+ rights.

### **Unit 1: Gender and Socialization**

#### **1. Theories of Gender Socialization:**

- Theories of gender socialization: Freud, Mead, and Parsons.
- Gender roles: How they are learned and perpetuated in society.
- The impact of family, peers, media, and education in shaping gender identities.

#### **2. Gender and Identity Formation:**

- The development of gender identity from childhood to adulthood.
- The role of cultural norms, family structures, and religious teachings in shaping gender roles.
- Gender nonconformity and the fluidity of gender identity.

#### **3. Socialization and Gender Inequality:**

- How gender socialization contributes to inequality: Patriarchy, sexism, and traditional gender roles.
- The influence of gender norms on women's and men's life choices, career paths, and aspirations.

### **Unit 2: Gender and Family**

#### **1. The Family as a Gendered Institution:**

- The role of family in gender socialization: Division of labor and caregiving roles.
- The impact of gender on family structures: Marriage, parenting, and caregiving.
- The changing family dynamics in response to gender equality movements.

#### **2. Reproduction and Gender:**

- The politics of reproduction: Reproductive rights, fertility, and family planning.
- Gendered division of labour in household chores and childcare.
- The concept of motherhood and its social implications.

#### **3. Marriage, Divorce, and Gender Relations:**

- The changing institution of marriage: The impact of feminism and women's rights on marriage norms.

- Gender roles in marital relationships: Power dynamics, decision-making, and economic contributions.
- Divorce and its gendered impact: Economic independence, custody rights, and social stigma.

### **Unit 3: Gender, Work, and Economy**

#### **1. Gender and Labor:**

- Gendered division of labour: Occupational segregation, the wage gap, and vertical and horizontal segregation.
- The role of women in the workforce: History, contributions, and challenges.
- Men and unpaid labour: Changing gender roles in caregiving and household tasks.

#### **2. Feminism and Economic Systems:**

- Feminist perspectives on economic inequality: Marxist, liberal, and socialist feminist views.
- Women in the informal economy: Labour exploitation, domestic work, and global supply chains.
- Gender, globalization, and the impact of transnational corporations on women's labour.

#### **3. Gender and Work-Life Balance:**

- The challenges of work-life balance for women and men.
- The impact of gender on career choices, promotions, and leadership roles.
- Policies and programs for promoting gender equality in the workplace: Affirmative action, maternity leave, and equal pay.

### **Unit 4: Gender and Politics**

#### **1. Gender and Political Representation:**

- The underrepresentation of women in politics: Barriers to political participation and leadership.
- Gender quotas and affirmative action in political offices.
- Women's political activism: Local and global perspectives.

#### **2. Feminist Politics and Social Movements:**

- The history of feminist movements: First, second, and third waves.
- Contemporary feminist activism: Issues such as reproductive rights, violence against women, and LGBTQ+ rights.
- Global feminism: Intersectionality, solidarity, and transnational movements.

#### **3. Gender, Power, and the State:**

- The role of the state in shaping gender relations: Laws, policies, and gender justice.
- Gender and citizenship: Rights, access to services, and social welfare.
- The impact of neoliberalism and globalization on gendered policies.

## Unit 5: Gender, Violence, and Social Change

### 1. **Gender-Based Violence:**

- Forms of gender-based violence: Domestic violence, sexual harassment, trafficking, and femicide.
- Causes and consequences of gender-based violence: Patriarchy, power dynamics, and social structures.
- Legal frameworks and policies addressing gender-based violence.

### 2. **Sexual Harassment and Workplace Violence:**

- The #MeToo movement and its impact on social and legal reforms.
- Gender, power, and sexual harassment in different contexts: Workplace, education, and public spaces.
- The role of media in exposing and addressing gender-based violence.

### 3. **Gender and Social Change:**

- Feminist interventions in law, media, and policy.
- Gender mainstreaming and strategies for social change.
- The role of education and social movements in transforming gender norms.

## **Suggested Books:**

- Crenshaw, K. (1991). *Mapping the Margins: Intersectionality, Identity Politics, and Violence Against Women of Color*. Stanford Law Review.
- Mohanty, C. T. (2003). *Feminism Without Borders: Decolonizing Theory, Practicing Solidarity*. Duke University Press.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Walby, S. (1990). *Theorizing Patriarchy*. Blackwell Publishing.
- Nussbaum, M. (1999). *Sex and Social Justice*. Oxford University Press.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Acker, J. (2006). *Hierarchies, Jobs, Bodies: A Theory of Gendered Organizations*. *Gender & Society*, 20(4), 441-464.
- England, P. (2010). *The Gender Revolution: Uneven and Stalled*. *Gender & Society*, 24(2), 149-168.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Acker, J. (2006). *Hierarchies, Jobs, Bodies: A Theory of Gendered Organizations*. *Gender & Society*, 20(4), 441-464.
- England, P. (2010). *The Gender Revolution: Uneven and Stalled*. *Gender & Society*, 24(2), 149-168.



- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company

## **Comparative Politics-II (BL 106B)**

**Subject Code: BL – 106B**

**L 4, C 4**

### **Course Objectives:**

- To deepen the understanding of different political systems and institutions.
- To develop skills for comparative analysis of political structures, processes, and outcomes.
- To critically evaluate the role of political institutions, political parties, and electoral systems in governance.
- To understand the impact of globalization on state sovereignty, democracy, and governance.
- To analyse the evolving nature of political authority, state capacity, and legitimacy in diverse political systems.

### **Unit 1: Political Systems and Political Structures**

#### **1. Types of Political Systems:**

- The concept of political systems: Democracy, authoritarianism, totalitarianism, and hybrid regimes.
- Characteristics and functioning of parliamentary and presidential systems.
- Comparative analysis of democratic and non-democratic political systems.

#### **2. Political Institutions:**

- Role of executive, legislature, and judiciary in different political systems.
- Analysis of constitutional frameworks: Federal vs. unitary systems.
- Political parties and party systems: Party structure, ideologies, and electoral systems.

#### **3. Government Structures:**

- Presidential, parliamentary, and mixed systems: Their evolution, advantages, and challenges.
- Case studies: USA, UK, France, India, and Brazil.

### **Unit 2: Political Culture and Political Socialization**

#### **1. Political Culture:**

- Definition, types, and components of political culture.
- The role of political culture in shaping democratic values and political behavior.
- The influence of national identity, traditions, and religion on political culture.

#### **2. Political Socialization:**

- Socializing agents: Family, education, media, and peer groups.
- The role of political socialization in the formation of public opinion and political participation.
- Comparative study of political socialization in different political systems.

### **3. Case Studies in Political Culture:**

- Political culture in democratic societies: USA, India, and France.
- Political culture in authoritarian regimes: China, Russia, and North Korea.

## **Unit 3: Comparative Political Economy**

### **1. State and Market Relations:**

- Theories of political economy: Capitalism, socialism, and welfare states.
- Economic systems and political governance: Free market vs. planned economies.
- Globalization and its impact on national economies: Trade, investment, and financial flows.

### **2. Development Models and State Capacity:**

- Theories of state development: Modernization theory, dependency theory, and post-colonial critique.
- The role of the state in economic development: Economic planning and policy-making.
- Comparative analysis of development in different countries: Success stories and failures (e.g., South Korea vs. Sub-Saharan Africa).

### **3. Political Economy of Transition:**

- The transition from command economies to market economies: Case studies of China, Russia, and Eastern Europe.
- The role of political regimes in economic reforms and transitions.

## **Unit 4: Electoral Systems and Political Participation**

### **1. Electoral Systems and Voting Behavior:**

- Types of electoral systems: Majoritarian, proportional representation, and mixed systems.
- The impact of electoral systems on party systems, voter behavior, and political representation.
- Comparative analysis of electoral systems in the UK, USA, India, and Germany.

### **2. Political Participation and Public Opinion:**

- Voter turnout and the factors affecting political participation.
- Political participation beyond voting: Protests, strikes, and civil society movements.
- The role of media in shaping public opinion and electoral outcomes.

### **3. Party Systems and Political Representation:**

- Major political party systems: Single-party, two-party, multi-party systems.
- The role of political parties in democratic and authoritarian regimes.
- Case studies: Political parties in the USA, India, and France.

## **Unit 5: Political Institutions and Governance**

### **1. Legislatures and Lawmaking:**

- The role of legislatures in policy-making and governance.
- Bicameral vs. unicameral systems: Their advantages and challenges.
- Comparative analysis of legislative systems: UK, USA, India, and Brazil.

### **2. Judiciaries and Legal Systems:**

- The role of judicial independence and its relation to democracy.
- Comparative study of judicial systems: Common law vs. civil law traditions.
- The role of the judiciary in protecting human rights and the rule of law.

### **3. Bureaucracy and Governance:**

- The role of the bureaucracy in policy implementation.
- Civil service reform: The challenges of corruption and inefficiency.
- Case studies on governance: Comparative analysis of administrative systems.

## **Suggested Books:**

- Diamond, L. (2008). *The Spirit of Democracy: The Struggle to Build Free Societies Throughout the World*. Times Books.
- Linz, J. J. (2000). *Totalitarian and Authoritarian Regimes*. Lynne Rienner Publishers.
- Huntington, S. P. (1991). *The Third Wave: Democratization in the Late Twentieth Century*. University of Oklahoma Press.
- Bagehot, W. (2001). *The English Constitution*. Blackmask Online.
- Shapiro, I., & Stokes, S. (2008). *Democracy's Edges*. Cambridge University Press.
- Lijphart, A. (2012). *Democracy in Plural Societies: A Comparative Exploration*. Yale University Press.
- Heywood, A. (2013). *Politics* (4th ed.). Palgrave Macmillan.
- Stiglitz, J. E. (2002). *Globalization and its Discontents*. W.W. Norton & Company.
- Rodrik, D. (2011). *The Globalization Paradox: Democracy and the Future of the World Economy*. W.W. Norton & Company.

## Political Theories-II (BL 106C)

Subject Code: BL – 102A

L 4, C 4

### Course Objectives:

- To understand the development of key political ideologies and thinkers.
- To critically analyse political thought in relation to contemporary issues such as human rights, democracy, and governance.
- To examine the evolution of core political concepts such as liberty, equality, justice, and power.
- To explore the intersection of political theory with social, economic, and cultural factors in shaping modern political systems.

### Unit 1: Classical Political Thought

#### 1. Plato and Aristotle:

- Plato's *Republic* and his concept of justice, the philosopher-king, and the ideal state.
- Aristotle's *Politics* and his views on democracy, polity, and the role of the citizen in governance.
- Comparison between Plato's and Aristotle's views on the state and politics.

#### 2. Machiavelli:

- Machiavelli's *The Prince* and his views on power, the role of the ruler, and the use of deceit and force in politics.
- The concept of *virtù* and *fortuna*, and their application to modern political analysis.
- Machiavelli's republicanism in *Discourses on Livy*.

#### 3. Hobbes, Locke, and Rousseau:

- Hobbes's theory of the state of nature, the social contract, and the need for an absolute sovereign (*Leviathan*).
- Locke's theories of natural rights, private property, and the limited government (*Two Treatises of Government*).
- Rousseau's general will, social contract, and critique of inequality (*The Social Contract*).

### Unit 2: Modern Political Thought

#### 1. John Stuart Mill:

- Mill's liberalism: *On Liberty*, utilitarianism, and the principle of harm.
- The concept of individual liberty, freedom of speech, and women's rights (e.g., *The Subjection of Women*).

- The limits of state intervention and the idea of a free market.
- 2. **Karl Marx:**
  - Marx's critique of capitalism: Historical materialism, class struggle, and the theory of surplus value (*The Communist Manifesto*).
  - Marxist views on the state, revolution, and the dictatorship of the proletariat.
  - Influence of Marxist thought on modern political movements.
- 3. **Friedrich Hayek and Milton Friedman:**
  - Hayek's critique of central planning and socialism (*The Road to Serfdom*).
  - Friedman's advocacy for free markets and minimal state intervention (*Capitalism and Freedom*).

### Unit 3: Political Ideologies

1. **Liberalism:**
  - The core tenets of liberal thought: Individualism, freedom, equality, and democracy.
  - Classical vs. modern liberalism: From Locke and Mill to Rawls and Nozick.
  - The liberal critique of state intervention and the role of the market.
2. **Socialism and Communism:**
  - Marxist socialism and the critique of capitalism.
  - Democratic socialism and the welfare state.
  - Communism as an ideology of revolutionary change, from Marx to Lenin.
3. **Conservatism:**
  - Key ideas of conservatism: Tradition, authority, gradual change, and skepticism of revolution.
  - Edmund Burke's defense of tradition and society.
  - Modern conservatism: The role of the state, free market, and cultural values.
4. **Feminism and Gender Theories:**
  - Feminist political theory: Equality, justice, and critique of patriarchy.
  - Liberal feminism, Marxist feminism, and radical feminism.
  - Gender and political power: Theories of sexual politics and intersectionality.

### Unit 4: Contemporary Political Thought

1. **Postmodernism and Critical Theory:**
  - Michel Foucault's views on power, knowledge, and discipline.
  - Postmodern critiques of grand narratives and ideologies.
  - Critical Theory and the Frankfurt School: Adorno, Horkheimer, and Habermas.
2. **Globalization and Political Thought:**
  - Global justice and the ethics of globalization.
  - Cosmopolitanism vs. nationalism: Theories of global governance.
  - The role of international organizations, such as the UN and WTO.

### 3. **Environmental Political Thought:**

- Green political thought: Environmental justice, sustainability, and eco-feminism.
- The critique of industrialism and the quest for eco-socialism.
- The politics of climate change and global environmental movements.

## **Unit 5: Modern Political Issues and Ideas**

### 1. **Democracy and Its Challenges:**

- Theories of democracy: Deliberative democracy, participatory democracy, and liberal democracy.
- Challenges to democracy: Populism, authoritarianism, and illiberal democracy.
- Democratic backsliding: Case studies from Eastern Europe and Latin America.

### 2. **Nationalism and Multiculturalism:**

- Theories of nationalism: Ethnic vs. civic nationalism.
- Multiculturalism and its political implications.
- Nationalism, citizenship, and global migration.

### 3. **Human Rights and Justice:**

- The evolution of human rights theory: Natural rights, civil rights, and social rights.
- Justice theories: Distributive justice, global justice, and reparative justice.
- Human rights in practice: International law and humanitarian interventions.

## **Suggested Books:**

- Dahl, R.A. (1989). *Democracy and Its Critics*. Yale University Press.
- Smith, A.D. (1998). *Nationalism and Modernism*. Routledge.
- Kymlicka, W. (1995). *Multicultural Citizenship: A Liberal Theory of Minority Rights*. Oxford University Press.
- Rawls, J. (1993). *Political Liberalism*. Columbia University Press.

## **Unit 6: Contemporary Political Theory and Applications**

### 1. **Global Political Theory:**

- Cosmopolitanism and global ethics.
- Theories of international justice: Global poverty, migration, and conflict.
- Postcolonial political theory: Colonialism, decolonization, and the politics of identity.

### 2. **Political Theory and the Environment:**

- Ecological justice: Environmental ethics and political theory.
- The relationship between political economy and environmental sustainability.
- Green political movements and the global climate crisis.

### **Suggested Books:**

- Held, D. (2010). *Global Political Theory*. Polity Press.
- Nussbaum, M.C. (2006). *Frontiers of Justice: Disability, Nationality, Species Membership*. Belknap Press.
- Scruton, R. (2008). \*Green
- Plato. (2003). *The Republic*. Trans. G.M.A. Grube. Hackett Publishing.
- Aristotle. (2009). *Politics*. Trans. C.D.C. Reeve. Hackett Publishing.
- Machiavelli, N. (1998). *The Prince*. Trans. W. K. Marriott. Dover Publications.
- Hobbes, T. (1994). *Leviathan*. Cambridge University Press.
- Locke, J. (1980). *Two Treatises of Government*. Cambridge University Press.
- Rousseau, J.J. (2002). *The Social Contract*. Trans. G.D.H. Cole. Dover Publications
- Dahl, R.A. (1989). *Democracy and Its Critics*. Yale University Press.
- Smith, A.D. (1998). *Nationalism and Modernism*. Routledge.
- Kymlicka, W. (1995). *Multicultural Citizenship: A Liberal Theory of Minority Rights*. Oxford University Press.
- Rawls, J. (1993). *Political Liberalism*. Columbia University Press.



# Constitutional Law - I

Sub. Code: BL 108

L – 4, C – 4.

## Course Objectives

- Examine federalism and state powers: Explore the relationship between federal and state governments, including the distribution of powers and how conflicts are resolved, with an emphasis on landmark cases in federalism.
- Study separation of powers: Analyse the separation of powers among the three branches of government (executive, legislative, and judiciary) and the checks and balances system designed to prevent any one branch from becoming too powerful.
- Understand the role of the judiciary: Study the judicial power in interpreting and applying the Constitution, including the principle of judicial review, and the role of courts in constitutional interpretation.
- Study fundamental rights and liberties: Delve into the rights protected by the Constitution, particularly those in the Bill of Rights and the Fourteenth Amendment, including freedom of speech, religion, and privacy.

## Unit-I

Constitution-Meaning and Significance - Evolution of Modern Constitutions -Classification of Constitutions-Indian Constitution - Historical Perspectives - Government of India Act, 1919 - Government of India Act, 1935 - Drafting of Indian Constitution - Role of Drafting Committee of the Constituent Assembly

## Unit-II

Nature and Salient Features of Indian Constitution - Preamble to Indian Constitution - Union and its Territories-Citizenship - General Principles relating to Fundamental Rights (Art.13) - Definition of State

## Unit-III

Right to Equality (Art.14-18) – Freedoms and Restrictions under Art.19 - Protection against Ex-post facto law - Guarantee against Double Jeopardy - Privilege against Self-incrimination - Right to Life and Personal Liberty - Right to Education – Protection against Arrest and Preventive Detention

## Unit-IV

Rights against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Limitations on Fundamental Rights (Art.31-A,B and C)

## **Unit-V**

Directive Principles of State Policy – Significance – Nature – Classification -

### **Suggested Readings:**

1. M.P.Jain, Indian Constitutional Law, Wadhwa& Co, Nagpur
2. V.N.Shukla, Constitution of India, Eastern Book Company, Lucknow
3. Granville Austin, Indian Constitution-Cornerstone of a Nation, OUP, New Delhi
4. H.M.Seervai, Constitutional Law of India (in 3 Volumes), N.M.Tripathi, Bombay
5. G.C.V.Subba Rao, Indian Constitutional Law, S.Gogia& Co., Hyderabad
6. B.Shiva Rao: Framing of India's Constitution (in 5 Volumes), Indian Institute of Public Administration, New Delhi
7. J.N.Pandey, Constitutional Law of India, Central Law Agency, Allahabad

## Law of Contract - II

Sub. Code: BL 110

L – 4, C – 4.

### Course Objectives

- Study advanced elements of contract formation: Explore the essential components for a valid contract (offer, acceptance, consideration, capacity, and legality) in more depth, including situations involving ambiguous terms, pre-contractual negotiations, and implied contracts.
- Analyze unilateral and bilateral contracts: Understand the differences between unilateral and bilateral contracts, and explore how each is formed, enforced, and discharged.
- Explore contract formation in specialized areas: Examine contracts involving commercial transactions, construction, and complex agreements, and analyze how standard industry practices influence contract formation. Study express and implied terms: Learn to differentiate between express terms (clearly stated in the contract) and implied terms (those inserted by law or custom) and their enforceability.
- Analyze standard form contracts: Investigate the use of standard terms or "boilerplate" clauses, focusing on their fairness, enforceability, and the potential for unconscionability or other defenses.

### Unit-I:

Indemnity and Guarantee - Contract of Indemnity, definition - Rights of Indemnity holder - Liability of the indemnified - Contract of Guarantee - Definition of Guarantee - Essential characteristics of Contract of Guarantee - Distinction between Indemnity and Guarantee - Kinds of Guarantee - Rights and liabilities of Surety - Discharge of surety. Contract of Bailment - Definition of bailment - Essential requisites of bailment - Kinds of bailment - Rights and duties of bailor and bailee - Termination of bailment - Pledge - Definition of pledge - Rights and duties of Pawnor and Pawnee - Pledge by non-owner.

### Unit-II:

Contract of Agency - Definition of Agent - Creation of Agency - Rights and duties of Agent - Delegation of authority - Personal liability of agent - Relations of principal and agent with third parties - Termination of Agency.

### Unit-III:

Contract of Sale of Goods - Formation of contract - Subject matter of sale - Conditions and Warranties - Express and implied conditions and warranties - Pricing - Caveat Emptor.

### Unit-IV:

Property - Possession and Rules relating to passing of property - Sale by non-owner - Nemo dat quod non habet - Delivery of goods - Rights and duties of seller and buyer before and after sale - Rights of unpaid seller - Remedies for breach.

**Unit-V:**

Contract of Partnership - Definition and nature of partnership - Formation of partnership- Test of partnership - Partnership and other associations - **Registration of firm - Effect of non-registration - Relations of partners.**

**Suggested Readings:**

1. Anson's Law of Contract, 25th Ed. 1998, OxfordUniversity Press, London.
2. VenkateshIyyer: The Law of Contracts and Tenders, Gogia& Company Hyderabad.
3. Cheshire& Fifoot: Law of Contract, Butterworth, London, 1976.
4. Mulla: The Indian Contract Act, N.M.Tripathi (P) Ltd. Bombay, 1984.
5. G.C.V. Subba Rao: Law of Contracts, S. Gogia& Co., Hyderabad, 1995.
6. Krishnan Nair: Law of Contracts, S. Gogia& Co. Hyderabad, 1995.
7. Avtar Singh: Law of Contracts, Eastern Book Company, Lucknow, 1998.
8. A Ramaiah'sSale of Goods Act, 4th Ed. 1998, The Law Book Co., Allahabad.
9. Benjamin's Sale of Goods, 1st Ed. 1978, Sweet & Maxwell, London.
10. P.S. Atiyah: Sale of Goods Act, 9th Ed. 1997, Universal Book Traders, Delhi.

## Economics-II

Sub. Code: BL 112

L 4, C 4

### Course Objectives

- Examine taxation and public finance: Study the theory of taxation, including different types of taxes (income, sales, property), their effects on individuals and businesses, and how they impact economic efficiency and equity.
- Understand government intervention and market failure: Analyze the role of government in correcting market failures, such as through regulation, public goods provision, externality correction, and income redistribution.
- Study social welfare and redistribution policies: Examine policies aimed at reducing inequality, such as progressive taxation, welfare programs, and social insurance. Investigate the efficiency and equity of various redistributive mechanisms.
- Explore fiscal policy and its impact on the economy: Understand how governments use fiscal policy (public spending and taxation) to influence economic activity, manage inflation, and address unemployment.

### Unit-I: Introduction

- (a). Structural Changes in Indian Economy in Post 1991 period.
- (b). New Economic policy, Liberalizations and Privatization.

### Unit-II: Agriculture Sector

- (a). Features and problems in Indian Agriculture.
- (b). Land Reforms in India, Consolidation of Holdings and its impact on poverty elevation in India.

### Unit-III: Industrial Sector

- (a). Industrial Policy in India since 1948 and recent Changes in with reference to economic Problems.
- (b). Industrial Sickness, Causes and its remedies.
- (c). Industrial relations and Trade unionism.

### Unit-IV: Economic Institutions in India

- (a). Single Proprietorship, Partnership.
- (b). Trust and Cooperative Societies.
- (c). Multinational Corporations.

**Unit-V: Foreign Trade & Investment**

(a). Foreign Trade Policy, major problems of Indian Export Sector.

(b). Foreign Investment; FDI.

**Suggested Readings**

1. Aggarwal A.N., Indian Economy, Vikas Publication, New Delhi.
2. Hanumanta Rao C.H. & Joshi F.C., Reflections of Economic Development and Social Changes.
3. Rudder Dutt & KPM Sundaram, Indian Economy, S. Chand & Co.

## **Indian Economy-II (BL-112 A)**

**Subject Code: BL – 112A**

**L 4, C 4**

### **Course Objectives:**

- To deepen understanding of key economic concepts and theories related to the Indian economy.
- To examine India's economic growth trajectory, sectoral transformations, and the policy measures implemented by the government.
- To critically analyse the challenges and opportunities facing the Indian economy.
- To explore the role of India in the global economy and its economic relations with other nations.
- To evaluate the effectiveness of various policy interventions in addressing socio-economic issues in India.

### **Unit 1: Economic Growth and Planning in India**

#### **1. Economic Growth in India:**

- Trends in India's economic growth post-independence.
- Factors influencing India's economic growth: Population, infrastructure, investment, and human capital.
- Growth theories and their application to the Indian context.

#### **2. Planning in India:**

- Evolution of planning in India: From Five-Year Plans to NITI Aayog.
- Role of public sector in planning and industrial development.
- Issues in the planning process: Targets, allocation of resources, and plan implementation.

#### **3. Economic Reforms and Liberalization:**

- The 1991 economic reforms: Structural adjustments, liberalization, privatization, and globalization.
- Impact of reforms on India's industrial, trade, and financial sectors.
- Critiques of economic reforms and the challenges faced in inclusive growth.

### **Unit 2: Sectoral Composition of Indian Economy**

#### **1. Agriculture:**

- Role of agriculture in India's economy: Employment, GDP contribution, and food security.
- Agricultural policies and reforms: Green Revolution, land reforms, and current challenges.

- Issues in rural development, agriculture sustainability, and the impact of climate change on agriculture.
- 2. **Industry and Manufacturing:**
  - Structure of the industrial sector in India: MSMEs, large industries, and the role of technology.
  - Industrial policy and reforms: Post-liberalization changes in the industrial landscape.
  - Make in India initiative and its impact on manufacturing.
- 3. **Services Sector:**
  - Growth and significance of the services sector in India: IT, financial services, tourism, and healthcare.
  - Contribution of the services sector to GDP and employment.
  - Challenges facing the services sector, including skill development, infrastructure, and regulation.

### **Unit 3: Fiscal and Monetary Policy in India**

1. **Fiscal Policy:**
  - Overview of India's fiscal system: Structure of government revenues and expenditure.
  - Fiscal policy tools: Taxation, public debt, and fiscal deficit.
  - Budgetary policy and the role of Finance Commission.
  - The role of fiscal policy in economic stabilization and growth.
2. **Monetary Policy:**
  - Role of Reserve Bank of India (RBI) in monetary policy formulation.
  - Objectives of monetary policy: Inflation targeting, interest rates, and exchange rates.
  - Recent developments in monetary policy: Liquidity management, credit control, and financial inclusion.
  - The impact of demonetization and GST on India's monetary policy.

### **Unit 4: External Sector and India's Foreign Trade**

1. **Trade and Balance of Payments:**
  - India's trade pattern and composition: Major exports and imports.
  - Issues related to India's balance of payments (BoP): Deficits, capital flows, and exchange rates.
  - India's exchange rate policies and its impact on international trade.
2. **Trade Policies and Agreements:**
  - Evolution of India's trade policy: From import substitution to export-led growth.
  - WTO and regional trade agreements: SAFTA, ASEAN, and RCEP.
  - Foreign trade policy and its role in promoting exports and economic growth.
3. **Foreign Direct Investment (FDI) and Capital Flows:**
  - Role of FDI in India's economic development.
  - Government policies to attract FDI: Make in India, Start-Up India.



## Unit 5: Poverty, Unemployment, and Inequality in India

### 1. Poverty in India:

- Measurement of poverty: Poverty lines, multidimensional poverty.
- Causes of poverty: Structural, social, and economic factors.
- Government initiatives for poverty alleviation: MGNREGA, PMAY, and direct benefit transfers (DBT).

### 2. Unemployment and Employment Policies:

- Types of unemployment: Frictional, structural, and disguised unemployment.
- Employment generation policies and programs: Skill development, employment guarantee schemes.
- Challenges in the labor market: Informal sector, wage disparity, and gender inequality.

### 3. Inequality:

- Economic inequality: Income and wealth disparities.
- Social inequality: Caste, class, and gender-based disparities.
- Government policies aimed at reducing inequality: Reservation policies, inclusive growth programs.

## Suggested Books:

- Desai, V. (2022). *Indian Economy: A Comprehensive Overview*. Pearson India.
- S.R. Mehta (2017). *Contemporary Issues in Indian Economy*. Macmillan India.
- Raghuram Rajan (2019). *The Third Pillar: How Markets and the State Leave the Community Behind*. Penguin Books.
- Datt, R., & Sundharam, K.P.M. (2021). *Indian Economy* (79th ed.). S. Chand & Co.
- Bhatia, H. L. (2005). *Public Finance*. Vikas Publishing House.
- Joshi, V., & Little, I. M. D. (1996). *India's Economic Reforms: 1991–2001*. Oxford University Press.
- Government of India (2023). *Union Budget of India* (Annual Publication).
- Reserve Bank of India (2023). *Annual Report of RBI* (Annual Publication).
- Mishra, S. K., & Puri, V. K. (2014). *Indian Economy* (30th ed.). Himalaya Publishing House.
- Government of India (2023). *Union Budget of India* (Annual Publication).
- Reserve Bank of India (2023). *Annual Report of RBI* (Annual Publication).
- Mishra, S. K., & Puri, V. K. (2014). *Indian Economy* (30th ed.). Himalaya Publishing House.

## **ECONOMY OF MONEY AND BANKING -II (BL-112 B)**

**Subject Code: BL – 112B**

**L 4, C 4**

### **COURSE OBJECTIVES**

- Develop a Strong Understanding of Monetary Theories  
To explore and critically analyse various theories related to the demand and supply of money, including classical, Keynesian, and modern approaches.
- Understand the Conduct of Monetary Policy  
To study the objectives, tools, and mechanisms through which central banks implement monetary policy, and assess how policy decisions impact inflation, growth, and employment.
- analyse the Role of Central Banks

#### **Unit 1: Money**

- Understanding concept and functions of money
- Measurement of money supply
- Analytics and Methodology of computation of money supply
- Theories of money supply determination.

#### **Unit 2: Financial markets:**

- Role of financial markets and institutions
- Problems of Asymmetric information
- Financial Crises; Financial derivatives: Futures, Options and Swaps
- Financial markets and Institutions in India: Organization, Structure and Reforms in India

#### **Unit 3: Determination of interest rates:**

- Sources of interest rates differentials and risk
- Theories of term structure of interest rates
- Interest rates in India.

#### **Unit 4: Banking**

- Theory of Separation of Powers and Checks and Balances
- N.G.O. Civil Society Campaigns and role of Mass Media

### **Unit 5: Historical context: Money and Banking**

- Introduction to banking system
- Types of banks

#### **Suggested Readings:**

1. F J Fabozzi et al: Foundations of Financial Markets and Institutions, Pearson
2. F S Mishkin , S G Eakins, T Jayakumar, R K Pattnaik : Financial Markets and Institutions Pearson
3. N Jadhav: Monetary Policy, Financial stability and Central Banking in India Macmillan
4. M.R. Baye and D.W. Jansen Money, Banking and Financial Markets AITBS, 1996
5. Report of the Working Group: Money Supply Analytics and Methodology of Compilation, 1998 Annual Report; Master Circular - Prudential Norms on Capital Adequacy - Basel I Framework - 2011;
6. Dua, P., "Monetary Policy Framework in India", Indian Economic Review, Vol. 55, Issue 1, June 2020

# **Principles of Sustainable Finance (BL-112C)**

**Subject Code: BL – 112C**

**L 4, C 4**

## **Course Objectives**

- This course explores the integration of environmental, social, and governance (ESG) factors into financial decision-making.
- It covers the foundational principles of sustainable finance
- The role of financial markets, and strategies for promoting sustainability in investment and corporate practices.

## **Unit 1: Introduction to Sustainable Finance**

- Overview of finance and sustainability
- Historical context and evolution of sustainable finance
- Importance of ESG factors

## **Unit 2: Key Concepts and Terminology**

- Definitions: sustainability, sustainable finance, ESG
- Sustainable Development Goals (SDGs)
- Impact investing vs. traditional investing

## **Unit 3: Long-term Value Creation**

- Understanding the concept of long-termism
- Case studies of successful sustainable investments
- The role of innovation in sustainable finance

## **Unit 4: Environmental Stewardship**

- Climate change and finance
- Renewable energy investments

## **Suggested Readings:**

1. "Finance and Sustainability: Towards a New Paradigm" by Marco Cattaneo
2. This book examines the intersection of finance and sustainability, offering new paradigms for integrating these fields.
3. "The Sustainable Investing Handbook" by Dr. Cary Krosinsky
4. A practical guide to sustainable investing strategies, frameworks, and tools, aimed at both investors and financial professionals.
5. "The Economics of Climate Change: The Stern Review" by Nicholas Stern
6. While not solely focused on finance, this influential report outlines the economic implications of climate change and the need for sustainable investment

# **SEMESTER III**

## Constitutional Law – II

Sub. Code: BL 201

L – 4, C – 4.

### Course Objective

- Examine the scope of individual rights: Study advanced topics related to individual rights guaranteed by the Constitution, focusing on the Due Process Clause, Equal Protection Clause, and First Amendment rights (including freedom of speech, freedom of religion, and freedom of association).
- Analyse the evolving jurisprudence of civil rights: Understand the historical development and contemporary application of civil rights protections, particularly regarding race, gender, and sexual orientation.
- Study substantive due process and privacy rights: Delve into the principles of substantive due process and the development of privacy rights, including landmark cases like *Griswold v. Connecticut*, *Roe v. Wade*, and *Lawrence v. Texas*.
- Explore procedural due process: Understand the constitutional requirements of fair procedures when individuals are deprived of life, liberty, or property, focusing on judicial review and the protections offered by the Fifth and Fourteenth Amendments.

### Unit-I

Legislature under Indian Constitution - Union and State Legislatures - Composition, Powers, Functions and Privileges - Anti-Defection Law - Executive under Indian Constitution - President and Union Council of Ministers - **Governor and State Council of Ministers - Powers and position of President and Governor**

### Unit-II

Judiciary under Constitution - Supreme Court - Appointment of Judges, Powers and Jurisdiction - High Courts - Appointment and Transfer of Judges - Powers and Jurisdiction - Subordinate Judiciary - **Independence of judiciary - Judicial Accountability**

### Unit-III

Centre State Relations - Legislative, Administrative and Financial Relations - Cooperation and Coordination between the Centre and States - **Judicial Interpretation of Centre-State Relations - Doctrines evolved by Judiciary**

### Unit-IV

Liability of State in Torts and Contracts - Freedom of Interstate Trade, Commerce and Inter course - **Services under the State - All India Services - Public Service Commissions**

## **Unit-V**

Emergency – Need of Emergency Powers - Different kinds of Emergency - National, State and **Financial emergency.**

### **Suggested Readings:**

1. M.P.Jain, Indian Constitutional Law, Wadhwa& Co, Nagpur
2. V.N.Shukla, Constitution of India, Eastern Book Company, Lucknow
3. Granville Austin, Indian Constitution-Cornerstone of a Nation, OUP, New Delhi
4. H.M.Seervai, Constitutional Law of India (in 3 Volumes), N.M.Tripathi, Bombay
5. G.C.V.Subba Rao, Indian Constitutional Law, S.Gogia& Co., Hyderabad
6. B.Shiva Rao, Framing of India's Constitution (in 5 Volumes), Indian Institute of Public Administration, New Delhi
7. J.N.Pandey, Constitutional Law of India, Central Law Agency, Allahabad

# Legal Methods

Sub. Code: BL – 203

L-4, C-4

## Course Objectives

- Understand the structure of legal systems: Introduce students to the basics of the legal system, including the different types of law (e.g., common law, statutory law, constitutional law), and the role of courts, legislatures, and executive bodies in shaping law.
- Familiarize with sources of law.
- Help students identify and understand the different sources of law, including primary sources (e.g., statutes, case law, constitutions) and secondary sources (e.g., legal commentary, law review articles, legal dictionaries).
- Develop legal research skills: Equip students with the skills to conduct effective legal research using legal databases (e.g., Westlaw, LexisNexis) and traditional research methods (e.g., library research, casebooks, and law reports).

## Unit-I: Introduction

Law as an independent discipline has its own materials and methods. Though related to and reflective of social processes, its development is unique in several respects. The character and content of legal knowledge are explained to the student in a systematic fashion. Familiarity with the sources of law and with legal materials and competence to find the law by the use of the law library are major concerns of this course. The ability to appreciate law as a process in the context of other processes in society (political, economic, cultural, social) is one of the goals of this course.

## Unit-II: Introduction to Law

### I. Meaning and Classification of Laws

- a. What is law?
- b. Meaning and definition
- c. How is law made?
- d. What are the uses and functions of law?
- e. Classification of laws:
  - i. Public and Private Law
  - ii. Substantive and Procedural Law
  - iii. Municipal and International Law

## Unit-III : Sources of Law

- a. Custom
- b. Precedent
- c. Legislation



#### **Unit-IV : Basic Concepts of Indian Legal System**

- a. Common Law
- b. Constitution as the Basic Law
- c. Rule of Law
- d. Separation of Powers
- e. Judicial system in India

#### **Unit-V : Legal Writing and Research**

Legal materials – Case law, b. Statutes, Reports, Journals, Manuals, Digests etc.,

#### **Suggested Readings**

- **"Introduction to Legal Research and Methodology"** by S.K. Verma and Kusum Verma
  - A detailed guide on legal research techniques and methodologies, focusing on Indian law.
- **"Legal Research and Writing"** by Nancy L. Schultz and Linda H. Edwards
  - Provides a comprehensive understanding of legal research and writing skills.
- **"Legal Method"** by S.P. Sathe
  - A foundational text on the principles of legal reasoning and methodology.
- **"The Legal System: A Social Science Perspective"** by Lawrence M. Friedman
  - Explores the structure and functioning of legal systems from a sociological viewpoint.
- **"An Introduction to Legal Theory"** by Peter G. Stein
  - Focuses on the philosophical underpinnings of law and its methods.

## POLITICAL SCIENCE-III

Sub. Code: BL – 205

L-4, C-4

### Course Objectives

- Understand the role of the state: Study the state's role in governance, lawmaking, security, and economic management. Analyze how states interact with citizens and non-state actors.
- Examine executive power and leadership: Understand the functions and powers of executive branches, focusing on the head of state/government and their relationship with the legislature and judiciary.
- Analyze the role of legislatures: Study how legislative bodies operate in different political systems, focusing on lawmaking, representation, and the relationship between the legislature and the executive.
- Study the judiciary and judicial review: Examine the role of courts in interpreting laws, ensuring the constitutionality of laws, and protecting individual rights and liberties.

**Unit I: Western Political Thought:** Plato (Ethics), Aristotle (State, Citizenship)

**Unit II: Western Political Thought:** Lock (Rights), Rousseau (Inequality), Marx (State)

**Unit III: Indian Political Thought:** Kautilya(State), Vivekanand (Vedanta, Education)

**Unit IV: Indian Political Thought:** Gandhi (Swaraj), Ambedkar (Social Justice),

### Suggested Readings:

1. Appadorai, Indian Political Thinking through the Ages, Khanna Publishers, Delhi,
2. Urmila Sharma, S K Sharma, Indian Political Thought, Atlantic
3. V. R. Mehta, Foundations of Indian Political Thought, New Delhi, Manohar
4. C.L. Wayper, Political Thought, New Delhi, (English & Hindi).
5. S. Mukherjee and S. Ramaswamy, A History of Political Thought: Plato to Marx, New Delhi, Prentice Hall.

Ian Adams & R.W. Dyson, Fifty Great Political Thinkers, Routledge

## **Society and Gender-III (BL – 205 A)**

**Subject Code: BL – 205A**

**L 4, C 4**

### **Course Objectives:**

- To understand and critically analyse the evolving concepts of gender and their impact on social structures.
- To explore the intersectionality of gender with other social categories like race, caste, class, and sexuality.
- To examine feminist theories, ideologies, and movements, both historical and contemporary.
- To evaluate the role of gender in key social institutions like family, education, politics, and media.
- To explore contemporary gender issues in a global context and discuss policies addressing gender inequality.

### **Unit 1: Foundations of Gender Studies**

#### **1. Introduction to Gender Studies:**

- Definition and conceptualization of gender, sex, and sexuality.
- Historical development of gender studies as an interdisciplinary field.
- The role of gender in social theory: Contributions of key theorists (Simone de Beauvoir, Judith Butler, Michel Foucault).

#### **2. Gender and Socialization:**

- Social construction of gender roles and identities.
- Gender socialization in family, school, and media.
- The impact of patriarchy, heteronormativity, and gender norms on individual lives.

#### **3. Intersectionality in Gender Studies:**

- Concept of intersectionality: Kimberlé Crenshaw's theory.
- The interconnectedness of gender, class, race, caste, and sexuality.
- Case studies exploring intersectional experiences of women and marginalized groups.

### **Unit 2: Feminist Theories and Movements**

#### **1. Classical Feminist Theories:**

- Liberal feminism: Emphasis on individual rights, equality, and legal reforms (e.g., Mary Wollstonecraft, John Stuart Mill).
- Socialist feminism: Connection between gender and class oppression (e.g., Engels, Simone de Beauvoir).

- Radical feminism: Focus on patriarchy and systemic oppression of women (e.g., Shulamith Firestone, Andrea Dworkin).
- 2. **Postmodern and Postcolonial Feminisms:**
  - Postmodern feminism: Critique of universalizing narratives and essentialism (e.g., Judith Butler, bell hooks).
  - Postcolonial feminism: The impact of colonialism on gender and identity, experiences of Third World women (e.g., Gayatri Spivak, Chandra Talpade Mohanty).
- 3. **Contemporary Feminist Movements:**
  - Global feminist movements and the fight for reproductive rights, gender-based violence, and equal pay.
  - #MeToo, Time's Up, and other social media-driven movements.
  - Feminism in India and the Global South: Challenges and perspectives.

### **Unit 3: Gender and Social Institutions**

1. **Gender in the Family:**
  - Family as a site of gender roles and power dynamics.
  - The evolution of family structures and the impact of globalization and migration.
  - Gendered division of labor in the household and caregiving responsibilities.
2. **Gender in Education:**
  - Gender stereotypes in textbooks, curriculum, and teacher-student interactions.
  - Gender disparities in access to education: Global and national perspectives.
  - Gender and academic achievement: Women's access to higher education and barriers faced.
3. **Gender and Work:**
  - Gendered labor markets: The feminization of certain jobs and gender pay gaps.
  - Occupational segregation: The glass ceiling, leadership roles, and the corporate ladder.
  - Feminist perspectives on unpaid work and the value of caregiving roles.
  -

### **Unit 4: Gender, Sexuality, and the Law**

1. **Legal Frameworks for Gender Equality:**
  - International laws and conventions on women's rights (e.g., CEDAW).
  - Indian Constitution and gender equality: Fundamental rights, Directive Principles of State Policy, and laws for women's protection.
  - Gender-based violence and the legal system: Domestic violence, sexual harassment, and trafficking.
2. **Gender and Reproductive Rights:**
  - Feminist perspectives on reproductive justice and autonomy.
  - Laws surrounding reproductive health: Abortion, contraception, and maternal health.
  - The role of the state in regulating and controlling women's bodies.

### 3. **LGBTQ+ Rights and Gender:**

- Gender identity, sexuality, and the law: Legal recognition of transgender rights.
- Decriminalization of homosexuality in India and the global fight for LGBTQ+ rights.
- Intersection of gender and sexuality in the context of marriage, adoption, and family law.

## **Unit 5: Gender, Media, and Culture**

### 1. **Gender Representation in Media:**

- Media as a tool for perpetuating gender stereotypes and roles.
- Representation of women in film, television, advertisements, and social media.
- Feminist media criticism and the portrayal of men and women in the media.

### 2. **Cultural Practices and Gender:**

- Gender and tradition: The role of cultural practices in shaping gender identities and roles.
- Rituals, religion, and gender: How gender roles are embedded in cultural practices and beliefs.
- The politics of gender and culture in the Global South: The debate on cultural relativism vs. universalism.

### 3. **Digital Feminism and Gender Activism:**

- Online gender activism and the impact of social media platforms.
- Cyber feminism and the role of technology in addressing gender inequalities.
- Virtual communities and their influence on gender discourse.

## **Suggested Books:**

- Walby, S. (2011). *The Future of Feminism*. Polity Press.
- Sen, A. (2001). *Development as Freedom*. Oxford University Press.
- Nanda, M. (2017). *Transgender Rights and Politics in India*. University of California Press.
- Mulvey, L. (2009). *Visual and Other Pleasures*. Palgrave Macmillan.
- Gill, R. (2007). *Gender and the Media*. Polity Press.
- Duffy, B. E. (2017). *(Not) Getting Paid to Do What You Love: Gender, Social Media, and Aspirational Work*. Yale University Press.
- Kabeer, N. (2005). *Gender, Poverty and Livelihoods: Issues for Social Protection*. Routledge.
- Reddy, A. (2011). *With Respect to Sex: Negotiating Hijra Identity in South India*. University of Chicago Press.
- Nussbaum, M. C. (2009). *Sexual Justice in a Liberal State*. Oxford University Press.

## **Comparative Politics-III (BL-205 B)**

**Subject Code: BL – 205 B**

**L 4, C 4**

### **COURSE OBJECTIVES**

- To deepen students' knowledge of advanced theories in comparative politics, including structuralism, institutionalism, and rational choice theory.
- To critically examine the methodological approaches used in comparative political analysis.
- To explore and compare different types of political systems, including democracies, authoritarian regimes, and hybrid systems.
- To understand the role of institutions such as legislatures, executives, and judiciaries in shaping political outcomes across different countries.

#### **Unit 1:**

- Introduction to Comparative Politics
- Human Nature and the Ends of Political Life.
- Approaches of the study of Comparative politics.
- Comparative Government and politics

#### **Unit 2:**

- Political Culture and political Socialization.
- Constitution and Constitutionalism.
- Development: Underdevelopment and dependency.
- Political Development, Democracy and Political Decay.

#### **Unit 3:**

- Organization of Government: Institution and Procedures.
- Rule Making Structure- The Legislature
- Rule Application Structure – The Executive
- Rule Adjudication Structure- The Judiciary.

#### **Unit 4:**

- Theory of Separation of Powers and Checks and Balances
- N.G.O. Civil Society Campaigns and role of Mass Media

#### **Unit 5:**

- Importance of the study Informal Institution in Comparative Politics.
- Electoral System and Voting Behavior.

### **Suggested Readings:**

- Bruce J. Dickson, *The Dictator's Dilemma: The Chinese Communist Party's Strategy for Survival* (New York: Oxford University Press, 2016).
- Robert Guest, *Borderless Economics: Chinese Sea Turtles, Indian Fridges and the New Fruits of Global Capitalism* (New York: St. Martin's Griffith, 2013).
- Steven Levitsky and Daniel Ziblatt, *How Democracies Die* (New York: Crown, 2019)
- Dambisa Moyo, *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa* (Farrar, Straus and Giroux, 1st reprint ed., 2010).

## **POLITICAL THEORIES -III (BL-205 C)**

**Subject Code: BL – 205 C**

**L 4, C 4**

### **COURSE OBJECTIVES**

- To explore the evolution of political thought in the modern and contemporary periods.
- To analyse key political ideologies, including liberalism, socialism, feminism, post-colonialism, and critical theory.
- To develop an understanding of how contemporary political theories, engage with questions of justice, rights, power, and equality in the context of the modern state and society.

#### **Unit 1: Classical Liberalism and Its Critics**

- **John Stuart Mill:** Liberty, individual rights, and utilitarianism
- Readings: On Liberty, Utilitarianism
- **T.H. Green:** Positive freedom and the welfare state
- **Critiques of Classical Liberalism:** From Marx, conservatism, and communitarianism

#### **Unit 2: Marxist and Neo-Marxist Theories**

- Karl Marx: Alienation, class struggle, historical materialism
- Readings: The Communist Manifesto, Das Kapital (selected sections)
- Antonio Gramsci: Hegemony, civil society, and the role of intellectuals
- The Frankfurt School: Critical theory, culture industry, and ideological domination (Adorno, Horkheimer, Marcuse)

#### **Unit 3: Socialism and Communism**

- Vladimir Lenin: Imperialism, the state, and revolution
- Leon Trotsky: Permanent revolution and critiques of Stalinism
- Rosa Luxemburg: Democracy and revolution, critique of reformism
- Contemporary Socialism: Democratic socialism, syndicalism, and revisionism

#### **Unit 4: Anarchism and Libertarianism**

- Pierre-Joseph Proudhon: Mutualism and property
- Mikhail Bakunin: Revolutionary anarchism, critique of Marxism
- Libertarianism: The minimal state, individual freedom, and free markets (Nozick's Anarchy, State, and Utopia)



## **Unit 5: Feminist Political Theory**

- Mary Wollstonecraft: The early feminist critique of inequality
  - Readings: A Vindication of the Rights of Woman
- Simone de Beauvoir: Existential feminism and the "othering" of women
  - Readings: The Second Sex
- Contemporary Feminism: Liberal, radical, and socialist feminism

### **Suggested Readings:**

1. John Rawls, A Theory of Justice
2. Karl Marx, The Communist Manifesto
3. Simone de Beauvoir, The Second Sex
4. Michel Foucault, Discipline and Punish
5. Edward Said, Orientalism
6. Frantz Fanon, The Wretched of the Earth
7. Robert Nozick, Anarchy, State, and Utopia
8. Gayatri Spivak, Can the Subaltern Speak?

## HISTORY-III

Sub. Code: BL 207

L 4, C4

### Course Objectives

- Understand the origins of British imperialism: Study the early stages of British expansion, including the Age of Discovery, the establishment of early colonies, and the economic, political, and military motivations behind imperial ventures.
- Analyze the development of the British Empire: Examine how Britain built its empire through the colonization of the Americas, Africa, India, and the Pacific, and the impact of trade routes, naval power, and colonial administration.
- Investigate the role of British explorers and merchants: Study the contributions of key figures like Francis Drake, Robert Clive, and Cecil Rhodes, and their roles in expanding British influence globally.

### Unit 1

- 1:- Advent of European in India.
- 2:- Governor General of Bengal.
- 3:- William Bentinck and his Policies.
- 4:- Dalhousie and his Policies.

### Unit 2

- 1:- Regulating Act 1773,
- 2:- Act of Settlement 1781,
- 3:- Pits India Act 1784,
- 4:- High Court Act 1861.

### Unit 3

- 1:- Revolt of 1857: Causes, Nature and Programme.
- 2:- Leadership, People Participation.
- 3:- British Repression and Response.
- 4:- Failure and Impact of the Revolt of 1857.

### Unit 4

- 1:- The Act of 1858,
- 2:- The Act of 1892,
- 3:- The Act of 1994,
- 4:- The Act of 1935.

### Unit 5

- 1:- Emergence of Organized Nationalism: Formation of Indian National Congress.
- 2:- Gandhian Movement: Nature, Programme, Social Composition.
- 3:- Pre-Partition Politics: Simon Commission.

### **Suggested Reading:**

- **"A History of India"** by Romila Thapar
- A comprehensive account of ancient and medieval Indian history, exploring cultural, political, and social aspects.
- **"The Wonder That Was India"** by A.L. Basham
- A classic work on the history, culture, and achievements of ancient India, covering a broad range of topics.
- **"India: A History"** by John Keay
- A concise yet detailed history of India from ancient times to the present, examining key events and figures.
- **"Medieval India: From Sultanat to the Mughals"** by Satish Chandra
- A scholarly work on the political, social, and economic changes in India from the Sultanate period to the Mughal era.
- **"Modern India: 1885-1947"** by Sumit Sarkar
- Focuses on India's modern history, especially the freedom struggle, the role of key figures, and social reforms.
- **"The British in India: A History of the British Empire in India"** by Nicholas B. Dirks
- Explores the British colonial impact on India, examining political, economic, and cultural changes.

## **Sociology-III (BL 207A)**

**Sub. Code: BL 207A**

**L 4, C4**

### **Course Objectives**

- Understand the relationship between law and society.
- Analyze the role of law in social change and justice.
- Examine legal responses to social stratification and inequality.
- Study the sociological aspects of social problems and legal remedies.
- Explore contemporary legal challenges in a globalized society.

### **Unit 1: Introduction to Law and Society**

- Concept and Functions of Law in Society
- Relationship Between Law, Society, and Social Control
- Customary Law and Legal Pluralism
- Sociology of Legal Institutions

### **Unit 2: Law and Social Change**

- Role of Law in Social Change
- Law as an Instrument of Social Transformation
- Resistance to Legal Change
- Case Studies: Social Reforms and Legal Impact

### **Unit 3: Social Stratification and Law**

- Caste, Class, and Gender in Legal Contexts
- Intersectionality and Legal Protection
- Affirmative Action and Reservation Policies
- Human Rights and Social Justice

### **Unit 4: Law and Social Problems**

- Law and Issues of Crime, Violence, and Deviance
- Poverty, Unemployment, and Legal Remedies
- Environmental Degradation and Legal Responses
- Cybercrimes and Modern Legal Challenges

### **Unit 5: Contemporary Issues in Law and Society**

- Globalization and Legal Systems
- Digital Society and Legal Challenges
- Role of NGOs and Civil Society in Legal Advocacy

## **Suggested Readings**

1. Emerging Trends: Artificial Intelligence and Law
2. **"Law and Society in India"** by Upendra Baxi
3. A critical analysis of the interaction between law and society in India.
4. **"On Law and Society"** by Roscoe Pound
5. Explores the relationship between law and societal needs from a jurisprudential perspective.
6. **"Sociology of Law"** by Steven Vago
7. A comprehensive introduction to the sociology of law, covering theory and applications.
8. **"The Spirit of Laws"** by Montesquieu
9. A foundational text discussing how societal factors influence laws and governance.
10. **"Law and Social Change in India"** by Agnes Flavia
11. Examines the impact of law on societal transformations, particularly in gender justice.
12. **"Social Stratification"** by Dipankar Gupta
13. Explores caste, class, and social hierarchies in India and their interaction with the legal system.

# Understanding Contemporary Social Issues-III

Sub. Code: BL 207B

L 4,C 4

## Course Objectives

- Analyse key contemporary social issues.
- Understand the impact of globalization and technology.
- Examine environmental and gender-related challenges.
- Explore legal frameworks for social justice.
- Develop critical thinking on emerging societal problems.

## Unit 1: Introduction to Contemporary Social Issues

- Concept of Social Issues: Definition and Characteristics
- Framework for Understanding Social Problems
- Role of Law in Addressing Social Issues

## Unit 2: Globalization and Its Impact

- Economic and Cultural Globalization
- Impact on Marginalized Communities
- Legal and Policy Responses to Globalization

## Unit 3: Environment and Sustainability

- Climate Change and Environmental Degradation
- Legal Framework for Environmental Protection
- Sustainable Development Goals (SDGs) and Social Justice

## Unit 4: Gender and Society

- Gender Inequality and Violence
- LGBTQIA+ Rights and Legal Recognition
- Role of Law in Promoting Gender Justice

## Unit 5: Technology and Society

- Digital Divide and Social Exclusion
- Cybercrime and Data Privacy Issues
- Legal Challenges in Regulating Technology

## Unit 6: Emerging Social Issues

- Urbanization and Housing Crisis
- Mental Health and Legal Frameworks
- Drug Abuse and
- Decriminalization Policies

## **Suggested Readings**

1. **"Globalization and Its Discontents"** by Joseph E. Stiglitz
2. Explores the impacts of globalization on societies and economies.
3. **"The Gendered Society"** by Michael Kimmel
4. Analyzes gender dynamics and their impact on contemporary social issues.
5. **"Development as Freedom"** by Amartya Sen
6. Examines the relationship between freedom, social issues, and development.
7. **"Silent Spring"** by Rachel Carson
8. A landmark work on environmental issues and their social impact.
9. **"The Net Delusion: The Dark Side of Internet Freedom"** by Evgeny Morozov
10. Discusses the societal challenges posed by technology and digitalization.

# **Social Institutions In India-III**

**Sub. Code: BL 207C**

**L 4, C 4**

## **Course Objectives**

- Understand key social institutions in India.
- Analyze family, caste, and class structures.
- Explore the role of religion and politics in society.
- Study the impact of education on social change.
- Examine legal frameworks shaping social institutions.

## **Unit 1: Introduction to Social Institutions**

- Definition, Nature, and Functions of Social Institutions
- Role of Social Institutions in Indian Society
- Interrelation between Law and Social Institutions

## **Unit 2: Family and Kinship**

- Types of Families in India: Joint and Nuclear
- Changing Dynamics of Family Structures
- Laws Related to Marriage, Divorce, and Succession

## **Unit 3: Caste and Class**

- Caste System in India: Historical and Contemporary Perspectives
- Class Structure and Social Mobility
- Legal Measures against Caste Discrimination

## **Unit 4: Religion and Society**

- Role of Religion in Indian Society
- Secularism and Religious Pluralism in India
- Legal Framework Governing Religious Practices

## **Unit 5: Political and Economic Institutions**

- Panchayati Raj and Local Governance
- Role of Political Parties and Electoral Processes
- Economic Institutions and Their Social Impact

## **Unit 6: Education as a Social Institution**

- Education and Social Change in India
- Right to Education and Related Policies
- Challenges in the Indian Education System



## **Suggested Readings**

1. **"Indian Society: Themes and Social Issues"** by Nadeem Hasnain
2. A comprehensive overview of social institutions and issues in India.
3. **"Caste in Modern India and Other Essays"** by M.N. Srinivas
4. Explores the caste system and its relevance in contemporary India.
5. **"Family and Kinship in India"** by Patricia Uberoi
6. Analyzes family and kinship structures in Indian society.
7. **"Religion and Society among the Coorgs of South India"** by M.N. Srinivas
8. Examines the interplay of religion and social institutions in India.
9. **"Social Background of Indian Nationalism"** by A.R. Desai
10. Discusses the role of social institutions in shaping Indian nationalism.
11. **"Education and Social Change in India"** by Satya Bhushan Verma
12. Studies the transformative role of education in Indian society.

# Microeconomics-I

Sub. Code: BL 209

L 4, C 4

## Course Objectives

- The Microeconomics course is designed to provide students with a deep understanding of the decision-making processes of individuals, firms, and markets, and how these decisions shape resource allocation, pricing, and the distribution of goods and services.
- By exploring the concepts of supply and demand, market structures, consumer and producer behaviour, market failures, and government intervention.
- students are equipped with the analytical tools necessary to understand and address a wide range of economic issues.
- This course lays a strong foundation for further studies in economics and prepares students for careers in areas such as business, finance, policy analysis, and economic research.

## Unit I: Introduction to Microeconomics

Definition & Scope, Production Possibility Curve, Demand, Quantity Demanded, Law of Demand, Supply, Quantity Supplied, Law of Supply, Shape & Characteristics of Demand & Supply Curve,

## Unit II: Consumer Theory I

Consumer Budget Constraint, Elasticity of Demand – its types, Types of Goods (Substitutes, Compliments etc.) & their elasticity.

## Unit III: Consumer Theory II

Concept of Utility (TU, MU), Law of Diminishing Marginal Utility (LDMU), Deriving law of demand using LDMU.

## Unit IV: Consumer Theory III

Indifference Curves (IC) (Properties, Types), Consumer Equilibrium using IC – Price & Substitution Effect.

## Unit V: Market Dynamics

### Suggested Readings:

1. Jhinga M.L., Microeconomics Theory, Vrinda Publishing House.
2. Samuelson & Nordhaus, Economics, Tata Mc Graw Hill.
3. Hal.R. Varian, Intermediate Microeconomics, W.W. Norton & Company.
4. Koutsoyiannis A., Modern Microeconomics, Mac Millan Press.

## **Economic Sociology-I (BL 209A)**

**Sub. Code: BL 209A**

**L 4, C 4**

### **Course Objectives:**

- To introduce students to the field of economic sociology and its key concepts.
- To understand how social structures, relationships, and institutions shape economic behaviour and decision-making.
- To explore the role of culture, power, and inequality in economic processes.
- To critically assess economic systems, institutions, and their social implications.
- To examine contemporary economic issues such as globalization, informal economies, and economic inequality from a sociological perspective.

### **Unit 1: Introduction to Economic Sociology**

#### **1. Definition and Scope of Economic Sociology:**

- What is economic sociology? Its historical development and evolution as a field of study.
- Economic sociology vs. economics: Key differences and interdisciplinary nature.
- The role of sociology in understanding economic processes and social structures.

#### **2. Basic Concepts in Economic Sociology:**

- Social structure, social relations, and economic behaviour.
- Markets, institutions, organizations, and networks in economic processes.
- The concept of embeddedness: Economic action as embedded in social networks and institutions.

#### **3. Key Theoretical Approaches:**

- Classical approaches: Max Weber's theory of economic action, Karl Marx's views on capitalism and class.
- Contemporary approaches: Rational choice theory, social network theory, and institutional theory.

### **Unit 2: Social Structure and Economic Behaviour**

#### **1. Social Class and Economic Behavior:**

- Theories of social class: Marxist, Weberian, and functionalist perspectives.
- The relationship between social class and economic behavior: Consumption patterns, labor markets, and mobility.
- The role of class in shaping access to resources, opportunities, and decision-making.

## **2. Social Networks and Economic Action:**

- Social networks as a form of capital: Networks and economic outcomes.
- Embeddedness of economic action in social relationships (Granovetter's theory of embeddedness).
- The role of trust and reciprocity in economic transactions.

## **3. Economic Organizations and Institutions:**

- The structure of economic organizations: Firms, markets, and bureaucracies.
- The role of institutions in shaping economic behavior: Legal systems, property rights, and labor laws.
- Institutional theories of the economy: Institutional isomorphism and path dependency.

### **Unit 3: Markets and Economic Systems**

#### **1. Markets and Social Order:**

- The sociology of markets: How markets emerge, function, and shape economic behavior.
- Market structures: Competitive, oligopolistic, and monopolistic markets.
- The role of social order in market behavior: Norms, regulations, and informal market practices.

#### **2. Market and State:**

- The role of the state in market regulation and intervention.
- Market failures and the state's role in correcting them: Public goods, externalities, and monopolies.
- The debate between market liberalization and state intervention: Neoliberalism vs. state-led development.

#### **3. Globalization and Market Dynamics:**

- Globalization and its impact on local and global markets.
- The social dimensions of global markets: Transnational corporations, global labor markets, and economic inequality.
- The role of culture and identity in shaping global markets.

### **Unit 4: Economic Inequality and Power**

#### **1. Economic Inequality:**

- Theories of economic inequality: Marxist, functionalist, and neo-liberal perspectives.
- The impact of economic inequality on social structures: Class, gender, and race.
- Measuring economic inequality: Income inequality, wealth inequality, and social mobility.

#### **2. Power and Economic Systems:**

- The concept of power in economic sociology: Economic elites, political power, and decision-making.
- Theories of power: Weberian and Marxist views on economic power.
- Corporate power, labor relations, and the state's role in mediating power relations.

### **3. Gender, Race, and Class in Economic Inequality:**

- Intersectionality and economic inequality: How gender, race, and class interact in shaping economic outcomes.
- Discrimination in the labor market: Gender pay gaps, racial discrimination, and the role of social networks.
- The impact of economic policies on marginalized groups.

## **Unit 5: Informal Economies and Globalization**

### **1. Informal Economies:**

- Defining informal economies: Unorganized labor, self-employment, and small enterprises.
- The role of the informal economy in developing countries: Informality as a survival strategy.
- Social networks and the informal economy: How informal work is organized and sustained.

### **2. Globalization and the Informal Economy:**

- Globalization's impact on informal labor markets: Global supply chains, migrant labor, and economic precarity.
- The rise of gig economies and platform-based labor.
- Informality in the context of global capitalism and neoliberal policies.

### **3. Global Capitalism and Its Sociological Impacts:**

- Theories of globalization in economic sociology: The rise of transnational capitalism and its social consequences.
- Cultural dimensions of globalization: The spread of consumerism, media, and global identities.
- The social impact of economic crises: Case studies on financial crises, austerity, and economic inequalities.

## **Unit 6: Sociology of Development and Economic Change**

### **1. Development and Economic Sociology:**

- Theories of economic development: Modernization theory, dependency theory, and world-systems theory.
- The role of social relations and institutions in shaping economic development.
- Social capital and its contribution to development: Trust, networks, and community.

### **2. Economic Change and Social Transformation:**

- The relationship between economic change and social transformation: Industrialization, urbanization, and globalization.
- The role of technology and innovation in economic change: Technological revolutions and their social implications.
- Development and sustainability: Social and environmental dimensions of economic change.

### **Suggested Books:**

- Sen, A. (1999). *Development as Freedom*. Oxford University Press.
- Sachs, J. D. (2005). *The End of Poverty: Economic Possibilities for Our Time*. Penguin Books.
- Giddens, A. (2009). *Sociology*. Polity Press.
- Granovetter, M. (1985). *Economic Action and Social Structure: The Problem of Embeddedness*. *American Journal of Sociology*.
- Smelser, N. J., & Swedberg, R. (2005). *The Handbook of Economic Sociology*. Princeton University Press.
- Bourdieu, P. (2005). *The Social Structures of the Economy*. Polity Press
- Castells, M. (1996). *The Rise of the Network Society*. Blackwell Publishers.
- Portes, A., Castells, M., & Benton, L. A. (1989). *The Informal Economy: Studies in Advanced and Less Developed Countries*. Johns Hopkins University Press.
- Harvey, D. (2005). *A Brief History of Neoliberalism*. Oxford University Press.

## **Economic Geography I (BL-209B)**

**Sub. Code: BL 209B**

**L 4, C 4**

### **Course Objectives**

- This course examines the spatial organization of economic activities and the relationships between geography, economics, and human behavior.
- It explores topics such as globalization, regional development, and the impact of location on economic practices.

### **Unit 1: Introduction to Economic Geography**

- Definition and scope of economic geography
- Key concepts and theories
- The importance of location in economic activities

### **Unit 2: Theoretical Foundations**

- Overview of economic theories (e.g., von Thünen, Weber, Christaller)
- Location theory and its applications
- Regional economic development theories

### **Unit 3: Globalization and Economic Networks**

- The role of globalization in economic geography
- Global supply chains and trade networks
- Impact of technology on economic connectivity

### **Unit 4: Economic Systems and Structures**

- Comparison of different economic systems (capitalism, socialism, mixed economies)

### **Suggested Readings:**

1. "Geography of Economic Activity" by Edward J. Malecki
2. An analysis of how economic activities are distributed across space and the factors influencing these patterns.
3. "Globalization and Its Discontents" by Joseph E. Stiglitz
4. Discusses the economic impacts of globalization, including its geographic implications and consequences.
5. "Regional Development and Planning for the 21st Century: Economic and Spatial Considerations" by Roger R. Stough
6. Focuses on regional economic development theories and planning practices in a global context.
7. "Industrial Clusters and Regional Business Networks in China" by J. Liu and Y. Wang
8. Examines the development of industrial clusters in China

## **Economic History I (BL-209C)**

**Sub. Code: BL-209 C**

**L 4, C 4**

### **Course Objectives**

- This course explores the evolution of economic systems, theories, and practices from ancient times to the present.
- Students will examine major economic events, trends, and transformations, analyzing their impact on societies and global economies.

### **Unit 1: Introduction to Economic History**

- Defining economic history
- Methodologies and sources in economic history
- The significance of economic history in understanding the present

### **Unit 2: Pre-Industrial Economies**

- Economic systems in ancient civilizations (Mesopotamia, Egypt, Greece, Rome)
- Trade and barter systems
- The role of agriculture in early economies

### **Unit 3: The Middle Ages and Feudalism**

- The feudal system and its economic implications
- The rise of trade and markets in medieval Europe
- The role of guilds and commerce

### **Unit 4: The Commercial Revolution**

- Factors leading to the Commercial Revolution (11th-18th centuries)

### **Suggested Readings:**

1. "The Wealth of Nations" by Adam Smith
2. A foundational text in economics, exploring the nature of wealth, trade, and the role of markets.
3. "Capital in the Twenty-First Century" by Thomas Piketty
4. Analyzes wealth inequality and the dynamics of capital accumulation from a historical perspective.
5. "The Great Transformation: The Political and Economic Origins of Our Time" by Karl Polanyi
6. Examines the social and economic changes during the Industrial Revolution and the emergence of market economies.
7. "An Economic History of the World Since 1400" by Donald J. Harreld
8. A comprehensive overview of global economic history, highlighting major developments and trends.



# HUMAN RIGHTS LAW

Sub Code: BL 202

L -4, C -4

## Course Objectives

- Define human rights: Understand the fundamental concept of human rights as universal, inalienable rights that every individual possesses by virtue of being human, irrespective of nationality, ethnicity, gender, or religion.
- Explore the historical development of human rights: Study the evolution of human rights from ancient civilizations, through key historical events such as the Magna Carta, the French Revolution, and the abolition of slavery, leading to the modern concept of human rights.
- Differentiate between civil, political, economic, social, and cultural rights: Understand the different categories of human rights and how they contribute to the protection of individual freedoms and dignity.

### Unit-I

Meaning and definition of Human Rights - Evolution of Human Rights - Human Rights and Domestic Jurisdiction

### Unit-II

Adoption of Human Rights by the UN Charter - U.N.Commission on Human Rights - Universal Declaration of Human Rights - International Covenants on Human Rights( Civil and Political; Economic, Social and Cultural).

### Unit-III

Regional Conventions on Human Rights - European Convention on Human Rights - American Convention on Human Rights - African Charter on Human Rights(Banjul).

### Unit-IV

International Conventions on Human Rights - Genocide Convention, Convention against Torture, CEDAW, Child Rights Convention, Convention on Statelessness, Convention against Slavery, Convention on Refugees - International Conference on Human Rights (1968) - World Conference on Human Rights (1993).

**Suggested Readings:**

- 1 P.R. Gandhi (ed): Blackstone's International Human Rights Documents, Universal Law Publishing Co. Delhi.
- 2 Richard B. Lillich and Frank C. Newman: International Human Rights - Problems of Law and Policy, Little Brown and Company, Boston and Toronto.
3. Frederick Quinn: Human Rights and You, OSCE/ ODIHR, Warsaw, Poland
4. T.S. Batra: Human Rights – A Critique, Metropolitan Book Company Pvt. Ltd., New Delhi.
5. Dr.U. Chandra: Human Rights, Allahabad Law Agency Publications, Allahabad.

## Legal History

**Sub Code: BL 204**

**L 4, C 4**

### Course Objectives

- Introduce the concept of legal history: Study the evolution of law as a social institution, with a focus on how different societies have developed legal systems to regulate behavior, resolve disputes, and maintain order.
- Examine the origins of law: Investigate the earliest forms of law, including customary law, religious law, and tribal codes in ancient societies.
- Understand the concept of justice: Analyze how different cultures have defined and approached justice, and how those definitions influenced the structure and function of legal systems.
- Explore how religious beliefs shaped the legal systems in various cultures, including Jewish law, Islamic law (Sharia), and Canon law (the law of the Catholic Church).

### Unit I: Early Developments (1600- 1836)

- a. Charters of the East India Company: 1600, 1661, 1726 and 1753
- b. Settlements: Surat, Madras, Bombay and Calcutta
- c. Courts: Mayor's Court of 1726 and Supreme Court of 1774
- d. Statutes: Regulating Act, 1773; Pitts India Act, 1784; The Act of Settlement 1781

### Unit II: Early Developments (1600- 1836)

- a. Conflict: Raja Nanad Kumar, Kamaluddin, Patna Case, and Cossijurah
- b. Warren Hastings: Judicial Plans of 1772, 1774 and 1780
- c. Lord Cornwallis: Judicial Plans of 1787, 1790 and 1793
- d. Lord William Bentinck (With special focus on Appraisal of Criminal law)

### Unit III: Evolution of Law and Legal Institutions

- a. Development of Personal Laws
- b. Development of Law in Presidency Towns
- c. Development of Civil law in Mufassil: Special Emphasis on Justice, Equity and Good Conscience
- d. Codification of Laws: Charter of 1833, The First Law Commission, the Charter of 1853,

### Unit IV:

- a. The Second Law Commission
- b. Establishment of High Courts, 1861
- c. Privy Council and Federal Court: Appeals and working of Privy Council
- d. Privy Council, Features of Federal Court
- e. Evaluation: Special Reference to Racial Discrimination, Merit and Demerits

### Suggested Readings:

1. M.P. Jain – Outlines of Indian Legal History
2. V.D. Kulshrethta – Landmarks of Indian Legal and Constitutional History

## LAW OF EVIDENCE

Sub. Code: BL 206

L – 4, C – 4.

### Course Objectives

- Understand the burden of proof: Study the concept of the burden of proof, which dictates which party is responsible for proving the facts of a case. Understand the difference between the prosecution's burden in criminal cases and the plaintiff's burden in civil cases.
- Examine the standard of proof: Learn about the standard of proof required in different types of cases, including the higher standard of beyond a reasonable doubt in criminal cases and the lower standard of preponderance of the evidence in civil cases.
- Study presumptions in evidence law: Explore legal presumptions (e.g., presumption of innocence in criminal law) and their role in shifting the burden of proof to the opposing party.
- Study the Admissibility and Use of Expert Evidence

### Unit-I:

The Indian Evidence Act, 1872 — Salient features of the Act – Meaning and kinds of Evidence — Interpretation clause — May Presume, shall presume and Conclusive proof - Fact, Fact in issue and Relevant facts — Distinction between Relevancy and Admissibility - Doctrine of Res Gestae — Motive, preparation and conduct — Conspiracy — When Facts not otherwise relevant become relevant — Right and custom — Facts showing the state of mind etc.

### Unit-II:

Admissions & Confessions: General Principles concerning Admissions — Differences between "Admission" and "Confession" — Confessions obtained by inducement, threat or promise – Confessions made to police officer - Statement made in the custody of a police officer leading to the discovery of incriminating material — Admissibility of Confessions made by one accused person against co-accused.

Dying Declarations and their evidentiary value — Other Statements by persons who cannot be called as Witnesses — Admissibility of evidence of witnesses in previous judicial proceedings in subsequent judicial proceedings.

### Unit-III:

Relevancy of Judgments — Opinion of witnesses — Expert's opinion — Opinion on Relationship especially proof of marriage — Facts which need not be proved — Oral and Documentary Evidence - General Principles concerning oral evidence and documentary evidence — Primary and Secondary evidence — Modes of proof of execution of documents — Presumptions as to documents — General Principles regarding Exclusion of Oral by Documentary Evidence.

### Unit-IV:

Rules relating to Burden of Proof - Presumption as to Dowry Death — Estoppel — Kinds of estoppel — Res Judicata, Waiver and Presumption.

**Suggested Readings:**

1. BatukLal: The Law of Evidence, 13th Edition, Central Law Agency, Allahabad, 1998.
2. M. Munir: Principles and Digest of the Law of Evidence, 10th Edition (in 2 vols), Universal Book Agency, Allahabad, 1994.
3. Vepa P. Saradhi: Law of Evidence 4th Edn. Eastern Book Co., Lucknow, 1989.
4. Avtar Singh: Principles of the Law of Evidence, 11th Edn. Central Law Publications.
5. V. Krishnama Chary: The Law of Evidence, 4th Edn. S.Gogia& Company, Hyderabad.

## LAW OF CRIMES

**Sub. Code: BL 208**

**L – 4, C – 4.**

- I. Understand the elements of a crime: Learn about the essential elements required to establish a crime under the IPC, including actus reus (guilty act) and mens rea (guilty mind).
- II. Examine criminal responsibility: Study the concept of criminal capacity and the factors that may affect liability, such as age, insanity, intoxication, duress, and consent.
- III. Explore the classifications of crimes: Understand the different classifications of crimes under the IPC, including cognizable offenses, non-cognizable offenses, bailable offenses, non-bailable offenses, and compoundable offenses.
- IV. Examine offenses against the state: Study crimes related to national security and sovereignty, such as treason, sedition, and terrorism (Sections 121 to 130 of IPC).

### **Unit-I:**

Concept of crime - Definition and meaning of crime - Distinction between crime and tort - Stages of crime - Intention, Preparation, Attempt and Commission of Crime - Elements of Crime - Actus Reus and Mensrea - Codification of Law of Crimes in India - Application of the Indian Penal Code - Territorial and Extra Territorial application - General Explanations - Punishments.

### **Unit-II:**

General exceptions - Abetment - Criminal Conspiracy - Offences against the State - Offences against public peace and Tranquility.

### **Unit-III:**

Offences affecting human body (offences affecting human life) Culpable Homicide and Murder – Hurt and Grievous Hurt - Wrongful restraint and Wrongful confinement - Criminal force and Assault - Kidnapping and abduction - Sexual offences - Unnatural offences.

### **Unit-IV:**

Offences affecting the public health, safety, convenience, decency and morals - Offences against Property - Theft - Extortion - Robbery & Dacoity - Cheating - Mischief - Criminal Trespass – Criminal misappropriation and Criminal breach of trust.

### **Suggested Readings:**

1. RatanLal and DhirajLal: Indian Penal Code, Wadhwa& Co., 2000.
2. Achutan Pillai: Criminal Law, Butterworth Co., 2000.
3. Gour K.D.: Criminal Law - Cases and Materials, Butterworth Co., 1999.
4. Kenny's: Outlines of Criminal Law, (1998 Edition)

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## MICRO ECONOMICS II

Sub. Code: BL – 210

L-4, C-4

### Course Objectives

- Examine advanced consumer behaviour: Build on the theory of consumer preferences and indifference curves. Study revealed preference theory and how it differs from traditional utility theory.
- Explore consumer choice under uncertainty: analyse how consumers make choices under conditions of risk and uncertainty using concepts like expected utility theory, risk aversion, and portfolio theory.
- Understand intertemporal choice: Study how consumers make decisions over time, particularly with regard to savings and consumption, and the concepts of present value and discount rates.
- Review advanced production theory: Study production functions in detail, including the law of variable proportions, returns to scale, and isoquants.

### Unit-I: Production Theory

Production Function, Production (TP) curve, Laws of variable proportions, Returns to Factor (Average and Marginal Product) and Scale (IRS, CRS, and DRS) & relationship between them.

### Unit-II: Revenue & Cost theory

General theories and types of Cost (FC, VC), Cost concepts & Curves (TC, AC, MC) & relationship between them, SR & LR Cost theory (SAC, SMC, LAC, LMC etc.), Revenue – Types, Curves & Characteristics (TR, MR, AR etc.) Profit Maximization & Cost Minimization.

### Unit-III: Markets

Types & Characteristics [PC, Monopoly (inclusive of price discrimination), Oligopoly, Monopolistic Competition], Market Equilibrium (SR & LR) of firm & Industry under PC, Monopoly, Characteristics of Collusive oligopoly – cartelization.

### Unit-IV: Market Dynamics

Effect of Shift in Market Demand & Supply & Shift in Firms Production & Cost Curves on market/firm equilibrium.

### Suggested Readings:

1. Jhingan M.L., Microeconomics Theory, Vrinda Pub.
2. Samuelson & Nordhaus, Economics, Tata Mc Graw Hill.
3. Hal.R. Varian, Intermediate Microeconomics, W.W. Norton & Company.
4. Koutsoyiannis A., Modern Microeconomics, Mac Millan Press.

## **Economic Sociology II (BL-210A)**

**Sub. Code: BL – 210A**

**L-4, C-4**

### **Course Objectives:**

- To explore the social aspects of economic life, including the relationship between economic behavior and social structures.
- To understand how social, political, and cultural factors influence economic processes and institutions.
- To analyze the evolution of economic systems in different societies, focusing on the role of economic sociology in contemporary global economies.
- To examine key theories, concepts, and empirical studies in economic sociology, including the study of capitalism, labor markets, and economic inequality.

### **Unit I: Theories of Economic Sociology**

- Classical Theories: Max Weber, Karl Marx, and Émile Durkheim's Contributions
- Neo-Classical and Institutional Economic Sociology
- Social Embeddedness of Economic Action: Granovetter's Theory
- Social Capital and Economic Development: Pierre Bourdieu and Robert Putnam
- The Role of Trust and Social Networks in Economic Transactions

### **Unit II: The Sociology of Markets and Consumption**

- Markets as Social Institutions: Social Structure of Markets and Market Behavior
- Cultural Dimensions of Consumption: Consumption Patterns and Identity
- Social Networks and Consumer Behavior
- The Role of Advertising, Media, and Branding in Shaping Consumption
- Globalization and its Impact on Local Markets and Consumption

### **Unit III: Labor Markets and Employment**

- Labor as a Social Institution: The Division of Labor and Labor Markets
- Labor Mobility, Migration, and Globalization of Labor
- The Informal Economy: Characteristics and Importance
- Social Stratification and Inequality in Labor Markets: Gender, Class, and Ethnicity
- Employment Relations: Work, Power, and Conflict in the Workplace

### **Unit IV: Capitalism, Socialism, and Development**

- Capitalism: Social, Political, and Economic Dimensions
- Theories of Capitalism: From Max Weber to Contemporary Capitalism
- Socialism and Planned Economies: The Role of State and Central Planning
- Development and Underdevelopment: Theories and Critiques
- Global Economic Inequality: North-South Divide and the Impact of Globalization



## **Unit V: Economic Sociology and Contemporary Issues**

- The Role of the State in Economic Development: Welfare State and Neoliberalism
- Financial Crises and Economic Sociology: The 2008 Global Financial Crisis
- Environmental Sociology and Sustainable Development
- Economic Sociology and the Informal Economy: Migrant Labor and Informal Markets
- Digital Economy and the Impact of Technology on Economic Relations

### **Suggested Books:**

1. "Economic Sociology: An Introduction" by Frank Dobbin
2. "The Social Economy: Market Society and the State" by Roger A. Friedland and Robert R. Alford
3. "The Sociology of Economic Life" by Mark Granovetter and Richard Swedberg
4. "Theories of Economic Sociology" by Neil J. Smelser and Richard Swedberg
5. "Capitalism and Modern Social Theory" by Anthony Giddens

## **Economic Geography II (BL-210B)**

**Sub. Code: BL – 210B**

**L-4, C-4**

### **Course Objectives**

- This course examines the spatial organization of economic activities the relationships between geography, economics, and human behavior.
- It explores topics such as globalization, regional development,
- The impact of location on economic practices.

### **Unit 1: Services and the Knowledge Economy**

- The growth of the service sector in the economy
- Geographic concentrations of knowledge-based industries
- The impact of technology on service delivery and innovation

### **Unit 2: Economic Geography of Trade**

- Patterns and theories of international trade
- Trade agreements and their geographic implications
- The role of logistics and transportation in trade

### **UNIT 3: Environmental Impact of Economic Activities**

- The relationship between economic development and environmental change
- Case studies on pollution, climate change, and resource depletion
- Strategies for sustainable economic practices

### **UNIT 4: Future Trends in Economic Geography**

- The impact of digital economies and e-commerce

### **Suggested Readings:**

1. "Geography of Economic Activity" by Edward J. Malecki
2. An analysis of how economic activities are distributed across space and the factors influencing these patterns.
3. "Globalization and Its Discontents" by Joseph E. Stiglitz
4. Discusses the economic impacts of globalization, including its geographic implications and consequences.
5. "Regional Development and Planning for the 21st Century: Economic and Spatial Considerations" by Roger R. Stough
6. Focuses on regional economic development theories and planning practices in a global context.
7. "Industrial Clusters and Regional Business Networks in China" by J. Liu and Y. Wang
8. Examines the development of industrial clusters in China and their implications for regional economic geography.

## Economic History II (BL-210C)

**Sub. Code: BL – 210C**

**L-4, C-4**

### **Course Objectives**

- This course explores the evolution of economic systems, theories, and practices from ancient times to the present.
- Students will examine major economic events, trends, and transformations, analyzing their impact on societies and global economies.

### **Unit 1: The Great Depression and Economic Policy**

- Causes and consequences of the Great Depression
- Responses from governments (e.g., New Deal, welfare state)
- The evolution of economic thought post-Depression

### **Unit 2: Post-War Economic Developments**

- Economic recovery and the Bretton Woods system
- The rise of welfare states in Europe
- Economic growth in emerging markets

### **Unit 3: Economic Crises and Restructuring**

- Analysis of major economic crises (1970s oil crisis, 2008 financial crisis)
- Impact on global economies and policy responses
- Lessons learned and changes in economic governance

### **Unit 4: Contemporary Economic Issues**

- Inequality, poverty, and economic development
- The role of technology and innovation in shaping economies

### **Suggested Readings:**

1. "The Wealth of Nations" by Adam Smith
2. A foundational text in economics, exploring the nature of wealth, trade, and the role of markets.
3. "Capital in the Twenty-First Century" by Thomas Piketty
4. Analyzes wealth inequality and the dynamics of capital accumulation from a historical perspective.
5. "The Great Transformation: The Political and Economic Origins of Our Time" by Karl Polanyi
6. Examines the social and economic changes during the Industrial Revolution and the emergence of market economies.
7. "An Economic History of the World Since 1400" by Donald J. Harreld
8. A comprehensive overview of global economic history, highlighting major developments and trends.

# **SEMESTER V**

# HINDI-I

Sub. Code : 301

L 4, C 4

## Course Objectives

- Enhance writing skills: Focus on improving the students' ability to write in Hindi across various forms, including essays, letters, stories, reports, and dialogues.
- This objective aims at developing grammatical accuracy, coherence, and clarity in written communication.
- Strengthen oral communication: Encourage students to converse in Hindi to improve fluency, pronunciation, and vocabulary. This includes group discussions, debates, and presentations to build confidence in speaking.
- Promote listening comprehension: Develop the ability to understand spoken Hindi through various mediums, including audio clips, films, and lectures. Focus on comprehension and interpretation skills.

### Unit I

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## SPANISH I (BL- 301A)

**Sub. Code: BL – 301A**

**L-4, C-4**

### **Course Objectives**

By the end of this course, students will be able to:

- Understand and use basic Spanish vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in Spanish.
- Write basic sentences and paragraphs in Spanish.

### **Unit 1: Introduction to Spanish**

- Overview of the Spanish language and its global significance
- Alphabet and pronunciation
- Basic greetings and introductions

### **Unit 2: Basic Grammar and Vocabulary**

- Nouns, articles, and gender
- Common adjectives and their agreement with nouns
- Essential vocabulary: family, colors, numbers

### **Unit 3: Present Tense Verbs**

- Introduction to regular verbs (AR, ER, IR)
- Conjugation patterns and usage
- Practical exercises and dialogues

### **Unit 4: Common Expressions and Questions**

- Essential phrases for everyday conversation
- Forming questions and negation

### **Suggested Readings:**

1. Madrigal's Magic Key to Spanish" by Margarita Madrigal
2. A classic introductory book that simplifies grammar and vocabulary, making it accessible for beginners.
3. "Practice Makes Perfect: Spanish Verb Tenses" by Dorothy Richmond
4. Focuses on mastering verb tenses with clear explanations and exercises.
5. "Easy Spanish Step-By-Step" by Barbara Bregstein
6. A structured approach to learning Spanish, emphasizing grammar and vocabulary in a logical progression.
7. "Living Language Spanish" (Complete Course)
8. A comprehensive language course that includes audio components and a variety of exercises.

## German- I (BL-301B)

Sub. Code: BL – 301B

L-4, C-4

### Course Objectives:

- To develop proficiency in understanding, speaking, reading, and writing German at an introductory level.
- To build a solid foundation in German grammar and vocabulary.
- To practice listening and speaking skills through interactive exercises, role plays, and dialogues.
- To understand and engage with basic German texts, including short stories, articles, and everyday conversations.
- To appreciate German culture, traditions, and history through authentic materials like songs, films, and cultural readings.

### Unit 1: Introduction to German Language

#### 1. The German Alphabet and Pronunciation:

- The German alphabet: Letters, sounds, and pronunciation rules.
- Pronunciation of common German vowels and consonants (e.g., ä, ö, ü, ß).
- Stress and intonation patterns in German.

#### 2. Basic Greetings and Introductions:

- Introducing oneself: Name, nationality, profession, etc.
- Common greetings: "Hallo," "Guten Morgen," "Wie geht's?"
- Phrases for polite conversation: "Danke," "Bitte," "Entschuldigung."

#### 3. Numbers and Basic Vocabulary:

- Counting in German: Numbers 1-100.
- Days of the week, months, seasons.
- Family members, colors, and simple adjectives.

### Unit 2: Grammar Fundamentals

#### 1. Nouns, Articles, and Gender:

- Understanding German noun genders (masculine, feminine, neuter).
- Definite and indefinite articles: der, die, das, ein, eine.
- Plural forms of nouns.

#### 2. Present Tense of Regular Verbs:

- Conjugation of regular verbs in the present tense (e.g., spielen, arbeiten).
- Common regular verbs and their usage in sentences.
- Sentence structure: Subject-verb-object.

#### 3. Personal Pronouns and Possessive Adjectives:

- Forms of personal pronouns (ich, du, er/sie/es, wir, ihr, sie/Sie).
- Possessive pronouns (mein, dein, sein, ihr, unser).



### **Unit 3: Expanding Vocabulary and Communication**

- 1. Describing People, Places, and Things:**
  - Describing appearance, personality, and characteristics.
  - Vocabulary for everyday objects, places, and locations.
  - Describing where things are (prepositions of place).
- 2. Asking and Answering Questions:**
  - Formulating simple questions: “Wie?”, “Was?”, “Wo?”, “Wann?”
  - Yes/no questions and question words.
  - Asking for directions, time, and information.
- 3. Useful Phrases for Everyday Situations:**
  - At the supermarket, restaurant, or doctor's office.
  - Making requests and giving polite commands.
  - Expressing likes, dislikes, and preferences.

### **Unit 4: German Sentence Structure and Verb Conjugation**

- 1. Present Tense of Irregular Verbs:**
  - Conjugation of common irregular verbs (e.g., sein, haben, gehen, essen).
  - Using irregular verbs in questions and negative sentences.
  - Common sentence patterns: Affirmative, negative, and questions.
- 2. Word Order in Sentences:**
  - Basic word order in German (SVO structure).
  - Word order with time expressions and negation.
  - Position of adverbs and objects in a sentence.
- 3. Modal Verbs:**
  - Introduction to modal verbs: können, wollen, müssen, dürfen, sollen, mögen.
  - Using modal verbs in the present tense to express necessity, permission, and ability.

### **Unit 5: Reading Comprehension and Writing Skills**

- 1. Short Texts and Dialogues:**
  - Reading and understanding short dialogues and texts on familiar topics.
  - Answering comprehension questions based on short readings.
  - Expanding vocabulary through reading.
- 2. Writing Simple Sentences and Paragraphs:**
  - Writing descriptions, letters, and simple emails in German.
  - Correct sentence structure and grammar in written communication.
  - Writing about oneself, hobbies, daily activities, and family.
- 3. Introduction to German Culture Through Texts:**
  - Basic cultural readings: Traditional German foods, holidays, and festivals.
  - Understanding German customs and social etiquette.

## **Unit 6: German Culture and Traditions**

### **1. German Holidays and Traditions:**

- Celebrating Christmas, Easter, and other German traditions.
- Understanding cultural significance: Oktoberfest, Karneval, and more.
- The importance of family and social customs in German-speaking countries.

### **2. Introduction to German Music, Films, and Art:**

- German classical music and famous composers (e.g., Beethoven, Bach).
- German cinema: Key films, directors, and genres.
- The influence of German art and philosophy on world culture.

### **Suggested Books:**

1. *Culture Smart! Germany* by Barry Tomalin
2. *A Concise History of Germany* by Mary Fulbrook
3. *German Short Stories for Beginners* by Olly Richards
4. *Deutsch im Blick* (*University of Texas Online Textbook, Free Resource*)
5. *German Grammar in a Nutshell* by Christine Stiefel (*Langenscheidt*)
6. *Practice Makes Perfect: German Sentence Builder* by Ed Swick
7. *German Grammar for Beginners* by Jenny Russ
8. *Practice Makes Perfect: German Verb Tenses* by Ed Swick

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## Chinese-I (BL-301C)

Sub. Code: BL – 301C

L-4, C-4

### Course Objectives:

- To develop basic proficiency in the Chinese language in speaking, listening, reading, and writing.
- To learn the fundamental grammar rules and sentence structures in Mandarin Chinese.
- To master basic vocabulary, focusing on daily life topics such as greetings, food, travel, and family.
- To acquire a solid understanding of Chinese characters and their formation.
- To introduce students to the cultural, social, and historical context of China.

### Unit 1: Introduction to Chinese Language

#### 1. Overview of the Chinese Language:

- Introduction to Mandarin Chinese as the official language of China.
- Importance of Chinese dialects: Mandarin vs. Cantonese.
- The role of Chinese in the global context.

#### 2. Chinese Pronunciation: Pinyin System:

- The Pinyin system: Tones, initials, and finals.
- Pronunciation practice with tone marks and common sounds (e.g., “x,” “q,” “zh,” “ch”).
- The importance of tones in Chinese communication.

#### 3. Basic Greetings and Introductions:

- Common greetings: 你好 (nǐ hǎo), 您好 (nín hǎo), 再见 (zài jiàn), 谢谢 (xièxiè).
- Introducing oneself: Name, nationality, and occupation.
- Phrases for everyday conversations: 你好吗? (nǐ hǎo ma?) How are you?

### Unit 2: Chinese Characters and Basic Grammar

#### 1. Introduction to Chinese Characters:

- Structure of Chinese characters: Radicals, strokes, and components.
- Simplified vs. traditional characters.
- Writing practice: Basic characters and their meanings (e.g., 我 (wǒ), 你 (nǐ), 中 (zhōng)).

#### 2. Basic Sentence Structure:

- Word order in Chinese: Subject-Verb-Object (SVO) sentence structure.
- Simple affirmative sentences: 我是学生 (wǒ shì xuéshēng) – I am a student.
- Basic negation: 不 (bù) and 没有 (méiyǒu) for negating verbs.

#### 3. Pronouns and Possessives:

- Personal pronouns: 我 (wǒ), 你 (nǐ), 他 (tā), 她 (tā), 它 (tā).
- Possessive pronouns: 我的 (wǒ de), 你的 (nǐ de), 他的 (tā de).

## Unit 3: Expanding Vocabulary and Communication

### 1. Daily Life Vocabulary:

- Family members: 父亲 (fùqīn), 母亲 (mǔqīn), 哥哥 (gēgē), 妹妹 (mèimei).
- Numbers: 1-100 (一, 二, 三, ..., 一百).
- Days of the week and time expressions: 今天 (jīntiān), 昨天 (zuótiān), 明天 (míngtiān), 星期 (xīngqī).

### 2. Food and Drink:

- Common foods and drinks: 饺子 (jiǎozi), 米饭 (mǐfàn), 茶 (chá), 水 (shuǐ).
- Ordering food: 我想要 (wǒ xiǎng yào) – I would like.
- Phrases for eating out: 请给我菜单 (qǐng gěi wǒ càidān) – Please give me the menu.

### 3. Expressing Preferences and Asking Questions:

- Expressing likes and dislikes: 我喜欢 (wǒ xǐhuān) – I like.
- Asking for clarification: 什么? (shénme?), 怎么样? (zěnmeyàng?).
- Using question words: 什么 (shénme), 哪 (nǎ), 多少 (duōshǎo), 为什么 (wèishéme).

## Unit 4: Chinese Grammar and Verb Conjugation

### 1. Verbs and Verb Usage:

- Conjugating verbs in the present tense.
- Common verbs: 做 (zuò), 看 (kàn), 听 (tīng), 学习 (xuéxí).
- Verbal phrases: 喜欢做 (xǐhuān zuò) – to like doing, 能做 (néng zuò) – can do.

### 2. Questions and Negations:

- Forming yes/no questions using 吗 (ma).
- Negative sentence structure using 不 (bù) for habitual actions and 没 (méi) for past actions.
- Using “了” (le) to indicate a change of state or action completion.

### 3. Time Expressions and Using the Verb "to be":

- Expressing time: 上午 (shàngwǔ), 下午 (xiàwǔ), 点 (diǎn), 分 (fēn).
- Talking about past, present, and future events: 昨天 (zuótiān), 今天 (jīntiān), 明天 (míngtiān).

## **Unit 5: Reading, Writing, and Listening Skills**

### **1. Reading Short Texts and Dialogues:**

- Reading simple dialogues and short stories based on everyday situations.
- Answering comprehension questions based on reading materials.
- Expanding vocabulary through context.

### **2. Writing Simple Sentences and Paragraphs:**

- Writing about daily routines, hobbies, and interests.
- Practicing basic sentence structures: 我每天都去学校 (wǒ měitiān dōu qù xuéxiào) – I go to school every day.
- Introducing personal information in writing.

### **3. Listening Practice:**

- Listening to audio clips and simple conversations.
- Identifying key words and phrases in spoken Mandarin.
- Developing skills for responding to basic listening exercises.

## **Unit 6: Chinese Culture and Social Context**

### **1. Understanding Chinese Culture and Society:**

- Overview of Chinese culture: Family, respect for elders, and social hierarchy.
- Chinese festivals: 春节 (Chūnjié) – Chinese New Year, 中秋节 (Zhōngqiū Jié) – Mid-Autumn Festival.
- Chinese art and calligraphy: Introduction to Chinese painting and traditional arts.

### **2. Social Etiquette and Communication:**

- Proper etiquette for greetings, gifts, and dining.
- The significance of "face" (面子) and politeness in Chinese culture.
- Understanding social hierarchies and addressing people with respect.

## **Suggested Books:**

- *Integrated Chinese: Level 1, Part 1* by Tao-chung Yao, Yuehua Liu (Cheng & Tsui)
- *Chinese Made Easy for Beginners* by Yamin Ma and Xinying Li
- *Chinese for Beginners* by Yi Ren
- *Culture Smart! China* by Kerry Brown
- *Culture Smart! China* by Kerry Brown
- *China: A History* by John Keay
- *Mandarin Chinese: A Functional Reference Grammar* by Charles N. Li and Sandra A. Thompson
- *The Complete Guide to Chinese Grammar* by Philip Yungkin Lee
- *New Practical Chinese Reader: Volume 1* by Liu Xun (Beijing Language and Culture University Press)

## FRENCH I (BL-301D)

Sub. Code: BL – 301D

L-4, C-4

### Course Objectives

- Understand and use basic French vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in French.
- Write basic sentences and paragraphs in French.

### Unit 1: Introduction to French

- Alphabet and pronunciation
- Basic greetings and introductions

### Unit 2: Numbers and Colors

- Counting (1-100)
- Basic colors and their use in sentences

### Unit 3: Days, Months, and Time

- Days of the week and months of the year
- Telling time

### Unit 4: Family and Descriptions

- Vocabulary related to family and relationships

### Suggested Readings:

1. Easy French Step-By-Step" by Myrna Bell Rochester
2. A clear, gradual approach to learning French grammar and vocabulary.
3. "French for Dummies" by Dodi-Katrin Schmidt and Michelle M. Williams
4. Practice Makes Perfect: Complete French Grammar" by Annie Heminway
5. Comprehensive grammar explanations with exercises for practice.
6. "Fluent in French: The Most Complete Study Guide to Learn French" by Frederic Bibard
7. Covers vocabulary, grammar, and cultural insights

## **FAMILY LAW–I (Hindu Law)**

**Sub. Code: BL 303**

**L – 4, C – 4.**

### **Course Objectives**

- Study modern reforms in Hindu law: Understand the role of various reforms, such as the Hindu Marriage Act, 1955, Hindu Adoption and Maintenance Act, 1956, Hindu Succession Act, 1956, and how they have contributed to the modernization of Hindu law.
- Evaluate the role of the Hindu Code Bill: Examine the significance of the Hindu Code Bill in bringing about reforms in marriage, inheritance, and succession, and its impact on the status of Hindu women.
- Assess the challenges and future reforms: Discuss current issues in Hindu law, such as the need for uniform civil code, the treatment of inter-caste marriages, and
- the integration of Hindu law with the principles of gender equality.

### **Unit-I:**

Sources of Hindu Law – Scope and application of Hindu Law – Schools of Hindu Law - Mitakshara and Dayabhaga Schools – Concept of Joint Family, Coparcenary, Joint Family Property and Coparcenary Property – Institution of Karta- Powers and Functions of Karta - Pious Obligation - Partition – Debts and alienation of property.

### **Unit-II:**

Marriage - Definition - Importance of institution of marriage under Hindu Law – Conditions of Hindu Marriage – Ceremonies and Registration – Monogamy – Polygamy.

### **Unit-III:**

**Matrimonial Remedies** under the Hindu Marriage Act, 1955 - Restitution of Conjugal Rights – Nullity of marriage – Judicial separation – Divorce – Maintenance pendente lite – importance of conciliation.

### **Unit-IV:**

Concept of Adoption - Law of Maintenance - Law of Guardianship - Hindu Adoption and Maintenance Act, 1956 – Hindu Minority and Guardianship Act 1956.

### **Suggested Readings:**

1. Paras Diwan : Modern Hindu Law, 13th Edition 2000, Allahabad Agency, Delhi.
2. Paras Diwan: Family Law, 1994 Edition, Allahabad Agency, Delhi.
3. Mayne: Hindu Law - Customs and Usages , Bharat Law House, New Delhi.
4. Sharaf: Law of Marriage and Divorce , 1999.

# CIVIL PROCEDURE CODE AND LAW OF LIMITATION

**Sub. Code: BL 305**

**L -4, C -4**

## **Course objective**

- Understand the nature of civil litigation: Introduce students to the basic concepts of civil law and civil procedure, explaining the difference between civil and criminal procedures.
- Study the objectives of the CPC: Examine the aims of the CPC, which include ensuring justice through fair trial procedures, speedy disposal of cases, and effective enforcement of judgments.
- Familiarize with key terms: Define essential legal terms such as plaintiff, defendant, suit, civil court, jurisdiction, and cause of action.
- Understand the hierarchy of civil courts: Study the structure of the civil courts in India, including district courts, subordinate courts, and high courts, and their functions in the administration of civil justice.

## **Unit-I :**

Codification of Civil Procedure and Introduction to CPC — Principal features of the Civil Procedure Code — Suits — Parties to Suit — Framing of Suit — Institution of Suits — Bars of Suit - Doctrines of Sub Judice and Res Judicata — Place of Suing — Transfer of suits — Territorial Jurisdiction — ‘Cause of Action’ and Jurisdictional Bars — Summons — Service of Foreign summons.

## **Unit-II :**

Pleadings — Contents of pleadings — Forms of Pleading — Striking out / Amendment of Pleadings - Plaint— Essentials of Plaint - Return of Plaint—Rejection of Plaint—Production and marking of Documents— Written Statement — Counter claim — Set off — Framing of issues.

## **Unit-III :**

Appearance and Examination of parties & Adjournments — Ex-parte Procedure — Summoning and Attendance of Witnesses — Examination — Admissions — Production, Impounding, Return of Documents — Hearing — Affidavit — Judgment and Decree — Concepts of Judgment, Decree, and Interim Orders and Stay — Injunctions — Appointment of Receivers and Commissions — Costs -- Execution — Concept of Execution — General Principles of Execution — Power of Execution — Power of Executing Courts — Procedure for Execution — Modes of Execution -- Arrest and detention — Attachment and Sale.

## **Unit-IV:**

Suits in Particular Cases — Suits by or against Government — Suits relating to public matters;— Suits by or against minors, persons with unsound mind, - Suits by indigent persons -- Interpleader suits — Incidental and supplementary proceedings - Appeals, Reference, Review and Revision



— Appeals from Original Decrees — Appeals from Appellate Decrees — Appeals from Orders  
— General Provisions Relating to Appeals.

**Suggested Readings:**

1. Mulla: Code of Civil Procedure:
2. Tripathi (Abridged Edition), 11th Edn.(StudentEdition) Edited by P.M. Bakshi, Bombay, 1985.
3. A.N. Saha: Code of Civil Procedure.
4. C.K. Takwani: Civil Procedure, 4th Edn. Eastern Book Co., Lucknow, 1974.
5. B.B. Mitra: Limitation Act, 17th Edn. Eastern Law House, Calcutta, 1974, Allahabad.
6. Sanjiva Row: Limitation Act, 7th Edn. (in 2 Vols), Law Book Co., Allahabad,

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# **CRIMINAL PROCEDURE CODE, LAW OF JUVENILE JUSTICE AND PROBATION OF OFFENDERS**

**Sub. Code: BL 307**

**L -4, C -4**

## **Course Objectives**

- Understand the nature of civil litigation: Introduce students to the basic concepts of civil law and civil procedure, explaining the difference between civil and criminal procedures.
- Study the objectives of the CPC: Examine the aims of the CPC, which include ensuring justice through fair trial procedures, speedy disposal of cases, and effective enforcement of judgments.
- Familiarize with key terms: Define essential legal terms such as plaintiff, defendant, suit, civil court, jurisdiction, and cause of action. Understand the hierarchy of civil courts: Study the structure of the civil courts in India, including district courts, subordinate courts, and high courts, and their functions in the administration of civil justice.
- Examine jurisdiction in civil cases: Discuss the concepts of territorial, pecuniary, and subject-matter jurisdiction in civil courts. Understand how to determine the appropriate court for filing a suit.

## **Unit-I :**

The Code of Criminal Procedure, 1973 : The rationale of Criminal Procedure — The importance of fair trial — Constitutional Perspectives : Articles 14, 20 & 21 — The organization of Police, Prosecutor and Defence Counsel — Pre-trial Process — Arrest — Distinction between “cognizable” and “non-cognizable” offences — Steps to ensure presence of accused at trial -- Warrant and Summons cases — Arrest with and without Warrant — The absconder status — **Rights of arrested persons under Cr.P.C. and Article 22 (2) of the Constitution of India.**

## **Unit-II:**

Search and Seizure — Search with and without warrant — Police search during investigation — General Principles of Search — **Seizure — Constitutional aspects of validity of Search and Seizure proceedings.**

## **Unit-III :**

Trial Process: Commencement of Proceedings — Dismissal of Complaint — Bail, Bailable and Non-bailable Offences — Cancellation of Bails — Anticipatory Bail — General Principles concerning Bail Bond — Preliminary pleas to bar trial — Jurisdiction — Time Limitations — Pleas of Autrefois Acquit and Autrefois Convict — Fair Trial — Concept of fair trial — Presumption of innocence — Venue of trial — Jurisdiction of Criminal Courts — Rights of accused -- **Constitutional Interpretation of Article 21 as a right to speedy trial — Charge — Form and content of Charge — Trial before a Court of Session : Procedural steps and substantive rights.**

## **Unit-IV:**

Judgment: Form and content -- Summary trial — Post-conviction orders in lieu of punishment — **Modes of providing judgment copy — appeals, review and revisions.**

**Unit-V:**

Probation and Parole: Authority granting Parole — Supervision — Conditional release -- suspension of sentence — Procedure under Probation of Offenders Act, 1958 -- Salient features of the Act. **Juvenile Justice System**

**Suggested Reading**

1. Kelkar R.V.: Criminal Procedure, 3rd Edn. Eastern Book Co., Lucknow, 1993.
2. Ratanlal and Dhirajlal: The Code of Criminal Procedure, 15th Edn. Wadhwa& Co.,
3. Padala Rama Reddi: The Code of Criminal Procedure, 1973, Asia Law House, Hyderabad.
4. Prof. S.N. Misra: The Code of Criminal Procedure, Central Law Agency.
5. M.P. Tandon: Criminal Procedure Code, Allahabad Law Agency.
6. ShoorvirTyage: The Code of Criminal Procedure, Allahabad Law Agency.

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## MACRO ECONOMICS I

Sub. Code: BL – 309

L-4, C-4

### Course Objectives

- Understanding the scope and nature of macroeconomics: Introduce students to the basic concepts and framework of macroeconomics, including the distinction between microeconomics (study of individual markets and agents) and macroeconomics (study of aggregate economic variables).
- Focus on national economy aggregates: Explain the study of aggregate variables such as GDP (Gross Domestic Product), national income, and the factors that influence them at the national level.
- Understanding the importance of macroeconomic analysis: Discuss the significance of macroeconomic policies in shaping national economic performance, maintaining economic stability, and promoting economic growth.
- Understanding how national income is measured: Introduce students to the methods of calculating national income, such as the income method, expenditure method, and output method.

### Unit-I: Introduction

Difference between Micro & Macroeconomics, Introduction to basic Theories in Macroeconomics – **Classical, Keynesian & Post Keynesian.**

### Unit-II: National Income Accounting

Circular flow of Income Model – Two & Three sector models (Closed only) National & Domestic Product – different types & their significance, **National Income – meaning, significance.**

**Unit-III: Money & Interest** Types & Functions of money, Classification of Money, Demand for & Supply of Money (inclusive of Money Multiplier) Theories of Money – Cambridge & Fisher Theory Inflation & Deflation – Types, **Reasons & their Effects, Monetary Policy & its Tools.**

### Unit-IV: Short Run Analysis

Characteristics of Short Run, Simple Keynesian Model / Theory – Consumption Function, **Investment Function, multipliers.**

**Suggested Readings**

1. Dwivedi D.N. ,Macroeconomic Theory &Policy,Tata Mac Graw Hill
2. Samuelson & Nordhaus ,Economics,Tata Mac Graw Hill
3. Shapiro, Macroeconomic Analysis,

## Anthropology-I BL – 309 A

Sub. Code: BL – 309A

L-4, C-4

### Course Objectives:

- To understand the key concepts and theoretical frameworks in economic anthropology.
- To explore the diversity of economic systems, including traditional, modern, and mixed economies.
- To analyze the role of culture in shaping economic behaviors and systems.
- To examine global economic issues through the lens of anthropological theory.
- To develop critical thinking skills regarding the impact of economic processes on individuals, communities, and societies.

### Unit 1: Introduction to Economic Anthropology

#### 1. Definition and Scope of Economic Anthropology:

- Overview of Economic Anthropology as a subfield of anthropology.
- The relationship between economic anthropology and traditional economics.
- Key questions and approaches in economic anthropology.

#### 2. Historical Development of Economic Anthropology:

- Early theoretical perspectives: From classical political economy to anthropological insights.
- The influence of Marx, Weber, and other theorists on the study of economic systems.
- The emergence of key anthropologists: Malinowski, Mauss, Boas, and others.

#### 3. The Economic System:

- The concept of economic systems in anthropology.
- Overview of different economic systems: Foraging, horticulture, pastoralism, and industrial economies.
- Subsistence economy vs. market economy.

### Unit 2: Theoretical Foundations in Economic Anthropology

#### 1. Classical Economic Theories:

- Theories of Adam Smith, Karl Marx, and Max Weber.
- The labor theory of value and its influence on anthropology.
- The notion of exchange and market relations.

#### 2. Formal vs. Substantive Economics (Karl Polanyi's Approach):

- Formalism: Economics as a universal set of rules.
- Substantivism: Economic systems as part of broader cultural systems.
- Polanyi's critique of Western economic assumptions in non-Western societies.

### **3. Reciprocity, Redistribution, and Market Exchange:**

- Types of exchange: Generalized reciprocity, balanced reciprocity, and negative reciprocity.
- The concept of redistribution in traditional societies (e.g., potlatch).
- Market exchange in both traditional and modern societies.

## **Unit 3: Production and Labor**

### **1. Modes of Production:**

- The concept of modes of production: Kin-based, household, and capitalist systems.
- Foraging, horticulture, pastoralism, and agriculture as modes of production.
- Industrial and post-industrial production systems.

### **2. Labor and Work:**

- The division of labor in different societies: Gender, age, and status.
- The anthropology of labor and the concept of “alienation” in capitalist societies.
- Rituals, kinship, and labor in traditional societies.

### **3. The Impact of Capitalism:**

- The rise of capitalism and its impact on traditional economies.
- Labor migration, wage labor, and the global workforce.
- Globalization and labor in the 21st century.

## **Unit 4: Consumption and Exchange**

### **1. Consumption and Social Status:**

- The role of consumption in defining social identity and status.
- The relationship between consumption and social relations (e.g., conspicuous consumption).
- The anthropology of food, housing, and material culture.

### **2. The Role of Markets:**

- The development and functioning of markets in various cultures.
- Comparative perspectives on markets: Local, national, and global markets.
- The anthropology of money and its role in exchange.

### **3. Gift Exchange and Reciprocity:**

- Marcel Mauss and the theory of the gift economy.
- The social and cultural significance of gift exchange in different societies.
- Reciprocity and its link to social cohesion and solidarity.

## **Unit 5: Globalization and Economic Change**

### **1. Global Economic Systems and the Anthropology of Development:**

- The anthropology of development and modernization theories.
  - Impact of globalization on traditional economies.
  - Economic anthropology in the context of international development.
2. **Neoliberalism and Global Capitalism:**
- The spread of neoliberal economic policies and their impacts on local economies.
  - Global capitalism and the anthropology of multinational corporations.
  - Case studies of economic transformation in various countries (e.g., Latin America, Asia).
3. **Environmental and Political Economy:**
- The role of economic systems in environmental degradation.
  - Political economy of resource management and environmental conservation.
  - Anthropological perspectives on sustainable development and indigenous economies.

**Suggested Books:**

- *Economic Anthropology: A Systematic Approach* by David W. MacKenzie
- *The Anthropology of Economy: A Reader* edited by Karen S. Ho and Lisa R. Procter
- *The Gift* by Marcel Mauss
- *Globalization: A Very Short Introduction* by Manfred B. Steger
- *A World of Struggle: How Power, Law, and Expertise Shape Global Political Economy* by David Kennedy
- *The Yanomami: The Social Anthropology of an Amazonian People* by Reena L. Halperin
- *Globalization: A Very Short Introduction* by Manfred B. Steger
- *The Anthropology of Development and Globalization* by Richard H. Robbins
- *The Great Transformation: The Political and Economic Origins of Our Time* by Karl Polanyi
- *Economic Anthropology* by Eric R. Wolf.



## Political Economy-I BL – 309 B

Sub. Code: BL – 309B

L-4, C-4

### Course Objectives:

- To introduce students to the fundamental concepts and theories in political economy.
- To explore the relationship between politics and economics in both historical and contemporary contexts.
- To analyze the role of state, market, and society in the organization and regulation of economic systems.
- To examine how economic systems are influenced by political ideologies, institutions, and global trends.
- To understand the impact of political economy on issues like development, inequality, and globalization.

### Unit 1: Introduction to Political Economy

#### 1. Defining Political Economy:

- What is Political Economy? Scope, relevance, and interdisciplinary nature.
- The relationship between economics, politics, and sociology.
- Key questions in political economy: How do political decisions influence economic outcomes? How do economic systems shape political structures?

#### 2. Historical Overview:

- Classical political economy and its evolution: From Mercantilism to Adam Smith.
- Early political economists: Karl Marx, David Ricardo, John Stuart Mill, and others.
- The shift from classical to neoclassical economics and its political implications.

#### 3. The Role of the State in Political Economy:

- The state's role in regulating and shaping economic life.
- Political economy in a capitalist state: Liberalism, welfare state, and neoliberalism.
- Theories of the state: Marxist, Weberian, and pluralist approaches.

### Unit 2: Classical Political Economy

#### 1. Adam Smith and the Foundations of Classical Economics:

- The invisible hand: Free markets and the role of self-interest.
- The division of labor and specialization.
- The nature of wealth and the principle of comparative advantage.

#### 2. David Ricardo and Comparative Advantage:

- Comparative advantage theory and international trade.
- The law of diminishing returns and its impact on production and distribution.
- Critiques of Ricardian theory.

#### 3. Karl Marx and the Critique of Capitalism:

- Marx's historical materialism and the role of class struggle in shaping the economy.
- The theory of surplus value and exploitation.

### **Unit 3: Neoliberalism and Contemporary Theories**

#### **1. The Rise of Neoliberalism:**

- What is neoliberalism? The shift from Keynesian economics to neoliberal policy.
- Key principles of neoliberalism: Market liberalization, deregulation, and privatization.
- The political economy of neoliberalism: The role of international institutions like the IMF, World Bank, and WTO.

#### **2. Post-War Keynesianism and the Welfare State:**

- Keynesian economics and the role of government intervention in the economy.
- The development of welfare states in the 20th century.
- Crisis of Keynesianism and the rise of neoliberalism in the 1970s.

#### **3. Theories of Global Political Economy:**

- Globalization and its political and economic implications.
- Dependency theory, world-systems theory, and the role of imperialism.
- The politics of economic development in the Global South.

### **Unit 4: Political Economy of Development**

#### **1. Theories of Economic Development:**

- The stages of economic development: Modernization theory and its critiques.
- Dependency theory and the role of the global economic system in underdevelopment.
- World-systems theory and the development of peripheral nations.

#### **2. The State and Economic Development:**

- The role of the state in development: State-led vs. market-led development.
- Theories of state intervention and development: Import substitution industrialization (ISI) vs. export-oriented industrialization (EOI).
- The challenges of governance, corruption, and political stability in developing economies.

#### **3. Globalization and Development:**

- The impact of globalization on developing countries: Trade, investment, and inequality.
- The role of international financial institutions in shaping development policies.
- The debate between economic liberalization and protectionism.

## **Unit 5: Political Economy of Globalization**

### **1. Understanding Globalization:**

- What is globalization? Economic, political, and cultural dimensions.
- The historical roots and modern processes of globalization.
- The role of technology, finance, and communication in driving globalization.

### **2. The Politics of Global Capitalism:**

- The rise of multinational corporations and their global reach.
- Financialization and the global economy: The role of global finance in economic crises.
- The impact of global trade agreements (e.g., NAFTA, TPP, and WTO).

### **3. Global Inequality and Power Dynamics:**

- The distribution of wealth in a globalized economy.
- Global inequality: Rich vs. poor countries and the politics of inequality.
- The role of the global political economy in shaping patterns of migration, labor exploitation, and environmental degradation.

## **Unit 6: Contemporary Political Economy: Issues and Debates**

### **1. Environmental Political Economy:**

- The relationship between economic development and environmental sustainability.
- Theories of environmental degradation: Tragedy of the commons and ecological modernization.
- Global environmental governance: The role of international agreements and institutions (e.g., Paris Agreement).

### **2. Economic Crises and Political Economy:**

- Theories of economic crises: The role of finance, banking, and speculative bubbles.
- Case studies: The 2008 financial crisis and its aftermath.
- The politics of austerity and economic recovery in crisis-hit economies.

### **3. Economic Inequality and Social Justice:**

- The politics of income and wealth inequality: Causes and consequences.
- Theories of distributive justice: Rawlsian justice vs. libertarianism.
- Global efforts to address inequality: The role of international organizations, NGOs, and movements.

## **Suggested Books:**

- *An Introduction to Political Economy* by James A. Caporaso and David P. Levine
- *The Wealth of Nations* by Adam Smith
- *A Brief History of Neoliberalism* by David Harvey
- *Development as Freedom* by Amartya Sen
- *The Shock Doctrine: The Rise of Disaster Capitalism* by Naomi Klein
- *The Political Economy of the Environment* by James K. Boyce

- *Capital in the Twenty-First Century* by Thomas Piketty
- *The Shock Doctrine: The Rise of Disaster Capitalism* by Naomi Klein
- *The Political Economy of the Environment* by James K. Boyce
- *Capital in the Twenty-First Century* by Thomas Piketty.

# **SEMESTER VI**

**HINDI-II ( )**

**Sub. Code : 302**

**L 4, C 4**

**Unit I :**

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**Unit II :**

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**Unit III :**

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**Unit IV :**

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**Books :**

1. Legal Glossary = Govt. Of india Publication.

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## **SPANISH II (BL-302 A)**

**Sub. Code: BL – 302A**

**L-4, C-4**

### **Course Objectives**

By the end of this course, students will be able to:

- Understand and use basic Spanish vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in Spanish.
- Write basic sentences and paragraphs in Spanish.

### **Unit 1: Introduction to Spanish**

- Overview of the Spanish language and its global significance
- Alphabet and pronunciation
- Basic greetings and introductions

### **Unit 2: Basic Grammar and Vocabulary**

- Nouns, articles, and gender
- Common adjectives and their agreement with nouns
- Essential vocabulary: family, colors, numbers

### **Unit 3: Present Tense Verbs**

- Introduction to regular verbs (AR, ER, IR)
- Conjugation patterns and usage
- Practical exercises and dialogues

### **Unit 4: Common Expressions and Questions**

- Essential phrases for everyday conversation
- Forming questions and negation

**Suggested Readings:**

1. Madrigal's Magic Key to Spanish" by Margarita Madrigal
2. A classic introductory book that simplifies grammar and vocabulary, making it accessible for beginners.
3. "Practice Makes Perfect: Spanish Verb Tenses" by Dorothy Richmond
4. Focuses on mastering verb tenses with clear explanations and exercises.
5. "Easy Spanish Step-By-Step" by Barbara Bregstein
6. A structured approach to learning Spanish, emphasizing grammar and vocabulary in a logical progression.



## **GERMAN II (BL302 B)**

**Sub. Code: BL – 302B**

**L-4, C-4**

### **Course Objectives**

- Understand and use basic German vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in German
- Write basic sentences and paragraphs in German.

### **Unit 1: Introduction to German**

- German alphabet and pronunciation
- Basic greetings and introductions
- Pronunciation drills
- Icebreaker introductions

### **Unit 2: Numbers and Colors**

- Numbers 1-100
- Basic colors and their usage
- Number games
- Color identification exercises

### **Unit 3: Everyday Vocabulary**

- Family members
- Common nouns (e.g., household items, animals)
- Create a family tree
- Vocabulary flashcard games

### **Unit 4: Basic Grammar and Sentence Structure**

- Introduction to articles (definite and indefinite)
- Subject-verb-object structure

**Suggested Readings:**

1. "German Made Simple: Learn to Speak and Understand German Quickly and Easily"  
Author: Arnold Leitner
2. A straightforward introduction to the language, covering essential vocabulary and grammar.
3. "German for Dummies"
4. Author: Wendy Foster
5. "The Everything Learning German Book"
6. "Practice Makes Perfect: Complete German Grammar"
7. Author: Ed Swick
8. A comprehensive workbook that reinforces grammar concepts with exercises and explanations.

## **CHINESE II (BL-302C)**

**Sub. Code: BL – 302C**

**L-4, C-4**

### **Course Objectives**

By the end of this course, students will be able to:

- Understand and use basic Chinese vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in Chinese.
- Write basic sentences and paragraphs in Chinese.

### **Unit 1: Introduction to Chinese**

- Pinyin and pronunciation
- Basic greetings and self-introduction
- Pronunciation practice
- Icebreaker introductions

### **Unit 2: Numbers and Dates**

- Numbers 1-100
- Days of the week and months
- Number games
- Calendar exercises

### **Unit 3: Everyday Vocabulary**

- Family members
- Common nouns (e.g., animals, objects)
- Family tree project
- Vocabulary flashcards

### **Unit 4: Basic Grammar and Sentence Structure**

- Subject-verb-object structure

- Introduction to measure words

### **Suggested Readings**

- "Integrated Chinese" (Textbook + Workbook)
  - Authors: Tao-chung Yao, Yuehua Liu, et al.
  - A comprehensive series that covers speaking, reading, and writing. It includes cultural notes and exercises.
- "Chinese Made Easier"
  - Authors: Maureen S. W. D. H. Wong, et al.
  - Focuses on conversational skills with a gradual introduction to reading and writing.
- "New Practical Chinese Reader"
  - Authors: Liu Xun
  - A popular series that integrates language and cultural elements, with a focus on conversational skills.
- "Reading & Writing Chinese"
  - Author: William McNaughton
  - A guide to learning characters, with clear explanations and practice exercises.

## **FRENCH II (BL-302D)**

**Sub. Code: BL – 302D**

**L-4, C-4**

### **Course Objectives**

- Understand and use basic French vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in French.
- Write basic sentences and paragraphs in French.

### **Unit 1: Daily Routines**

- Common verbs (aller, être, avoir)
- Talking about daily activities

### **Unit 2: Food and Drink**

- Vocabulary related to food
- Expressing likes and dislikes

### **Unit 3: Clothing and Shopping**

- Vocabulary for clothing
- Shopping dialogue and role-play

### **Unit 4: Directions and Transportation**

- Asking for and giving directions

### **Suggested Readings:**

1. "Easy French Step-By-Step" by Myrna Bell Rochester
2. A clear, gradual approach to learning French grammar and vocabulary.
3. "French for Dummies" by Dodi-Katrin Schmidt and Michelle M. Williams
4. "Practice Makes Perfect: Complete French Grammar" by Annie Heminway
5. Comprehensive grammar explanations with exercises for practice

## Family Law – II ( Muslim Law)

Sub. Code: BL 304

L – 4, C – 4.

### Course objectives

- The Muslim Law course provides students with an in-depth understanding of Islamic jurisprudence and its application in modern legal contexts.
- Students will gain knowledge about the principles governing family law, inheritance, contractual relationships, and criminal law within the framework of Shari'ah.
- The course also emphasizes the interaction between personal law and secular law in India and the role of judicial intervention and legal reforms in shaping Muslim law practices.
- By the end of the course, students will have a comprehensive understanding of Muslim personal law and its application in the Indian legal system, and will be able to critically assess contemporary issues and challenges faced by Muslim communities in India and other parts of the world.

### Unit-I :

Origin and development of Muslim Law - Sources of Muslim Law - Schools of Muslim Law - Difference between the Sunni and Shia Schools – Sub-schools of Sunni Law - Operation and application of Muslim Law - Conversion to Islam - Effects of conversion - Law of Marriage, nature of Muslim Marriage - Essential requirements of valid Marriage - Kinds of Marriages - distinction between void, irregular and valid marriage - **Dower (Mahr) - Origin, nature and importance of dower, object of dower and classification of dower.**

### Unit-II:

Divorce - Classification of divorce - different modes of Talaq - Legal consequences of divorce - Dissolution of Muslim Marriage Act, 1939 - Maintenance, Principles of maintenance, Persons entitled to maintenance - **The Muslim Women (Protection of Rights on Divorce) Act, 1986 - Effect of conversion on maintenance and difference between Shia and Sunni Law.**

### Unit-III:

Parentage - Maternity and Paternity - Legitimacy and acknowledgment - Guardianship - Meaning - Kinds of guardianship - Removal of guardian - Difference between Shia and Sunni Law. Gift - Definition of Gift - Requisites of valid gift - Gift formalities - Revocation of gift - Kinds of gift. **Wills - Meaning of Will - Requisites of valid Will - Revocation of Will - Distinction between Will and Gift - Difference between Shia and Sunni Law.**

### Unit-IV :

Waqf \_ Definition - Essentials of Waqf - Kinds of Waqf – Creation of Waqf - - Revocation of Waqf - Salient features of the Waqf Act, 1995 – Mutawalli - Who can be Mutawalli - Powers and duties of Mutawalli - Removal of Mutawalli and Management of Waqf property. Succession - Application of the property of a deceased Muslim - **Legal position of heirs as representatives - Administration - Waqf Tribunals and Jurisdiction.**

**Suggested Readings:**

1. Tahir Mahmood: The Muslim Law of India, 1980, Law Book Company, Allahabad.
  2. Aquil Ahmed: Text Book of Mohammadan Law, 5th Edition 1992, Central 4. Law Agency, Allahabad.
  3. Prof. G.C.V. Subba Rao: Family Law in India, 6th Edition, 1993, S.Gogia & Company, Hyderabad.
  5. Asaf A.A. Fyzee: Outlines of Mohammadan Law, 4th Edition, 1999, Oxford University Press, Delhi.
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## Legal Language and Legal Writing

Sub. Code: BL 306

L -4, C -4

### Course Objectives

- The Legal Language and Legal Writing course aims to build proficiency in the specialized language used in the legal profession, along with developing practical skills for drafting legal documents and writing persuasive legal arguments.
- Students will gain a strong foundation in legal research, drafting, analytical reasoning, and professional communication, all of which are essential for success in legal practice.
- By the end of the course, students will be prepared to write effectively and ethically in a wide range of legal contexts, and they will have the tools necessary for successful legal practice, whether in litigation, contract law, corporate law, or public policy.
- Engage students in simulated legal scenarios, where they apply their legal writing and research skills to draft documents or provide advice based on a hypothetical case.

### Unit I: Meaning and uses of legal terms

#### Commonly used Latin terms in courts

Ab initio', Res judicata, Res– subjudice, Adhoc, Ad infinitum, Ad interim, Adjourn sine die, Ad litem, Ad valorem, Alibi, Aliter, Almamater, Amicus Curiae, Animus, Animus possidendi, Alumni, Anti-meridiem, Bonafide, Bona Vacantia, Causeausans, Coram non judice, Corpus Possessionis, Custodia Legis, Composmentis, Cypress, Defacto, De Jure, Denovo, Donati on mortis cause, Enventresamere, Enroute, Ex officio, Ex gratia, Ex parte, Ex post facto, Factum valet, Femesole, Filius nullius, In forma pauperis, Ibid, In limine, In memoriam, In parimaterial, Intelligible differentia, Interalia, Interse, Ipso jure, Intoto, Ipsofacto, In invitum, In locoparentis, In pais, In pari delicto, potio rest condition possidentis (or defendentis), In rem, Intervivos, Intra-vires, Justertii, Juscivile, Jusdivinum, Lex Fori, Lex Loci delicti, Lispendens, Locus standi, Malafide, Mens Rea, Modus operandi, Modus Vivendi, Non compos mentis, Nonfeasance, Nudum Pactum, Onus probandi, Pacta Sunt Servanda, Pari Passu, Pendente lite, Per annum, Per capita, Per diem, Per mensem, Per stripes, Persona non grata, Postmeridiem, Postmortem, Prima facie, Pro bono publica, Prorata, Protanto, Protem, Quasi-judicial, Quid pro quo, Rati decidendi, Raison d'etre, Res Gestae, Res integra, Res nullius, Sine qua non, Sine die, Solatium, Stare decisis, Status quo, Sub-judice, Suppressionary, Scienter, Trespasser ab initio, Ultra-vires, Vice Versa, Vis-à-vis, Vis major

#### Unit II: Legal maxims

1. Absoluta sententia expositore non-indiget
2. A bundanscautela non nocet.
3. Actio-personalismi moritur-cum persona
4. Actori incumbit onus probandi
5. Actus curiae neminem gravabit
6. Actus de nemine facit injuriam
7. Actus reus
8. Actus legis nemini est damnosus



9. Actus non-facit reum nisi mens sit rea
10. Eiusdem Generis
11. Exturpi causa non oritur actione
12. Noscitur a sociis
13. Novus actus interveniens
14. Respondent superior
15. Falsus in uno falsus in omnibus
16. Acquitus sequitur legem
17. Allegans contraria non est audiendus
18. Audi alteram partem
19. Caveat emptor
20. Damnum sine injuria
21. De minimis non curat lex
22. Dolus malus pactum se non servabit
23. Delegates non potest delegare
24. Fiat Justitia ruat caelum
25. Ignorantia legis neminem excusat
26. Injuria sine damno
27. Interest reipublicae ut sit finis litium
28. Lex non cogit ad impossibilia
29. Nemo dat quod non habet
30. Nemo debet esse iudex in propria causa
31. Quantum meruit
32. Qui approbat non reprobat
33. Qui facit per alium per se
34. Res ipsa loquitur
35. Salus populi est Suprema Lex
36. Ubi ius ibi remedium
37. Vigilantibus non dormientibus iura subveniunt

### **Unit III: Paragraph & Precise Writing of Legal Texts**

### **Unit IV: Writing of Moot Memorials**

#### **Suggested Reading:**

1. Myneni S.R., Legal language and Legal Writing, Central Law Agency, Allahabad.
2. Jain R.L., Legal Language, Central Law Agency, Allahabad.
3. Prasad Anirudh, Legal Language, Central Law Publications, Allahabad.

## PUBLIC INTERNATIONAL LAW

Sub. Code: BL 308

L – 4, C – 4.

### Course objectives

- The Public International Law course aims to provide students with a thorough understanding of the legal rules that govern the relations between states and other international actors.
- By the end of the course, students will be familiar with the sources, subjects, and principles of international law, as well as its application in areas such as human rights, international humanitarian law, trade, investment, and conflict resolution.
- The course prepares students to critically engage with global legal challenges and equips them with the tools to understand and navigate the complexities of international law in contemporary global affairs.
- Analyze the role of international law in global development and the protection of economic, social, and cultural rights, particularly in the context of poverty, disaster relief, and humanitarian assistance.

### Unit-I:

Definition, Nature, Scope and Importance of International Law — Relation of International Law to Municipal Law — Sources of International Law — Codification.

### Unit-II:

State Recognition — State Succession — Responsibility of States for International delinquencies — State Territory — Modes of acquiring State Territory

### Unit-III:

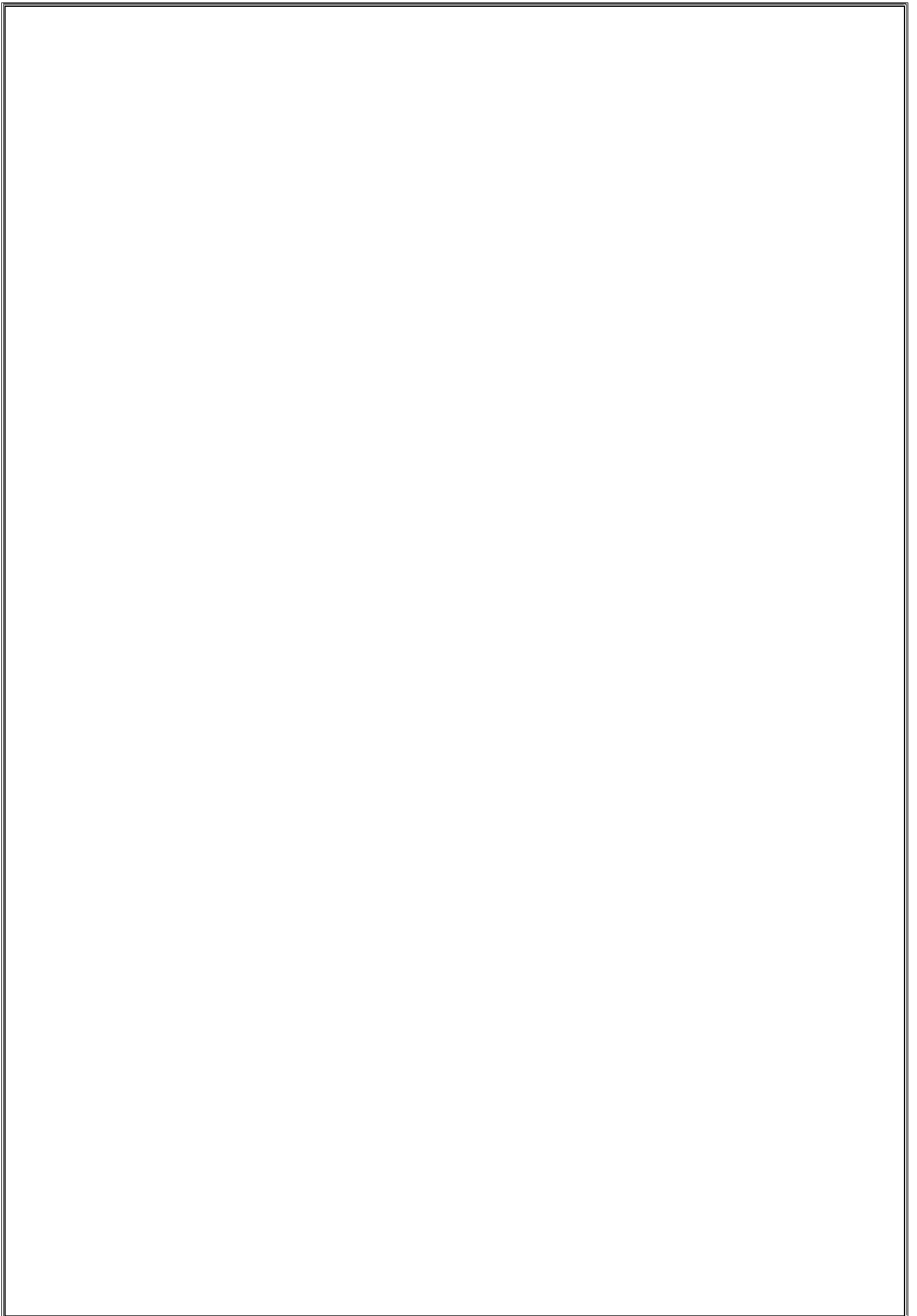
Position of Individual in International Law — Nationality — Extradition — Asylum — Privileges and Immunities of Diplomatic Envoys — Treaties – Formation of Treaties - Modes of Consent, Reservation and termination.

### Unit-IV:

The Legal Regime of the Seas – Evolution of the Law of the Sea – Freedoms of the High Seas – Common Heritage of Mankind – United Nations Convention on the Law of the Sea – Legal Regime of Airspace – Important Conventions relating to Airspace – Paris, Havana, Warsaw and Chicago Conventions – Five Freedoms of Air – Legal Regime of Outer space – Important Conventions such as Outer space Treaty, Agreement on Rescue and Return of Astronauts, Liability Convention, Agreement on Registration of Space objects, Moon Treaty - Unispace.

### Suggested Readings:

1. S.K. Kapoor, Public International Law, Central Law Agencies, Allahabad.
2. H.O. Agarwal, International Law and Human Rights, Central Law Publications, Allahabad.
3. S.K. Verma, An Introduction to Public International Law, Prentice Hall of India.



# MACRO ECONOMICS II

Sub. Code: BL – 310

L-4, C-4

## Course objectives

- The Macroeconomics II course aims to deepen students' understanding of the complex dynamics that govern national and global economies.
- It combines advanced theoretical analysis with practical policy applications, preparing students to understand and evaluate the impact of economic policies, global trends, and crises.
- By the end of the course, students should be able to critically assess macroeconomic phenomena, formulate policy recommendations, and utilize econometric tools to analyze real-world economic problems.
- Debates in Macroeconomics: Engage students in contemporary policy debates in macroeconomics, such as austerity vs. stimulus, central bank independence, and the role of fiscal policy in economic stabilization.

## Unit I: Classical Theory/ Long Run Analysis

Foundation & features of Classical Theory, Introduction to Says Law.

## Unit II: Principles of Aggregate Demand & Aggregate Supply

Theory of Aggregate Demand, Theory of Aggregate Supply

## Unit III: New Keynesian/Post Keynesian Economics

Importance & Scope, Different Theories of Post Keynesian Economics (RET Business Cycle theory etc.)

## Unit IV: Growth & Development

Concept of Economic Growth & Economic Development, Neo-Classical Growth Theory, Types of Growth & Development, Factors of Growth & Development, Measures of Growth & Development

## Suggested Readings:

1. Jhingan M.L., Development Economic, Vrinda Pub.
2. Dwivedi D.N., Macroeconomic Theory & Policy, Tata Mac Graw Hill
3. Samuelson & Nordhaus, Economics, Tata Mac Graw Hill
4. Shapiro, Macroeconomic Analysis, Galgotia

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## **Anthropology-II (BL – 310 A)**

**Sub. Code: BL – 310 A**

**L-4, C-4**

### **Course Objectives:**

- To deepen the understanding of economic behaviors, institutions, and practices from an anthropological perspective.
- To explore the interplay between culture, economy, and society, focusing on contemporary issues.
- To analyze economic systems and their evolution, emphasizing globalization, development, and inequality.
- To examine the roles of exchange, property, labor, and consumption in different societies, using anthropological theories and empirical studies.

### **Unit I: Theoretical Perspectives in Economic Anthropology**

- Classical Approaches: Marxian, Weberian, and Durkheimian Perspectives on Economic Life
- Cultural Economics: The Role of Culture in Economic Decision-Making
- Neoliberalism, Globalization, and Economic Anthropology
- Post-Colonial Critiques of Economic Anthropology
- Political Economy and Economic Anthropology: Key Concepts and Debates

### **Unit II: Modes of Production and Economic Systems**

- Subsistence Economies: Foraging, Horticulture, Pastoralism, and Agriculture
- The Role of Kinship and Social Structures in Economic Systems
- The Rise of Industrial Capitalism and Its Anthropological Impact
- State-Controlled Economies: Socialism, State Capitalism, and Nationalism
- Transition from Traditional to Modern Economic Systems in Developing Societies

### **Unit III: Exchange, Trade, and Markets**

- Theories of Exchange: Reciprocity, Redistribution, and Market Exchange (Mauss, Sahlins, Polanyi)
- The Role of Barter Systems, Gift Economies, and Money in Different Cultures
- Market Systems: Local, National, and Global Markets
- The Anthropology of Global Trade: Commodities, Global Supply Chains, and Fair Trade
- The Informal Economy: Informal Work, Microenterprises, and the Shadow Economy

### **Unit IV: Labor, Property, and Economic Inequality**

- The Anthropology of Labor: Division of Labor, Gender, and Work Relations

- Property Rights: Land Ownership, Intellectual Property, and Cultural Property
- Social and Economic Inequality: Caste, Class, Race, and Gender Dimensions
- Economic Exploitation and Worker's Rights: Case Studies from the Global South
- Anthropology of Development and Underdevelopment: Economic Anthropology's Role in Policy

### **Unit V: Consumption, Development, and Globalization**

- The Anthropology of Consumption: Material Culture, Consumerism, and Identity
- Development Theories and Practices: From Modernization to Post-Development
- Globalization and Its Impact on Local Economies: Culture, Labor, and Power
- The Role of NGOs and International Organizations in Economic Development
- Environmental Anthropology: Sustainability, Resources, and Development

### **Suggested Books:**

1. "Economic Anthropology: A Systematic Approach" by Stephen Gudeman
2. "The Anthropology of Economy: A Reader" edited by Brian Moeran and Richard Wilk
3. "The Gift: The Form and Reason for Exchange in Archaic Societies" by Marcel Mauss
4. "Markets and Money: A Critical Introduction" by Keith Hart and John Sharp
5. "The Anthropology of Development and Globalization" by Richard H. Robbins
6. "Globalization and Its Discontents" by Joseph E. Stiglitz

## **Political Economy-II BL – 310B**

**Sub. Code: BL – 310 B**

**L-4, C-4**

### **Course Objectives:**

- To analyze the relationship between politics and economics in the context of contemporary global capitalism.
- To examine the historical and theoretical foundations of political economy, including critical perspectives on capitalist systems.
- To understand economic policy choices, their implications for governance, and the role of the state in economic management.
- To explore key issues such as economic globalization, economic inequality, neoliberalism, and sustainable development within a political economy framework.

### **Unit I: Theories of Political Economy**

- Classical Political Economy: Adam Smith, David Ricardo, and John Stuart Mill
- Marxist Political Economy: Karl Marx's Theory of Value, Surplus Value, and Historical Materialism
- Neoclassical Political Economy: Marginalism, Utility, and the Role of Markets
- Keynesian Political Economy: Theories of Aggregate Demand, Government Intervention, and Economic Stability
- The Chicago School and Neoliberalism: Market Fundamentalism and Its Critics

### **Unit II: State and the Economy**

- The Role of the State in Economic Systems: Intervention vs. Laissez-Faire
- State Capitalism: Characteristics, Examples, and Contemporary Relevance
- Theories of State and Market Relations: Marxist, Liberal, and Institutionalist Approaches
- The Political Economy of Welfare States: Social Safety Nets, Redistribution, and Fiscal Policy
- Economic Crises and State Responses: The Role of Government in Economic Recovery

### **Unit III: Globalization and Political Economy**

- Globalization and Its Impacts: Economic, Political, and Cultural Dimensions
- Theories of Global Capitalism: World Systems Theory (Wallerstein) and Globalization of Capital
- Global Trade and Finance: WTO, IMF, World Bank, and Global Financial Institutions
- The Politics of Global Economic Governance: Regionalism, Bilateral Agreements, and Trade Wars
- Global Inequality and the South-North Divide: The Political Economy of Development

#### **Unit IV: Neoliberalism and Its Discontents**

- Neoliberalism: Theory, Policies, and Practices
- Privatization, Deregulation, and Austerity: Global Impact of Neoliberal Policies
- The Rise of Multinational Corporations and Financialization
- The Global Financial Crisis of 2008: Causes, Consequences, and Policy Responses
- Resistance to Neoliberalism: Anti-Globalization Movements and Alternative Economic Models

#### **Unit V: Political Economy of Development and Sustainability**

- Theories of Economic Development: Modernization, Dependency Theory, and Post-Colonial Critiques
- The Political Economy of Sustainable Development: Growth vs. Environmental Sustainability
- Green Political Economy: Environmental Economics, Green New Deal, and Eco-Socialism
- The Role of International Organizations in Development: The UN, World Bank, and Regional Development Banks
- Economic Planning in Developing Countries: Challenges and Policy Alternatives

#### **Suggested Books:**

1. **"The Political Economy of Development and Underdevelopment"** by Charles K. Wilber
2. **"Capitalism and Modern Social Theory"** by Anthony Giddens
3. **"Political Economy: A Marxist Introduction"** by Ben Fine
4. **"Global Political Economy"** by John Ravenhill
5. **"The Political Economy of Neoliberalism"** by David Coates
6. **"Globalization and Its Discontents"** by Joseph E. Stiglitz
7. **"Theories of Political Economy"** by James A. Caporaso and David P. Levine



# **SEMESTER VII**

## LABOUR LAW –I

Sub. Code: BL 401

L – 4, C – 4.

### Course Objectives

- Students should have a solid understanding of the legal framework that governs the workplace.
- They will be equipped to critically assess the interplay between labour laws and socio-economic policies, the role of trade unions and employer organizations, and the various protections afforded to workers in different sectors and jurisdictions.
- Students will also develop the skills to address labour law issues both in domestic and international contexts, contributing to discussions on labour market regulation, worker protection, and social justice in a rapidly changing world.
- Understand the obligations of employers in complying with labor laws, including the importance of record-keeping, compliance audits, and training programs for workplace rights and safety.

### Unit-I

Trade Unions: History of Trade Union Movement - The Trade Union Act 1926 – Definitions - Registration – Rights and Liabilities of Registered Trade Unions – Immunities – Amalgamation and dissolution of Unions – **Reorganization of Trade Unions.**

### Unit-II

Prevention and Settlement of Industrial Disputes in India - The role of State in Industrial Relations – The Industrial Disputes Act 1947 - Definition of industry - Industrial Dispute – Individual Dispute - workman- Lay off – **Retrenchment - Closure -Award - Strike – Lockout**

### Unit-III

Authorities under the IDAct – Works committee – Conciliation - Court of inquiry - Labour Courts- Tribunal – Powers and functions of authorities - Voluntary Arbitration - Provisions under Chapter V-A & V- B of the Act- Alteration of conditions of service – Management rights of action during pendency of proceedings – **Recovery of money due from employer – Unfair labour practices - miscellaneous provisions of the Act.**

### Unit-IV

Standing Orders -Concept and Nature of Standing Orders – scope and coverage- Certification process – its operation and binding effect – Modification and Temporary application of Model **Standing Orders – Interpretation and enforcement of Standing Orders and provisions contained in the Industrial Employment ( Standing Orders ) Act 1946.**

**Suggested Readings:**

1. Srivastava: Law of Trade Unions , Eastern Book Company, Lucknow
2. .Goswami : Labour and Industrial Law, Central Law Agency.
3. R.F. Rustomji: Law of Industrial Disputes : Asia Publishing House, Mumbai
4. S.N. Misra : Labour and Industrial Law
5. J.N. Malik : Trade Union Law
6. Khan& Khan : Labour Law , Asia Law House, Hyderabad
7. S.C. Srivastava : Industrial Relations and Labour Law, Vikas Publishing House.

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## **Jurisprudence**

**Sub. Code: BL 403**

**L – 4, C – 4.**

### **Course Objectives**

- The Jurisprudence course, often referred to as the philosophy of law, aims to introduce students to the fundamental principles and theories underlying the concept of law and legal systems.
- The course explores the nature, function, and purpose of law, providing students with the tools to critically examine how laws are created, interpreted, and enforced. Students will engage with a variety of legal philosophies, schools of thought, and historical perspectives, gaining insight into the relationship between law, morality, justice, and society.
- By the end of the course, students will be able to analyze and evaluate the different schools of jurisprudence, understand the key concepts that shape legal theory, and apply these insights to the practical functioning of legal systems.
- Explore key theories about the nature of law, including natural law, positive law, and legal realism, and understand the distinction between law and morality.

### **Unit-I:**

Meaning and Definition of Jurisprudence — General and Particular Jurisprudence - Elements of Ancient Indian Jurisprudence — Schools of Jurisprudence — Analytical, Historical, Philosophical and Sociological Schools of Jurisprudence. Theories of Law — Meaning and Definition of Law — **The Nature and Function of Law — The Purpose of Law — The Classification of Law — Equity, Law and Justice — Theory of Sovereignty.**

### **Unit-II :**

Sources of Law — Legal and Historical Sources — Legislation - Definition of legislation - Classification of legislation- Supreme and Subordinate Legislation - Direct and Indirect Legislation - Principles of Statutory Interpretation. Precedent — Definition of Precedent — Kinds of Precedent — Stare Decisis — Original and Declaratory Precedents — Authoritative and Persuasive Precedents. Custom – Definition of Custom – Kinds of Custom – General and Local Custom – Custom and Prescription - Requisites of a valid custom - Relative merits and demerits of Legislation , Precedent and Custom as a source of Law . **Codification — Advantages and disadvantages of codification.**

### **Unit-III:**

Persons — Nature of personality — Legal Status of Lower Animals, Dead Persons and Unborn persons — Legal Persons — Corporations — Purpose of Incorporation — Nature of Corporate Personality - Rights and Duties — Definition of Right — Classification of Rights and Duties — **Absolute and Relative Rights and Duties — Rights and Cognate concepts like Liberty, Power, Immunity, Privilege etc.**

**Unit-IV :**

Obligation — Nature of Obligation — Obligation arising out of Contract, Quasi Contract, trust and breach of obligation etc. — Liability — Nature and kinds of liability — Acts — Mens Rea — Intention and Motive — Relevance of Motive — Negligence — Strict Liability — Accident — Vicarious Liability — Measure of Civil and Criminal Liability.

**Unit-V:**

Ownership — Definition and kinds of Ownership - Possession — Elements of Possession - Relation between Ownership and Possession — Possessory Remedies — Property — Meaning —

**Suggested Readings:**

1. Salmond: Jurisprudence, Universal Publishers 12th Edn. 1966.
2. Rama Jois, Legal and Constitutional History of India, Universal Law Publications, Delhi.
3. N.V. Pranjape – Jurisprudence
4. S.R. Dhyeni – Jurisprudence

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## Company Law

Sub. Code: BL 405

L – 4, C – 4.

### Course Objectives

- Students will have gained a thorough understanding of the **legal frameworks** that govern the operation of companies, from their incorporation to their dissolution.
- They will be equipped to critically assess corporate governance issues, company finance, shareholder rights, and the protection of stakeholders in business law.
- Additionally, students will be able to analyze the challenges and opportunities posed by evolving corporate regulations, and the role of company law in the modern global economy.
- Study the different types of shares (e.g., ordinary shares, preference shares), the issue of shares, and the rules regarding share capital. Discuss the legal requirements for subscription, allotment, and transfer of shares.

### Unit-I:

Definition and attributes of Company — Distinction between Partnership Firm and Company — Kinds of Companies including Multinational Companies — Advantages and Disadvantages of Incorporation — Consequences of non-compliance of the provisions of the Companies Act in matters of incorporation.

### Unit-II:

Promoters and Registration — Pre-incorporation contracts — Memorandum of Association — Articles of Association.

### Unit-III:

Prospectus — Members — Shareholders — Share Capital — Shares and Dividends — Debentures — Directors — Powers and Liabilities of Directors.

### Unit-IV:

Director, Manager and Secretary — Meetings — Majority powers and minority rights — Prevention of Oppression and Mismanagement

### Unit-V:

Modes of winding up of companies.

### Suggested Readings:

1. Shah : Lectures on Company Law, N.M.Tripathi, Bombay.
2. Avtar Sing : Company Law, Eastern Book Company, 13th Edn. 2001.
3. Charlesworth: Company Law, Sweet and Maxwell, 1996.
4. Ramaiah: Company Law, Wadhwa& Co. 15th Edn. 2001.
5. Dutta: Company Law, Eastern Law House, Calcutta

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## ADMINISTRATIVE LAW

Sub. Code: BL 407

L – 4, C – 4.

### Course Objectives

- Definition and Nature: Understand the basic principles of administrative law, its relationship to constitutional law, and how it regulates the exercise of executive powers by governmental agencies.
- Scope of Administrative Law: Study the scope of administrative law in various contexts, including rule-making, enforcement, and decision-making.
- Examine the role of administrative agencies in the legislative, executive, and judicial functions of government.
- Sources of Administrative Law: Analyze the sources of administrative law, including statutes, regulations, judicial decisions, government orders, and administrative directives.

### Unit-I:

Nature and scope of Administrative Law — Meaning, Definition and Evolution of Administrative Law—Reasons for the growth of Administrative Law — Relationship between Administrative Law and Constitutional Law.

### Unit-II:

Basic concepts of Administrative Law — Rule of Law — Interpretation of Dicey's Principle of Rule of Law — Modern trends - Theory of Separation of Powers — Position in India, UK and USA

### Unit-III:

Classification of Administrative functions — Legislative, Quasi-judicial, Administrative and Ministerial functions — Delegated Legislation — Meaning, Reasons for the growth and Classification of delegated legislation— Judicial and Legislative Control of Delegated litigation.

### Unit-IV:

Judicial Control of Administrative Action - Grounds of Judicial Control — Principles of Natural Justice — Administrative discretion and its control.

### Unit-V:

Remedies available against the State — Writs — Lokpal and Lok Ayukta — Liability of the State in Torts and Contracts.

### Suggested Readings:

1. Griffith and Street: Principles of Administrative Law.
2. H.W.R.Wade: Administrative Law, Oxford Publications, 8th Edn. 2000, London.
3. De Smith: Judicial Review of Administrative Action, Sweet and Maxwell, 1998.
4. S.P. Sathe: Administrative Law, Butterworths, 6th Edn. 1998.
5. I.P.Massey: Administrative Law, Eastern Book Company, 5th Edn. 2001.

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## ALTERNATE DISPUTE RESOLUTION

Sub. Code: BL 409

L -4, C -4

### Course Objectives

- The Alternative Dispute Resolution (ADR) course is designed to introduce students to methods of resolving disputes outside the traditional court system.
- ADR techniques, such as mediation, arbitration, negotiation, and conciliation, offer parties an opportunity to resolve conflicts more efficiently, cost-effectively, and with greater control over the outcome than formal litigation.
- The course aims to equip students with the knowledge and skills necessary to understand, apply, and analyze different ADR mechanisms.
- Students will explore the principles, processes, advantages, and challenges of ADR, along with the legal frameworks that govern these alternative methods of dispute resolution. By the end of the course, students will be able to assess the suitability of ADR in various contexts and understand how these methods contribute to access to justice and the reduction of the burden on courts.

This is a first clinical paper of which written examination will be for 60 marks and the remaining 40 marks for record and viva voce. There shall be classroom instruction on the following topics:

### Unit-I:

Alternate Dispute Resolution — Characteristics — Advantages and Disadvantages—Unilateral — Bilateral — Triadic (Third Party) Intervention — Techniques and processes -- Negotiation — Conciliation — Arbitration — Distinction between Arbitration, Conciliation and Negotiation.

### Unit-II:

The Arbitration and Conciliation Act, 1996 — Historical Background and Objectives of the Act — Definitions of Arbitration, Arbitrator, Arbitration Agreement -- Appointment of Arbitrator — Termination of Arbitrator -- Proceedings in Arbitral Tribunal -- Termination of Proceedings — Arbitral Award -- Setting aside of Arbitral Award — Finality and Enforcement of Award — Appeals – Enforcement of Foreign Awards. Conciliation – Appointment of Conciliators – Powers and Functions of Conciliator -- Procedure – Settlement of disputes through conciliation.

### Unit-III:

Other Alternative Dispute Resolution Systems —Tribunals .

### Practical Exercises (30 marks)

- (a) The students are required to participate in 5 (five) simulation proceedings relating to Arbitration, Conciliation, Mediation and Negotiation. Participation in each such simulation proceeding shall be evaluated for a maximum of 4 (four) marks (Total 5x4=20marks).
- (b) Students are required to attend and observe the proceedings of Lok Adalats, Family Courts, Tribunals and other ADR Systems. Each student shall record the above observations in the diary which will be assessed. Record submitted by the student shall be evaluated for 10 marks by the



teacher concerned. The Records of the students duly certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University before the commencement of the theory examinations

**Viva- voce (10marks):** There shall be viva-voce examination on the above components. The Viva-voce Board consisting of (i) Principal of the College/the teacher concerned (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law, and (iii) an advocate with 10 years experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.

**Note: Attendance of the students in all the four components of the paper (written examination, participation in simulation proceedings, submission of record and attendance in viva) shall be compulsory.**

**Suggested Readings:**

1. O.P. Tiwari : The Arbitration and Conciliation Act (2nd Edition): Allahabad Law Agency.
2. Johar's : Commentary on Arbitration and Conciliation Act, 1996: Kamal Law House.
3. Acharya N.K.: Law relating to Arbitration and ADR, Asia Law House, Hyderabad
4. Tripathi S.C.: Arbitration, Conciliation and ADR, Central Law Agency, Allahabad.
5. Avatar Singh: Arbitration and Conciliation, Eastern Law Book House, Lucknow.

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## Data Analysis-1/ (BL-409A)

Sub. Code: BL 409 A

L -4, C -4

### Course Objectives:

- To develop practical skills that complement academic learning.
- To enhance problem-solving abilities and critical thinking.
- To foster creativity and innovation through practical work.
- To improve communication, teamwork, and leadership skills.
- To make students job-ready by providing exposure to real-world scenarios.
- To ensure students gain competence in tools, software, and techniques that are relevant to their field of study.

### Unit 1: Introduction to Practical Skills and Work Ethics

#### 1. Understanding Practical Skills:

- Importance of practical skills in academic and professional success.
- Distinction between theoretical knowledge and practical application.
- Identifying core skills relevant to students' academic fields.

#### 2. Work Ethics and Professionalism:

- Understanding the concept of work ethics: Punctuality, responsibility, and accountability.
- Teamwork and collaboration in professional settings.
- Ethical decision-making and handling conflicts in the workplace.

#### 3. Time Management:

- Techniques for effective time management: Prioritizing tasks, deadlines, and multitasking.
- Tools for personal and professional time management.
- Stress management and maintaining a healthy work-life balance.

### Unit 2: Communication Skills and Presentation

#### 1. Verbal Communication:

- Mastering effective speaking: Clarity, tone, and expression.
- Public speaking and presentation techniques.
- Interview skills: Preparing for and succeeding in job interviews.

#### 2. Written Communication:

- Writing professional emails, reports, and memos.
- Academic writing: Essays, research papers, and citations.
- Resume writing and crafting a cover letter.

### **3. Non-Verbal Communication:**

- The role of body language in communication.
- Understanding and using visual aids effectively in presentations.
- Active listening skills and empathetic communication.

## **Unit 3: Problem-Solving and Critical Thinking**

### **1. Problem-Solving Techniques:**

- Approaches to problem-solving: Identifying problems, generating solutions, and evaluating outcomes.
- Creative problem-solving techniques: Brainstorming, lateral thinking, and mind mapping.
- Case studies and real-world problems: Analyzing and providing solutions.

### **2. Critical Thinking Skills:**

- Understanding the concept of critical thinking: Analyzing, evaluating, and interpreting information.
- Logical reasoning and decision-making frameworks.
- Identifying biases and fallacies in problem-solving and decision-making.

### **3. Decision-Making and Risk Management:**

- Making informed decisions under uncertainty.
- Understanding risk and how to mitigate it.
- Case studies on decision-making in professional environments.

## **Unit 4: Computer Literacy and Technology Tools**

### **1. Basic Computer Skills:**

- Operating systems: Introduction to Windows, macOS, and Linux.
- File management and software installation.
- Internet navigation and online security.

### **2. Microsoft Office Suite:**

- MS Word: Document formatting, tables, and references.
- MS Excel: Data entry, formulas, and data analysis tools.
- MS PowerPoint: Creating and designing presentations.

### **3. Other Relevant Software Tools:**

- Introduction to design tools like Adobe Photoshop and Illustrator (depending on the course).
- Introduction to statistical tools like SPSS, R, or Python (depending on the course).
- Project management software: Using tools like Trello or Asana for task management.

## **Unit 5: Leadership and Teamwork**

### **1. Understanding Leadership Styles:**

- Theories of leadership: Transformational, transactional, and servant leadership.
- The role of a leader in guiding teams and achieving goals.
- Conflict resolution and leadership during crises.

### **2. Teamwork and Collaboration:**

- The importance of teamwork in professional and academic settings.
- Building and managing effective teams.
- Communication and coordination within teams: Achieving shared goals.

### **3. Project Management Skills:**

- The basics of project management: Planning, organizing, and execution.
- Understanding project management tools and methodologies (e.g., Agile, Waterfall).
- Evaluating project success: Time, cost, and quality management.

## **Unit 6: Practical Training or Project Work**

### **1. Internship/Practical Exposure:**

- Hands-on experience in the chosen field (e.g., internship, industry visits, or fieldwork).
- Application of theoretical knowledge in real-world settings.
- Reflection on learning outcomes from the practical exposure.

### **2. Project Work:**

- Undertaking a group or individual project related to the academic discipline.
- Research, data collection, analysis, and presentation of results.
- Collaborative problem-solving and practical application of skills.

### **3. Evaluation and Reporting:**

- Writing a project report or internship report.
- Preparing a presentation on the practical work undertaken.
- Peer and instructor evaluations of performance.

## **Suggested Books:**

- *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses* by Eric Ries
- *The Art of Project Management* by Scott Berkun
  
- *The 7 Habits of Highly Effective People* by Stephen R. Covey
- *How to Win Friends and Influence People* by Dale Carnegie
- *Microsoft Office 365 All-in-One For Dummies* by Peter Weverka
- *Leaders Eat Last* by Simon Sinek
- *Microsoft Office 365 All-in-One For Dummies* by Peter Weverka

# Computer Programming-1 (BL-409B)

Sub. Code: BL 409B

L -4, C -4

## Course Objectives:

- To provide students with a foundational understanding of data analysis techniques.
- To teach students how to organize, clean, and interpret data.
- To introduce students to basic statistical methods and data visualization techniques.
- To familiarize students with data analysis software and tools (Excel, SPSS, or R).
- To develop the ability to apply data analysis techniques to real-world problems.

## Unit 1: Introduction to Data Analysis

### 1. Understanding Data:

- Types of data: Qualitative vs. Quantitative, Continuous vs. Discrete.
- Levels of measurement: Nominal, Ordinal, Interval, and Ratio.
- Data collection methods: Surveys, experiments, observational studies, etc.
- Introduction to data sets and variables.

### 2. The Data Analysis Process:

- Steps in the data analysis process: Data collection, cleaning, analysis, and interpretation.
- Overview of data analysis software tools (Excel, SPSS, and R).
- Understanding the importance of data quality: Accuracy, completeness, and consistency.

### 3. Ethics in Data Analysis:

- Ethical considerations in data collection and analysis.
- Data privacy, confidentiality, and informed consent.
- Avoiding data manipulation and bias.

## Unit 2: Descriptive Statistics

### 1. Measures of Central Tendency:

- Mean, Median, Mode: Definitions, calculations, and applications.
- Understanding the use of each measure in different contexts.
- Interpreting and comparing measures of central tendency.

### 2. Measures of Dispersion:

- Range, Variance, Standard Deviation, Interquartile Range.
- Interpreting measures of variability.
- Importance of dispersion in understanding data distribution.

### 3. Data Distribution and Visualization:

- Introduction to histograms, bar charts, and pie charts.
- Introduction to box plots and frequency distributions.
- Introduction to skewness and kurtosis.

### **Unit 3: Probability and Probability Distributions**

#### **1. Introduction to Probability:**

- Basic probability concepts: Events, sample space, and probability rules.
- Conditional probability and Bayes' theorem.
- The law of large numbers and central limit theorem.

#### **2. Probability Distributions:**

- Discrete probability distributions: Binomial and Poisson distributions.
- Continuous probability distributions: Normal and Exponential distributions.
- Applications of probability distributions in real-world scenarios.

#### **3. Sampling and Sampling Distributions:**

- Introduction to sampling methods: Simple random sampling, stratified sampling, and cluster sampling.
- Sampling distribution of the sample mean and central limit theorem.
- The relationship between sample size and estimation accuracy.

### **Unit 4: Inferential Statistics**

#### **1. Estimation:**

- Point estimates and confidence intervals.
- Confidence intervals for population mean, proportion, and variance.
- Margin of error and its interpretation.

#### **2. Hypothesis Testing:**

- Formulation of null and alternative hypotheses.
- Types of errors: Type I and Type II errors.
- Performing hypothesis tests: Z-test, t-test, chi-square test, and ANOVA.
- p-values and their interpretation in decision-making.

#### **3. Chi-Square Tests and Goodness of Fit:**

- Chi-square test for independence and goodness of fit.
- Applications of chi-square tests in categorical data analysis.
- Interpreting chi-square test results and conclusions.

### **Unit 5: Data Visualization and Presentation**

#### **1. Data Visualization Techniques:**

- Importance of data visualization in communicating results.
- Advanced visualization techniques: Scatter plots, line charts, heatmaps.
- Use of color, size, and shapes in enhancing visualizations.

#### **2. Data Visualization Tools:**

- Introduction to Excel for creating visual representations of data.
- Using SPSS and R for generating statistical graphs and plots.
- Visualization of multiple variables: Bubble charts, 3D plots, and correlation matrices.

#### **3. Creating Reports and Presentations:**

- Best practices for presenting data analysis results.

- Structuring reports: Introduction, methodology, findings, and recommendations.
- Using PowerPoint and other tools to present findings to stakeholders.

## **Unit 6: Introduction to Software for Data Analysis**

### **1. Excel for Data Analysis:**

- Using Excel for basic data analysis: Functions, formulas, and pivot tables.
- Creating charts and graphs in Excel.
- Data manipulation and cleaning techniques in Excel.

### **2. Introduction to SPSS:**

- Overview of SPSS: Data entry, coding, and cleaning.
- Conducting descriptive and inferential statistical analysis in SPSS.
- Visualizing data in SPSS: Graphs, charts, and tables.

### **3. Introduction to R:**

- Introduction to R programming language: Basic syntax, data structures, and functions.
- Data manipulation and analysis in R.
- Visualization using R libraries: ggplot2 and other popular packages.

## **Suggested Books:**

- Excel 2021 For Dummies by Greg Harvey.
- Discovering Statistics Using SPSS by Andy Field.
- R for Data Science by Hadley Wickham and Garrett Golemund.
  
- Statistics for Business and Economics by Paul Newbold, William L. Karlin, and Betty Thorne.
- Data Science for Business by Foster Provost and Tom Fawcett.
- R for Data Science by Hadley Wickham and Garrett Golemund.
- The Visual Display of Quantitative Information by Edward R. Tufte.
- Data Visualization: A Practical Introduction by Kieran Healy.

# Python Programming-I (BL-409C)

Sub. Code: BL 409C

L -4, C -4

## Course Objectives

- Learn Python syntax and basic programming concepts.
- Develop skills in using control structures and loops.
- Understand and implement functions and data structures.
- Perform file handling and exception management.
- Gain an introduction to object-oriented programming in Python.

## Unit 1: Introduction to Python

- Overview of Python: History, Features, and Applications
- Setting Up the Python Environment (IDE, Jupyter Notebook, etc.)
- Writing and Executing Python Programs
- Understanding Variables, Data Types, and Basic Syntax

## Unit 2: Control Flow and Loops

- Conditional Statements: if, elif, else
- Looping Structures: for and while loops
- Nested Loops and Conditional Expressions
- Introduction to Iterators and Generators

## Unit 3: Functions

- Defining and Calling Functions
- Parameters and Return Values
- Scope of Variables: Local and Global Scope
- Lambda Functions and Recursion

## Unit 4: Data Structures

- Lists, Tuples, and Dictionaries
- Sets and Strings Manipulation
- List Comprehension and Dictionary Comprehension
- Basic Operations and Iteration on Data Structures

## Unit 5: File Handling

- Reading and Writing Files
- Working with Text and Binary Files
- Exception Handling in File Operations
- File Manipulation Techniques



## Suggested Readings

- **"Python Crash Course"** by Eric Matthes
- A hands-on introduction to Python, ideal for beginners.
- **"Automate the Boring Stuff with Python"** by Al Sweigart
- Focuses on practical Python applications for everyday tasks.
- **"Think Python: How to Think Like a Computer Scientist"** by Allen B. Downey
- Explores Python programming with an emphasis on problem-solving.
- **"Python Programming: An Introduction to Computer Science"** by John M. Zelle
- A beginner-friendly introduction to Python and computer science concepts.
- **"Learning Python"** by Mark Lutz
- A comprehensive guide to mastering Python programming.

## **Leadership and Management I (BL-409D)**

**Sub. Code: BL 409D**

**L -4, C -4**

### **Course Objectives**

- Understand key theories and concepts of leadership and management.
- Develop personal leadership skills and management strategies.
- Analyze organizational structures and dynamics.
- Apply leadership and management principles in real-world scenarios.

### **Unit 1: Change Management**

- Theories of organizational change
- Strategies for effective change implementation

### **Unit 2: Ethical Leadership and Corporate Social Responsibility**

- Ethical decision-making frameworks
- The role of leaders in promoting ethical behavior

### **Unit 3: Conflict Resolution and Negotiation**

- Types of conflicts in organizations
- Techniques for effective negotiation and conflict resolution

### **Unit 4: Leadership in a Global Context**

- Cultural influences on leadership and management practices

### **Suggested Readings:**

1. "The Five Dysfunctions of a Team: A Leadership Fable" by Patrick Lencioni
2. A practical guide on building effective teams and addressing common team challenges.
3. "Leaders Eat Last: Why Some Teams Pull Together and Others Don't" by Simon Sinek
4. Discusses the importance of trust and cooperation in effective leadership.
5. "Leadership and Self-Deception: Getting Out of the Box" by The Arbinger Institute

# **SEMESTER VIII**

## LABOUR LAW-II

Sub. Code: BL402

L – 4, C –4.

### Course Objectives

- Constitutional and Understand the constitutional provisions relating to labour rights and the key labour statutes governing industrial relations, such as the Industrial Disputes Act, 1947, Trade Unions Act, 1926, Factories Act, 1948, and Shops and Establishments Act.
- International Labour Explore the role of International Labour Organization (ILO) and its conventions in shaping domestic labour laws, focusing on the fundamental principles of labour rights, such as freedom of association, non-discrimination, and the right to equal pay for equal work.
- Industrial Relations System: Study the structure and importance of industrial relations systems in maintaining harmonious employer-employee relationships. Understand the role of trade unions in representing workers and advocating for their rights.
- Formation and Registration of Trade Unions: Explore the legal provisions governing the formation, registration, and functions of trade unions under the Trade Unions Act, 1926.

### Unit-I

The Remunerative Aspects – Wages – Concepts of wages - Minimum, Fair, Living Wages - Wage and Industrial Policies - Whitley Commission Recommendations - Provisions of Payment of Wages Act 1936 - Timely payment of wages - Authorised deductions – Claims - Minimum Wages Act 1948 - Definitions - Types of wages - Minimum rates of wages - Procedure for fixing and revising Minimum Wages – Claims -Remedy.

### Unit-II

Bonus – concept - Right to claim Bonus – Full Bench formula - Bonus Commission - Payment of Bonus Act 1965 - Application – Computation of gross profit, available, allocable surplus - Eligibility of Bonus - Disqualification of Bonus - set on – set off of allocable surplus- Minimum and Maximum Bonus-Recovery of Bonus.

### Unit-III

Employees Security and Welfare aspect - Social Security - Concept and meaning - Social Insurance - Social Assistance Schemes. Social Security Legislations - Law relating to workmen's compensation - The Workmen's Compensation Act 1923 – Definitions - Employer's liability for compensation - Nexus between injury and employment - payment of

compensation - penalty for default - Employees State Insurance Act 1948 – Application - Benefits under the Act - Adjudication of disputes and claims – ESI Corporation.

#### **Unit-IV**

Employees Provident Fund and Miscellaneous Provisions Act 1952 – Contributions - Schemes under the Act - Benefits. The Maternity Benefit Act 1961 - Definitions- Application - Benefits. The Payment of Gratuity Act 1972 – Definitions – application - Payment of gratuity - eligibility – forfeiture – Nomination - Controlling authorities.

#### **Suggested Readings**

1. S.N.Misra, Labour and Industrial Laws, Central law publication-22<sup>nd</sup> edition. 2006.
2. N.G. Goswami, Labour and Industrial Laws, Central Law Agency.
3. Khan & Kahan, Labour Law-Asia Law house, Hyderabad
4. K.D. Srivastava, Payment of Bonus Act, Eastern Book Company
5. K.D. Srivastava, Payment of Wages Act
6. K.D. Srivastava, Industrial Employment (Standing Orders) Act 1947
7. S.C.Srivastava, Treatise on Social Security
8. Jidwitesukumar Singh, Labour Economics, Deep & Deep, New Delhi
9. V.J.Rao, Factories Law

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# UTTAR PRADESH LAND LAWS

Sub. Code: BL 404

L-4, C-4

## Course Objectives

- Students will have gained a comprehensive understanding of land-related legal principles, including ownership rights, land acquisition, tenancy laws, land reforms, and the legalities surrounding land use and distribution.
- Students will also be able to critically analyze land disputes, propose legal solutions, and understand the broader social, economic, and environmental issues related to land management.
- Examine the challenges posed by rapid urbanization and land scarcity in urban areas, and how legal mechanisms are being adapted to address the needs of growing cities.
- Study the legal measures to prevent land grabbing and illegal encroachments on both public and private land.

## Unit I: Introduction

Interpretation Clause, Objects and Clause of UP Zamindari Abolition and **Land Reforms Act 1950, Characteristics of Act.**

## Unit II: Classes and Rights of Tenure Holder

Bhumidhar with Transferable Rights, Bhumidhar with Non-Transferable Rights, **Asami, Government Lease.**

## Unit III: Succession

General Order of Succession, Succession as per strips, Critical Approach to Law of Succession, **Succession for Females.**

## Unit IV: Ejectment

Ejectment of Tenure Holder from the Land of Public Utility, Ejectment of Trespasser, Ejectment of Bhumidhar, Ejectment of Asami, Abandonment and Surrender.

### **Leading Cases For Detail Study**

\*Abdul Saeed And Another Vs State Of Uttar Pradesh & Others

\*Smt. Mainia Vs Dy. Director Consolidation

\*Satyendra Singh Vs State Of Up

\*Lalsa Vs State Of Up

\*InduBhushan Vs State Of Up

### **Suggested Reading:**

1. Maurya R.R., Uttar Pradesh Land Laws, Central Law Publications, Allahabad.

2. Singh C.P., Uttar Pradesh Land Laws, Central Law Agency, Allahabad.

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## Intellectual property law

Sub.Code:BL406

L -4, C -4

### Course Objectives

- Students will have a comprehensive understanding of IPR laws and their application in various sectors.
- They will be equipped with the tools necessary to analyze, protect, and enforce intellectual property rights in a globalized digital economy.
- Students will also be able to navigate legal challenges related to IPR and understand the interplay between innovation, regulation, and public interest in the evolving world of intellectual property.
- Examine the debate over IPR and access to medicines, particularly in the context of generic drugs and compulsory licensing.

### Unit-I:

Meaning, Nature, Classification and protection of Intellectual Property — The main forms of Intellectual Property — Copyright, Trademarks, Patents, Designs (Industrial and Layout) -- Geographical Indications - Plant Varieties Protection and Biotechnology.

### Unit-II:

Introduction to the leading International instruments concerning Intellectual Property Rights — The Berne Convention — Universal Copyright Convention — The Paris Union — Patent Co-operation Treaty -- The World Intellectual Property Organization (WIPO) and the UNEESCO, International Trade Agreements concerning IPR — WTO — TRIPS.

### Unit-III :

Select aspects of the Law of Copyright in India — The Copy Right Act, 1957 - Historical evolution — Meaning of copyright — Copyright in literary, dramatic and musical works, computer programmes and cinematograph films — Neighbouring rights — Rights of performers and broadcasters, etc. — Ownership and Assignment of copyright — Author's special rights — Notion of infringement — Criteria of infringement — Infringement of copyright in films, literary and dramatic works — Authorities under the Act — Remedies for infringement of copyright.



**Unit-IV:**

Intellectual Property in Trademarks and the rationale of their protection - The Trade Marks Act, 1999 — Definition of Trademarks — Distinction between Trademark and Property Mark - Registration — Passing off — Infringement of Trademark — Criteria of Infringement — Remedies. The Designs Act, 2000 — Definition and characteristics of Design — Law in India — Protection and rights of design holders — Copyright in design — Registration — Remedies for infringement.

**Unit-V:**

Patents — Concept of Patent — Historical overview of the Patents Law in India — Patentable Inventions — Kinds of Patents — Procedure for obtaining patent — The Patents Act, 1970 — Rights and obligations of a patentee —

**Suggested Readings:**

1. P. Narayanan: Patent Law, Eastern Law House, 1995.
2. Roy Chowdhary, S.K. & Other: Law of Trademark, Copyrights, Patents and Designs, Kamal Law House, 1999.
3. Dr. G.B. Reddy, Intellectual Property Rights and the Law 5th Ed. 2005 GogiaLaw Agency.
4. John Holyoak and Paul Torremans: Intellectual Property Law.
- 5 B.L. Wadhera: Intellectual Property

## Research Methodology (BL406A)

Sub. Code: BL406A

L -4, C -4

### Course Objectives:

- To introduce students to the principles and techniques of conducting academic research.
- To provide the necessary tools and methods for designing, executing, and analysing research projects.
- To develop skills in critical thinking, data collection, analysis, and interpretation.
- To understand ethical considerations and the role of research in advancing knowledge.

### Unit I: Introduction to Research and its Types

- **Definition and Importance of Research:** Understanding research, its scope, and significance in various fields.
- **Types of Research:** Basic vs. Applied Research, Quantitative vs. Qualitative Research, Exploratory, Descriptive, and Analytical Research.
- **Research Process:** Stages in Research – Problem Identification, Literature Review, Hypothesis Formulation, Data Collection, Analysis, and Report Writing.
- **Research Paradigms:** Positivism, Interpretivism, and Pragmatism.

### Unit II: Research Design

- **Meaning and Importance of Research Design:** Types of Research Design – Experimental, Correlational, Cross-Sectional, and Longitudinal Studies.
- **Sampling Techniques:** Probability and Non-Probability Sampling, Sampling Methods (Random, Stratified, Systematic, Cluster, etc.).
- **Sampling Error and Sample Size Determination:** Understanding sample size, margin of error, and confidence levels.
- **Variables in Research:** Independent, Dependent, Control, and Confounding Variables.

### Unit III: Data Collection Methods

- **Primary Data Collection:** Surveys, Interviews, Focus Groups, and Observations.
- **Secondary Data Collection:** Using Existing Data Sources like Databases, Reports, and Published Research.
- **Questionnaire Design:** Types of questions (Closed, Open, Likert Scale, etc.), reliability, and validity of instruments.
- **Fieldwork Techniques:** Participant Observation, Case Studies, Ethnography.
- **Ethical Issues in Data Collection:** Informed Consent, Privacy, Confidentiality, and Ethical Approval.

#### **Unit IV: Data Analysis**

- **Quantitative Data Analysis:** Descriptive and Inferential Statistics, Measures of Central Tendency (Mean, Median, Mode), Variability (Range, Standard Deviation), and Hypothesis Testing (t-tests, chi-square tests, ANOVA).
- **Qualitative Data Analysis:** Thematic Analysis, Content Analysis, Narrative Analysis.
- **Use of Software in Data Analysis:** Introduction to SPSS, Excel, and NVivo for quantitative and qualitative data analysis.
- **Interpreting Research Results:** Drawing Conclusions, Identifying Patterns, and Making Recommendations.

#### **Unit V: Research Report Writing and Presentation**

- **Structure of a Research Report:** Introduction, Literature Review, Methodology, Results, Discussion, Conclusion, and References.
- **Writing the Research Proposal:** Objectives, Scope, Methodology, Timeline, and Budgeting for Research.
- **Academic Writing and Citation Styles:** APA, MLA, Chicago, and Harvard referencing styles.
- **Presenting Research Findings:** Writing and presenting research papers, posters, and oral presentations at academic conferences.
- **Avoiding Plagiarism:** Importance of Originality, Citation Practices, and Ethical Use of Sources.

#### **Unit VI: Ethical Issues in Research**

- **Ethics in Research:** Ethical Principles, Institutional Review Boards (IRB), Research Integrity.
- **Conflict of Interest and Bias:** Recognizing and addressing biases in data collection, analysis, and reporting.
- **Data Integrity and Misuse:** Issues related to falsification, fabrication, and manipulation of data.
- **Research Misconduct:** Types of misconduct and how to avoid them.

#### **Suggested Books:**

1. **"Research Methodology: A Step-by-Step Guide for Beginners"** by Ranjit Kumar
2. **"Research Methodology: Methods and Techniques"** by C.R. Kothari
3. **"Qualitative Research Methods for the Social Sciences"** by Bruce L. Berg
4. **"The Craft of Research"** by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams
5. **"Research Methods in Education"** by Louis Cohen, Lawrence Manion, and Keith Morrison
6. **"Practical Research: Planning and Design"** by Paul D. Leedy and Jeanne Ellis Ormrod

## **Publication Ethics and Emerging Trends in Research (BL406B)**

**Sub. Code: BL406B**

**L -4, C -4**

### **Course Objectives:**

- To provide students with a comprehensive understanding of ethical issues in research and publication.
- To explore emerging trends in research methodologies, technology, and publication processes.
- To develop skills in ethical decision-making, responsible conduct of research, and academic writing.
- To prepare students to navigate the complex landscape of modern academic publishing, including open access, peer review, and copyright issues.

### **Unit I: Introduction to Research Ethics**

- **Overview of Research Ethics:** Importance of ethics in research and its role in ensuring integrity, trust, and quality.
- **Ethical Guidelines for Research:** Overview of key ethical principles like respect for persons, beneficence, and justice.
- **Ethical Approval:** Institutional Review Boards (IRB) and ethics committees.
- **Plagiarism:** Definition, types, consequences, and how to avoid it.
- **Authorship and Acknowledgments:** Determining authorship, responsibilities of authors, and proper acknowledgment of contributions.

### **Unit II: Ethical Challenges in Research**

- **Fabrication and Falsification of Data:** Distinguishing between ethical and unethical research practices.
- **Conflicts of Interest:** Identifying and managing conflicts in research and publishing.
- **Data Management and Privacy:** Ethical handling of sensitive data, participant confidentiality, and consent.
- **Research Misconduct:** Types of misconduct (plagiarism, data falsification, authorship disputes), and the process of investigation and reporting.
- **Reproducibility and Transparency:** Ensuring research findings can be replicated and are reported transparently.

### **Unit III: Publication Ethics**

- **Principles of Ethical Publishing:** Fairness, transparency, and accountability in publishing.
- **Peer Review Process:** The role of peer review in ensuring quality and integrity in scientific publishing.
- **Publishing Guidelines:** How to select journals, manuscript preparation, and submission processes.
- **Open Access Publishing:** Definition, advantages, disadvantages, and open-access policies.
- **Copyright and Intellectual Property:** Ownership of research, copyright laws, and licensing (Creative Commons, etc.).

### **Unit IV: Emerging Trends in Research**

- **Digital Transformation in Research:** The impact of technology on research methodologies, data collection, and analysis (e.g., big data, AI, machine learning).
- **Interdisciplinary Research:** Growing importance of interdisciplinary approaches and collaborative research.
- **Citizen Science and Crowdsourcing:** Involving the public in research through citizen science platforms and online collaboration.
- **Preprint Repositories:** Role of preprints in accelerating research dissemination and their ethical implications.
- **Research Integrity in the Digital Age:** Addressing issues related to online publication, social media, and open-source tools.

### **Unit V: Ethical Issues in Emerging Research Areas**

- **Ethics of Artificial Intelligence and Machine Learning in Research:** Ethical concerns in AI-driven research, algorithmic bias, and transparency.
- **Ethics of Genetic and Biomedical Research:** Ethical challenges in genomics, biotechnology, and biomedical research, including gene editing (CRISPR).
- **Environmental Sustainability and Research:** Ethical issues related to climate change, environmental studies, and sustainable development.
- **Ethics of Social Media and Networking in Research:** Ethical use of social media platforms for data collection, research dissemination, and networking.

### **Unit VI: Responsible Conduct of Research**

- **Promoting Research Integrity:** Best practices for ensuring ethical conduct in research.
- **Training and Education in Research Ethics:** Importance of ethics training for researchers at all levels.
- **Role of Institutions in Promoting Ethical Research:** Policies, guidelines, and resources provided by academic and research institutions.

- **Research Ethics in Global Context:** Ethical challenges in international collaborations, including differences in cultural, legal, and institutional contexts.
- **Case Studies and Ethical Dilemmas:** Analyzing real-world cases of ethical dilemmas in research and publication.

#### **Suggested Books:**

1. **"Publication Ethics: A Primer for Researchers" by Philip M. Davis**
2. **"Ethics in Research & Publication" by R. S. Dhillon and S. G. R. Murthy**
3. **"Research Ethics: A Psychological Approach" by S. R. Behnke**
4. **"Responsible Conduct of Research" by Adil E. Shamoo and David B. Resnik**
5. **"Research Ethics in the Digital Age" by Jeannette Pols and Sophia de Boer**
6. **"Ethics in Science and Engineering" by L. R. Andrew**
7. **"Handbook of Research Ethics and Scientific Integrity" edited by Barbara Koenig, Sandra Soo-Jin Lee, and Philip K. Robb**

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## Interpretation of Statutes

Sub. Code: BL408

L – 4, C – 4.

### Course Objectives

- The Interpretation of Statutes course aims to provide students with a comprehensive understanding of the methods, principles, and tools used to interpret and apply statutes (laws made by a legislative body).
- The course focuses on equipping students with the skills needed to interpret legal texts, identify legislative intent, and resolve ambiguities or conflicts in statutes. Students will study the various canons of statutory interpretation and rules of construction used by courts to ascertain the meaning of statutes. The course will also delve into legislative history, judicial precedents, and the interaction between statutory law and constitutional principles.
- The Students will explore the role of judges in interpreting statutes, the importance of context in legal texts, and the balance between the literal and purposive approaches to interpretation.
- The Students will be able to confidently apply these interpretative techniques to real-world legal issues and understand how judicial interpretation can shape the application of law in various contexts.

### Unit-I:

Meaning and Definition of Statutes — Classification of Statutes — Meaning and Definition of Interpretation — General Principles of Interpretation — Rules of Construction under the General Clauses Act, 1897.

### Unit-II:

Grammatical Rule of Interpretation — Golden Rule of Interpretation – Rule of Interpretation to avoid mischief.

### Unit-III:

Interpretation of Penal Statutes and Statutes of Taxation — Beneficial Construction — Construction to avoid conflict with other provisions — Doctrine of Harmonious Construction.

### Unit-IV:

External Aids to Interpretation — Statement of objects of legislation, Legislative debates, identification of purpose sought to be achieved through legislation — Internal Aids to Interpretation — Preamble, title, interpretation clause, marginal notes, explanations etc. — Presumptions.

**Suggested Readings:**

1. Vepa P. Sarathi: Interpretation of Statutes, Eastern Book Co, 4th Edition, 1976.
2. Chatterjee: Interpretation of Statutes.
3. G.P. Singh: Principles of Statutory Interpretation, Wadhwa and Company, 8th Ed., 2001.

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## PROFESSIONAL ETHICS AND PROFESSIONAL ACCOUNTING SYSTEM

Sub.Code:BL410

L -4, C-4

### Course Objectives

- Students will be able to critically analyze ethical dilemmas and apply ethical principles real-world situations in various professional settings.
- They will be equipped with the knowledge to make ethically sound decisions, ensure compliance with professional codes of conduct, and contribute to the overall integrity and trustworthiness of their chosen profession.
- The course will prepare students to act responsibly, maintain high moral standards, and uphold the values of fairness, honesty, and social responsibility in their professional lives.
- Learn how to build a career based on ethical principles and professional integrity.

The written examination of this second clinical paper will be for 60 marks and the remaining 40 marks for record and viva voce. There shall be classroom instruction on the following topics:

**Unit-I:** Development of Legal Profession in India — The Advocates Act, 1961 — Right to Practice — a right or privilege? - Constitutional guarantee under Article 19(1) (g) and its scope — Enrolment and Practice — Regulation governing enrolment and practice — **Practice of Law — Solicitors firm — Elements of Advocacy.**

**Unit-II:** Seven lamps of advocacy — Advocates duties towards public, clients, court, and other advocates and legal aid ; **Bar Council Code of Ethics.**

**Unit-III:** Disciplinary proceedings — Professional misconduct — Disqualifications — Functions of Bar Council of India/State Bar Councils in dealing with the disciplinary proceedings — **Disciplinary Committees -- Powers and functions - Disqualification and removal from rolls.**

**Unit-IV:** Accountancy for Lawyers — Nature and functions of accounting —

**Record (30 marks):** Each student shall write 50 selected opinions of the Disciplinary Committees of Bar Councils and 10 major judgments of the Supreme Court of India in the Record. The Record shall be evaluated for 30marks by the teacher concerned. The Records of the students duly certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University before the commencement of the theory examinations.

**Viva- voce (10marks):** There shall be viva-voce examination on the above components. The Viva-voce Board consisting of (i) Principal of the College/the teacher concerned (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law, and (iii) an advocate with 10 years experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.

**Note: All the three components of the paper (written examination, submission of record and attendance in viva) shall be compulsory.**

#### **Suggested Reading**

- **"Professional Ethics in Accounting"** by Steven M. Mintz
- A comprehensive guide to the ethical principles and standards governing the accounting profession, with case studies and examples.
- **"Ethics in Accounting: A Decision-Making Approach"** by Gordon Klein
- Focuses on decision-making in accounting ethics, discussing real-world dilemmas and ethical frameworks.
- **"Ethical Obligations and Decision Making in Accounting"** by Steven M. Mintz and Roselyn E. Morris
- Explores ethical obligations for accountants, with an emphasis on ethical decision-making processes.
- **"Accounting Ethics"** by Rick B. M. G. (Gerrit) Gouwenberg
- A study of ethical issues in accounting, examining key moral theories and the role of ethics in accounting practices.
- **"The Ethics of Accounting and Finance: A Guide for Managers and Investors"** by J. Edward Ketz
- Discusses the role of ethics in financial decision-making, including the impact of accounting systems on corporate governance.

# Data Analysis-II BL 410A

**Sub. Code: BL410A**

**L -4, C-4**

## Course Objectives

- Learn advanced data cleaning and preprocessing techniques.
- Perform exploratory and statistical data analysis.
- Apply machine learning methods for data interpretation.
- Develop skills in Python for data manipulation and visualization.
- Analyze real-world data for informed decision-making.

## Unit 1: Data Pre-processing and Cleaning

- Handling Missing Data
- Outliers Detection and Treatment
- Data Transformation: Scaling, Normalization, and Encoding
- Data Integration and Reduction Techniques

## Unit 2: Advanced Data Visualization

- Exploratory Data Analysis (EDA) Techniques
- Visualization Tools: Matplotlib, Seaborn, Plotly
- Multidimensional Data Visualization
- Dashboards and Interactive Visualizations

## Unit 3: Statistical Analysis

- Inferential Statistics: Hypothesis Testing and Confidence Intervals
- Correlation and Regression Analysis
- Analysis of Variance (ANOVA)
- Non-parametric Statistical Methods

## Unit 4: Machine Learning Basics

- Introduction to Supervised and Unsupervised Learning
- Linear and Logistic Regression
- Clustering Techniques: K-Means, Hierarchical Clustering
- Decision Trees and Random Forests

## Unit 5: Data Analysis with Python

- Working with Pandas for Data Manipulation
- NumPy for Numerical Computation
- Introduction to Scikit-Learn for Machine Learning
- Case Studies: Applying Python to Real-World Data

## Suggested Readings

- **"Python for Data Analysis"** by Wes McKinney
- A comprehensive guide to using Python's Pandas library for data analysis.
- **"Practical Statistics for Data Scientists"** by Peter Bruce and Andrew Bruce
- Covers statistical methods and their application in data science.
- **"An Introduction to Statistical Learning"** by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
- A beginner-friendly introduction to statistical and machine learning techniques.
- **"Data Science from Scratch"** by Joel Grus
- Introduces fundamental concepts of data science with Python.
- **"Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow"** by Aurélien Géron
- Focuses on machine learning techniques with practical Python implementation.

## **Computer Programming-II BL410B**

**Sub.Code:BL410B**

**L -4, C-4**

### **Course Objectives**

- Learn advanced programming techniques and concepts.
- Implement and analyse data structures and algorithms.
- Apply object-oriented programming principles.
- Work with file handling and database integration.
- Develop problem-solving skills through practical projects.

### **Unit 1: Advanced Programming Concepts**

- Recursion: Principles, Examples, and Applications
- Pointers and Memory Management (For C/C++)
- Dynamic Memory Allocation
- Error Handling and Debugging Techniques

### **Unit 2: Data Structures**

- Arrays, Linked Lists, Stacks, and Queues
- Trees and Graphs: Basics and Traversals
- Hashing Techniques
- Searching and Sorting Algorithms

### **Unit 3: Object-Oriented Programming (OOP)**

- Principles of OOP: Encapsulation, Inheritance, Polymorphism, and Abstraction
- Class and Object Concepts
- Constructors, Destructors, and Method Overloading
- Advanced Concepts: Interfaces and Abstract Classes

### **Unit 4: File Handling and Data Storage**

- File Operations: Reading, Writing, and Updating Files
- Binary and Text Files
- Random Access File Processing
- Serialization and Deserialization

### **Unit 5: Introduction to Databases and SQL**

- Basics of Database Management Systems (DBMS)
- SQL Syntax: Create, Read, Update, and Delete Operations
- Integrating SQL with Programming Languages
- Practical Case Studies

# Python Programming-II

Sub.Code: BL410C

L -4, C-4

## Course Objectives

- Master advanced Python programming concepts and techniques.
- Work with complex data structures and file handling.
- Apply object-oriented programming for real-world applications.
- Integrate Python with databases and APIs.
- Develop, debug, and test robust Python applications.

## Unit 1: Advanced Python Concepts

- Iterators, Generators, and Decorators
- Context Managers (`with` Statement)
- Working with Dates and Times (`date` `time` module)
- Regular Expressions (`re` module)

## Unit 2: Advanced Data Structures

- Nested Data Structures: Lists of Lists, Dictionaries of Dictionaries
- Collections Module: `namedtuple`, `deque`, `Counter`, and `defaultdict`
- Advanced Operations with Sets and Dictionaries
- Working with JSON and XML Data

## Unit 3: Object-Oriented Programming in Python

- Advanced OOP Features: Method Overloading, Operator Overloading
- Class Methods and Static Methods
- Multiple Inheritance and MRO (Method Resolution Order)
- Abstract Classes and Interfaces (`abc` module)

## Unit 4: Exception Handling and Debugging

- Advanced Exception Handling: Custom Exceptions
- Debugging Techniques and Tools (`pdb` module)
- Logging for Application Debugging (`logging` module)
- Writing Robust Python Code

## Unit 5: Working with Files and Data

- Advanced File Handling: File Modes, Working with Binary Files
- CSV, Excel, and Other File Formats (`csv`, `openpyxl`)
- Data Persistence with SQLite (`sqlite3` module)
- Introduction to Data Analysis with Pandas

## Suggested Readings

- **"Fluent Python"** by Luciano Ramalho
- A comprehensive guide to advanced Python programming techniques and best practices.
- **"Python Cookbook"** by David Beazley and Brian K. Jones
- Provides practical solutions to common Python programming challenges, with a focus on advanced topics.
- **"Python 3 Object-Oriented Programming"** by Dusty Phillips
- Focuses on object-oriented design and advanced OOP concepts in Python.
- **"Effective Python: 59 Specific Ways to Write Better Python"** by Brett Slatkin
- Offers actionable insights and best practices for writing efficient and maintainable Python code.
- **"Automate the Boring Stuff with Python"** by Al Sweigart
- While it's an introductory text, it provides useful real-world examples for automating tasks with Python.
- **"Python for Data Analysis"** by Wes McKinney
- A great resource for learning data analysis with Python, focusing on libraries like Pandas and NumPy.

## **Leadership and Management II(BL 410D)**

**Sub.Code:BL410D**

**L -4, C-4**

### **Course Objectives**

- Understand key theories and concepts of leadership and management.
- Develop personal leadership skills and management strategies.
- Analyze organizational structures and dynamics.
- Apply leadership and management principles in real-world scenarios.

### **Unit 1: Regional Development and Disparities**

- Factors influencing regional economic development
- Economic disparities between regions
- Policies for regional development and economic equity

### **Unit 2: Industry and Manufacturing Geography**

- The spatial distribution of industries
- Industrial clusters and agglomeration economies
- The role of technology in reshaping industrial landscapes

### **Unit 3: Agriculture and Food Systems**

- The geography of agriculture: factors influencing agricultural production
- Food systems and global supply chains
- Sustainable agriculture and food security

### **Unit 4: Services and the Knowledge Economy**

- The growth of the service sector in the economy



**Suggested Readings:**

1. "The Five Dysfunctions of a Team: A Leadership Fable" by Patrick Lencioni
2. A practical guide on building effective teams and addressing common team challenges.
3. "Leaders Eat Last: Why Some Teams Pull Together and Others Don't" by Simon Sinek
4. Discusses the importance of trust and cooperation in effective leadership.
5. "Leadership and Self-Deception: Getting Out of the Box" by The Arbinger Institute

# **SEMESTERIX**

**Law of Taxation**

**Sub. Code: BL 501**

**L4, C4**

**Course Objectives**

- The Law of Taxation course aims to provide students with a comprehensive understanding of the fundamental principles, concepts, and laws governing taxation. The course explores various types of taxes, the legal framework for tax administration, and the rights and obligations of taxpayers and the state.
- Students will gain the knowledge necessary to analyze, interpret, and apply tax laws, understand tax compliance, and engage in the practical application of tax law in various legal contexts.
- The course is designed to help students develop critical thinking skills regarding the tax system, enhance their understanding of tax policy, and prepare them for careers in taxation law, corporate tax advisory, or public finance.
- Familiarize students with the structure and types of taxes in different jurisdictions, including direct taxes (e.g., income tax, corporate tax) and indirect taxes (e.g., sales tax, VAT).

**Unit – I: Introduction**

a. Definitions

b. Basis of Income

- Charge of Income Tax
- Scope of total Income
- Residential status of an assessee
- Dividend Income
- Income deemed to accrue or arise in India
- Foreign income and its taxability

**Unit – II: Incomes which do not form part of total Income**

a. Incomes not included in total income

b. Special provision in respect of newly established industrial undertaking in free trade zones

c. Special provision in respect of newly established hundred per cent export oriented undertaking

d. Income from property held for charitable or religious purpose

e. Income of trusts or institutions from contributions

f. Conditions as to registration of trusts, etc.

g. Section 11 not to apply in certain cases

h. Special provision relating to incomes of political parties

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### Unit – III: Heads of Income

- a. Salaries
- b. Income from house property
- c. Profits and gains of business or profession
- d. Capital gains
- e. Income from other sources

### Unit – IV: Tax Authorities

#### Suggested Readings

##### Text books:

1. Dinesh Ahuja and Ravi Gupta, Systematic approach to Income Tax, (Latest Edition)
2. Singhania, Student Guide to Income Tax, Taxmann (Latest Edition).

##### References:

1. N.A. Palkwllah's Income Tax Act (Two Volume)
2. Iyer's Income Tax Act
3. Chaturvedi's Direct Tax Act (Three Volume)

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**LAW OF PROPERTY**

**Sub. Code: BL 503**

**L – 4, C – 4.**

**Course Objectives**

- I. The students will have a solid understanding of the legal principles surrounding property rights, ownership, transfer, and dispute resolution.
- II. They will be equipped to navigate the legal complexities of property transactions, including real estate deals, leasing arrangements, inheritance issues, and intellectual property.
- III. The students will be able to critically analyze property laws in the context of social justice, economic development, and legal protections for individuals and communities.
- IV. This knowledge will prepare them for careers in property law, real estate law, and related fields, enabling them to address both individual and societal property issues effectively.

**Unit-I:**

**Meaning** and concept of property — Kinds of property — Transfer of property — Transferable and non-transferable property — Who can transfer — Operation of transfer — Mode of transfer — Conditional transfer — Void and unlawful conditions — Condition precedent and condition subsequent — **Vested and contingent interest — Transfer to unborn person**

**Unit-II:**

Doctrine of Election — Covenants — Transfer by ostensible owner — Doctrine of Feeding the Grant by Estoppel — Doctrine of Lis Pendens — **Fraudulent Transfer — Doctrine of Part-performance.**

**Unit-III:**

Sale - Essential features — Mode of Sale — Rights and liabilities of parties. Mortgage - Kinds of Mortgages - Rights and liabilities of mortgagor and mortgagee — **Marshalling and Contribution — Charges.**

**Unit-IV:**

Lease — Essential features — Kinds of leases — Rights and liabilities of lessor and lessee — Termination of lease — forfeiture — Exchange — Gifts — **Different types of gifts — Registration of Gifts — Transfer of Actionable Claims.**

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### **Suggested Readings:**

1. Mulla: Transfer of Property, Butterworths Publications.
2. Subba Rao GCV: Commentaries on the Transfer of Property Act.
3. KrishnaMenon: Law of Property.
4. UpadhyasCommon Matrix of Transfer of Property.

**ENVIRONMENTAL LAWS**

**Sub. Code: BL 505**

**L – 4, C – 4.**

**Course Objectives**

- The Environmental Law course aims to provide students with a thorough understanding of the legal frameworks, principles, and policies designed to protect the environment and regulate human impact on natural resources.
- The course covers both domestic and international environmental law, with a focus on the role of law in promoting sustainable development and addressing key issues such as pollution control, biodiversity conservation, climate change, natural resource management, and environmental justice.
- The objective is to equip students with the legal knowledge and analytical skills needed to navigate the complexities of environmental governance, as well as to promote awareness of the challenges of balancing economic development with environmental protection.
- Students will learn to interpret and apply environmental laws and policies and to critically assess their effectiveness in addressing contemporary environmental issues.

**Unit-I**

The meaning and definition of environment – Ecology - Ecosystems-Biosphere - Biomes - Ozone depletion - Global Warming - Climatic changes - Need for the preservation, conservation and protection of environment - Ancient Indian approach to environment- Environmental degradation and pollution - Kinds, causes and effects of pollution.

**Unit-II**

Common Law remedies against pollution - trespass, negligence, and theories of Strict Liability & Absolute Liability - Relevant provisions of I.P.C. and Cr.P.C. and C.P.C., for the abatement of public nuisance in pollution cases - Remedies under Specific Relief Act - Reliefs against smoke and noise - Noise Pollution.

**Unit-III**

The law relating to the preservation, conservation and protection of forests, wild life and endangered species, marine life, coastal ecosystems and lakes etc. - Prevention of cruelty towards animals - The law relating to prevention and control of water pollution - Air Pollution - Environment pollution control mechanism - Law relating to environment protection – National Environmental Tribunal and National Environmental Appellate Authority.

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### Unit-IV:

Art. 48A and Art. 51A(g) of the Constitution of India - Right to wholesome environment - Right to development - Restriction on freedom of trade, profession, occupation for the protection of environment - Immunity of Environment legislation from judicial scrutiny(Art.31C) - Legislative powers of the Centre and State Government - Writ jurisdiction - Role of Indian Judiciary in the evolution of environmental jurisprudence.

### Unit-V

International Environmental Regime - Transactional Pollution - State Liability - Customary International Law - Liability of Multinational Corporations/Companies - Stockholm Declaration on Human Environment, 1972 .

### Suggested Readings:

1. Paras Diwan: Studies on Environmental Cases.
  2. S.N. Jain (ed.): Pollution Control and the Law.
  3. Armin Rosencranz and Shyam Divan: Environmental Law and Policy in India.
  4. A. Agarwal (ed.): Legal Control of Environmental Pollution
  5. Chetan Singh Mehta: Environmental Protection and Law
  6. V.K. Krishna Iyer: Environment Pollution and Law
  7. Shah : Environmental Law
  8. Paras Diwan : Environmental Law and Policy in India, 1991
  9. Dr. N. Maheshwara Swamy, Environmental Law, Asia Law House, Hyderabad.
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**Public Relations BL 505A**

**Sub. Code: BL 505A**

**L – 4, C – 4.**

**Course Objectives:**

- To provide students with an understanding of the theory and practice of public relations.
- To develop skills in strategic communication, media relations, and crisis management.
- To introduce students to PR tools and techniques used in crafting messages for different audiences.
- To enable students to understand and apply PR ethics and professional standards.
- To examine how PR integrates with marketing, advertising, and other aspects of communication within organizations.

**Unit 1: Introduction to Public Relations**

**1. Understanding Public Relations:**

- Definition of PR and its importance in organizational communication.
- The evolution and history of public relations.
- Key functions of PR: Media relations, event planning, crisis management, and community outreach.

**2. The Role of PR in Modern Organizations:**

- PR as a tool for brand building and reputation management.
- The relationship between PR and other communication fields like advertising and marketing.
- PR in non-profit, government, and corporate sectors.

**3. Key PR Theories and Models:**

- Press Agency/Publicity Model, Public Information Model, Two-Way Asymmetrical Model, and Two-Way Symmetrical Model.
- Models of communication in PR: Shannon-Weaver, Berlo's SMCR Model, etc.

**Unit 2: Media Relations and Communication Channels**

**1. Working with the Media:**

- The role of media in PR: Print, broadcast, and digital media.
- Building and maintaining relationships with journalists and media outlets.
- Writing press releases, media kits, and pitch letters.
- Conducting interviews and handling media inquiries.

**2. Communication Channels in PR:**

- Owned, earned, and paid media.
- Digital PR: Social media, blogs, podcasts, and websites.

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- Importance of storytelling in PR: Crafting compelling narratives for various audiences.

### 3. **Media Ethics and Laws:**

- Ethical issues in media relations: Transparency, truth, and accuracy.
- Legal aspects of PR: Copyright, defamation, privacy laws.
- The role of public relations professionals in upholding ethical media practices.

## **Unit 3: PR Campaigns and Strategic Communication**

### 1. **Planning and Implementing PR Campaigns:**

- The process of developing a PR campaign: Research, planning, execution, and evaluation.
- Setting objectives and defining target audiences.
- Creating PR materials: Newsletters, speeches, brochures, and websites.

### 2. **Tactics and Tools in PR:**

- Press conferences, media interviews, and special events.
- Social media and digital tools: Content creation, blogging, and influencer partnerships.
- Using measurement and analytics to track campaign success.

### 3. **Evaluating PR Campaign Effectiveness:**

- Techniques for evaluating PR efforts: Media coverage, public perception, surveys.
- ROI in public relations: Quantifying impact and success.
- Case studies of successful and failed PR campaigns.

## **Unit 4: Crisis Communication and Reputation Management**

### 1. **Understanding Crisis Communication:**

- Definition and types of crises: Natural disasters, scandals, product failures, etc.
- The role of PR in crisis management: Anticipation, response, and recovery.
- The crisis communication process: Message creation, media management, and stakeholder engagement.

### 2. **Developing Crisis Communication Plans:**

- Importance of a crisis communication strategy and a crisis communication team.
- Key principles in handling crises: Honesty, timeliness, transparency, and consistency.
- Using media and social media effectively during a crisis.

### 3. **Reputation Management and Brand Protection:**

- The significance of reputation in public relations.
- Strategies for managing and maintaining a positive public image.
- Case studies of organizations that effectively managed their reputation.

## Unit 5: PR in the Digital Age

### 1. Digital PR and Social Media:

- The rise of digital PR: The impact of blogs, social media, and podcasts.
- Creating content for digital platforms: Best practices for blogs, Twitter, Instagram, and Facebook.
- Social media engagement: Building online communities and responding to online criticism.

### 2. Online Reputation and Influencer Marketing:

- The role of influencers and bloggers in modern PR.
- Managing online reviews and user-generated content.
- The importance of SEO and content marketing in PR efforts.

### 3. Ethics and Legal Considerations in Digital PR:

- Ethical issues in social media communication: Transparency, privacy, and disclosure.
- Legal aspects: Copyright, defamation, and social media laws.

## Suggested Books:

- *Public Relations: Strategies and Tactics* by Dennis L. Wilcox and Glen T. Cameron.
- *The New Rules of Marketing & PR* by David Meerman Scott.
- *Crisis Communications: A Casebook Approach* by Kathleen Fearn-Banks.
- *Public Relations: Strategies and Tactics* by Dennis L. Wilcox and Glen T. Cameron.
- *Public Relations: Strategies and Tactics* by Dennis L. Wilcox and Glen T. Cameron.
- *The New Rules of Marketing & PR* by David Meerman Scott.
- *Ethics in Public Relations: Responsible Advocacy* by Patricia J. Parsons.
- *Public Relations Ethics: Theory and Practice* by M. J. Bowen.
- *Public Relations Campaigns: An Integrated Approach* by J. K. Grunig.
- *Effective Public Relations* by Scott M. Cutlip and Allen H. Center
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**Global Politics BL 505B**

**Sub. Code: BL 505**

**L – 4, C – 4.**

**Course Objectives:**

- To introduce students to the fundamental concepts and theories in global politics.
- To examine global political structures, power dynamics, and governance mechanisms.
- To provide an understanding of contemporary issues such as conflict, security, development, and human rights.
- To analyze the role of international institutions, states, and non-state actors in shaping global politics.
- To foster critical thinking about the impact of globalization and international political change.

**Unit 1: Introduction to Global Politics**

**1. Understanding Global Politics:**

- Definition and scope of global politics.
- Theories and approaches in international relations: Realism, Liberalism, Constructivism, Marxism.
- The concept of the state and the role of sovereignty in global politics.

**2. Key Actors in Global Politics:**

- The state as a central actor in international relations.
- Non-state actors: International organizations, multinational corporations, civil society, NGOs, and individuals.
- Transnational issues and the role of non-state actors in addressing them.

**3. Globalization:**

- Definition and key features of globalization.
- The impact of globalization on politics, economics, and culture.
- Debates about the benefits and drawbacks of globalization.

**Unit 2: Theories and Approaches in International Relations**

**1. Realism and Liberalism:**

- Key principles of Realism: Power, national interest, and anarchy.
- Key principles of Liberalism: Cooperation, institutions, and interdependence.
- Comparing Realism and Liberalism in understanding state behavior.

**2. Constructivism and Marxism:**

- Constructivism: The role of ideas, identities, and norms in shaping global politics.

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- Marxism and Critical Theory: Understanding global politics through economic structures and class struggle.
- Feminist and postcolonial approaches to global politics.
- 3. **Post-Colonialism and Global Governance:**
  - The legacy of colonialism in shaping global politics.
  - Global governance and the role of institutions in maintaining order.

### Unit 3: Global Governance and International Institutions

1. **The United Nations and Global Governance:**
  - History and structure of the United Nations.
  - The role of the UN in peacekeeping, human rights, and development.
  - The Security Council and its decision-making process.
2. **Regional Organizations and International Law:**
  - The European Union, African Union, ASEAN, and other regional organizations.
  - International law and its role in global politics: Human rights law, international humanitarian law, and the International Criminal Court.
3. **International Financial Institutions:**
  - The International Monetary Fund (IMF), World Bank, and World Trade Organization (WTO).
  - The role of these institutions in global economic governance.
  - Criticisms and challenges facing these institutions.

### Unit 4: Security and Conflict in Global Politics

1. **Theories of Security:**
  - Traditional security vs. human security.
  - The role of military power in global politics.
  - The security dilemma and arms races.
2. **Global Conflict and War:**
  - Causes of conflict: Ideology, resources, territorial disputes, and ethnic tensions.
  - The role of international institutions in conflict resolution.
  - Case studies of recent conflicts (e.g., Syria, Ukraine, Afghanistan).
3. **Terrorism and Non-Traditional Security Threats:**
  - The rise of global terrorism and its impact on international politics.
  - Non-state actors in global conflict.
  - Cybersecurity and environmental threats as emerging security challenges.

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## Unit 5: Global Political Economy

1. **Theories of International Political Economy (IPE):**
  - Liberalism, Mercantilism, and Structuralism in understanding the global economy.
  - The role of multinational corporations in global economic politics.
  - The relationship between politics and economics in a globalized world.
2. **Global Trade and Development:**
  - The World Trade Organization (WTO) and global trade agreements.
  - Global poverty, inequality, and the role of development aid.
  - Sustainable development and the United Nations' SDGs (Sustainable Development Goals).
3. **Global Financial Crises and the Role of Global Institutions:**
  - The 2008 financial crisis and its global impacts.
  - The role of international financial institutions (IMF, World Bank) in global economic stability.
  - Issues of debt, austerity, and development in the global South.

## Unit 6: Human Rights and Global Justice

1. **The Concept of Human Rights:**
  - Universalism vs. relativism in human rights.
  - The role of international organizations in human rights protection (e.g., UN, NGOs).
  - Case studies: Human rights violations in different regions (e.g., Myanmar, China, Africa).
2. **Global Justice and Ethics:**
  - Theories of global justice: Cosmopolitanism, communitarianism, and global citizenship.
  - Ethical challenges in global politics: Intervention, sovereignty, and the "responsibility to protect."
  - Debates on global inequality and justice.
3. **Humanitarian Intervention and Peacekeeping:**
  - The ethical and legal dimensions of humanitarian intervention.
  - The role of international organizations in peacekeeping and post-conflict reconstruction.
  - Case studies: Rwanda, Bosnia, Libya.

## Suggested Books:

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- *The Globalization of World Politics* by John Baylis, Steve Smith, and Patricia Owens.
- *Global Environmental Politics* by Pamela S. Chasek, David L. Downie, and Janet Welsh Brown.
  
- *Global Politics* by Andrew Heywood.
- *The Globalization of World Politics* by John Baylis, Steve Smith, and Patricia Owens.
- *International Relations* by Joshua S. Goldstein.
- *International Human Rights: Law, Policy, and Process* by Rhona K. M. Smith.
- *The Ethics of Global Development* by David Held.
- *Security Studies: An Introduction* by Paul D. Williams.
- *The Globalization of World Politics* by John Baylis, Steve Smith, and Patricia Owens.

**Introduction to Sociology BL 505C**

**Sub. Code: BL 505C**

**L – 4, C – 4.**

**Course Objectives:**

- To provide students with an understanding of the key concepts, theories, and perspectives in sociology.
- To explore the structure and functions of social institutions and their impact on individual behavior.
- To examine how socialization, culture, and identity shape social interactions.
- To develop critical thinking and analytical skills regarding contemporary social issues.
- To familiarize students with basic research methods in sociology.

**Unit 1: Introduction to Sociology and Sociological Imagination**

**1. Sociology**

- Definition and scope of sociology.
- The significance of sociology in understanding human behavior and society.
- Sociology as a discipline: Interdisciplinary connections with anthropology, psychology, economics, and political science.

**2. The Sociological Imagination:**

- C. Wright Mills' concept of the sociological imagination.
- Understanding the relationship between individual experiences and larger social forces.
- The personal troubles vs. public issues framework.

**3. Sociological Perspectives:**

- Structural Functionalism: Key ideas and major theorists (e.g., Emile Durkheim, Talcott Parsons).
- Conflict Theory: Key ideas and major theorists (e.g., Karl Marx, Max Weber).
- Symbolic Interactionism: Key ideas and major theorists (e.g., George Herbert Mead, Erving Goffman).



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## Unit 2: Social Structure and Socialization

1. **The Structure of Society:**
  - Social structure: Role, status, norms, and values.
  - Social institutions: Family, education, religion, economy, and government.
  - Social stratification and inequality: Class, caste, race, and gender.
2. **Socialization:**
  - Definition and importance of socialization.
  - The process of socialization: Agents of socialization (family, peers, schools, media).
  - Socialization across the life course: Childhood, adolescence, adulthood, and old age.
  - Theories of socialization: Freud, Piaget, Cooley, Mead.
3. **Culture and Society:**
  - Culture and its components: Material and non-material culture.
  - Cultural norms, values, and symbols.
  - Cultural diversity and multiculturalism.
  - Ethnocentrism and cultural relativism.

## Unit 3: Social Institutions

1. **Family:**
  - Definition and functions of the family as a social institution.
  - Types of family structures: Nuclear, extended, single-parent, etc.
  - Changes in family patterns: Marriage, divorce, parenting.
  - Family and socialization.
2. **Education:**
  - The role of education in society: Socialization, cultural transmission, social control.
  - Education and inequality: Class, gender, race, and educational outcomes.
  - Theories of education: Functionalism, Conflict Theory, and Symbolic Interactionism.
3. **Religion:**
  - The role of religion in society.
  - Different types of religion: Monotheism, polytheism, animism, etc.
  - Theories of religion: Durkheim, Marx, Weber.
  - Secularization and the role of religion in modern society.

## Unit 4: Social Change and Social Movements

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### 1. **Social Change:**

- Definition and types of social change: Evolution, revolution, reform.
- Causes of social change: Technological advancements, social movements, economic and political factors.
- Theories of social change: Evolutionary, cyclical, and conflict theories.

### 2. **Social Movements:**

- Definition and characteristics of social movements.
- Types of social movements: Reform movements, revolutionary movements, resistance movements, and expressive movements.
- Major social movements in history: Civil rights movement, feminist movement, environmental movement.

### 3. **Globalization and Social Change:**

- The impact of globalization on society: Economic, political, and cultural changes.
- Social consequences of globalization: Global inequality, migration, cultural homogenization.
- Technology, the internet, and social media as agents of social change.

## **Unit 5: Social Problems and Issues**

### 1. **Defining Social Problems:**

- Characteristics of social problems: Social deviance, crime, inequality, poverty.
- The role of sociological perspective in understanding social problems.
- The social construction of social problems.

### 2. **Contemporary Social Issues:**

- Poverty, unemployment, and economic inequality.
- Crime and deviance: Theories of crime (strain theory, differential association theory, labeling theory).
- Gender inequality: Women's rights, sexual harassment, gender roles.
- Racism, ethnic conflict, and discrimination.
- Environmental degradation and climate change.

### 3. **Addressing Social Problems:**

- Social policy and the role of the state in addressing social issues.
- The role of non-governmental organizations (NGOs) and civil society in addressing social problems.
- Social reforms and the role of social movements in effecting change.

## Unit 6: Research Methods in Sociology

### 1. Introduction to Sociological Research:

- The importance of research in sociology.
- Types of research methods: Quantitative and qualitative research.
- Research process: Problem formulation, hypothesis testing, data collection, and analysis.

### 2. Quantitative and Qualitative Research:

- Surveys, experiments, and statistical analysis.
- Participant observation, ethnography, and case studies.
- Strengths and limitations of different research methods.

### 3. Ethics in Sociological Research:

- Ethical considerations in sociological research: Consent, confidentiality, and researcher bias.
- The role of ethics committees and institutional review boards (IRBs).

## Suggested Books:

- *Sociology: A Global Introduction* by John J. Macionis and Ken Plummer.
- *Introduction to Sociology* by Anthony Giddens.
- *Social Problems* by John J. Macionis.
- *Sociological Research: Methods and Techniques* by Ranjit Kumar.
- *The Practice of Social Research* by Earl Babbie.
- *Social Problems* by John J. Macionis.
- *The Sociology of Social Problems* by Joel Best.
- *Sociology: A Global Introduction* by John J. Macionis and Ken Plummer.
- *The Sociology of Religion* by Max Weber.

**LAW OF BANKING AND NEGOTIABLE INSTRUMENTS**

**Sub. Code: BL 507**

**L -4, C -4**

**Course objectives**

- By the end of the Law of Banking and Negotiable Instruments course, students will have acquired a comprehensive understanding of the legal principles governing banking operations, negotiable instruments, and financial transactions.
- They will be equipped to interpret, apply, and advise on banking laws in areas such as customer-banker relations, negotiable instruments transactions, dispute resolution, and regulatory compliance in the banking sector.
- The course will also prepare students for careers in banking law, corporate law, financial regulation, and legal practice related to financial institutions.
- Study the increasing emphasis on sustainable banking, green finance, and the role of banks in promoting social responsibility and environmental sustainability.

**Unit-I:**

History of the Banking Regulation Act — Salient features — Banking Business and its importance in modern times.

**Unit-II:**

Relationship between Banker and Customer — Debtor and Creditor Relationship — Fiduciary Relationship — Trustee and Beneficiary — Principal and Agent — Bail and Bailee — Guarantor, etc.

**Unit-III:**

Cheques — Crossed Cheques — Account Payee — Banker's Drafts — Dividend Warrants — Postal order and money orders — Travelers cheques and circular notes — Negotiable instruments and deemed negotiable instruments — Salient features of Negotiable Instruments Act.

**Unit-IV:**

The Paying Banker — Statutory protection to Bankers — Forgeries—Collecting Banker - Statutory protection.

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### **Suggested Readings:**

1. Tannan: Banking Law & Practice in India, 18th Edn., Orient Law House, New Delhi.
2. Avtar Singh: Negotiable Instruments, 3rd Edn., Eastern Book Company, Lucknow, 1997.
3. P.N.Varshney: Banking Law & Practice, 17th Edn. Sultan Chand & Sons, New Delhi.
4. Taxman: Law of Banking, India Law House

**DRAFTING, PLEADINGS AND CONVEYANCING**

**Sub. Code: BL 509**

**L -1,P-6, C -4**

**Course Objectives**

- Students will have acquired practical skills in legal writing and drafting essential for effective representation in both litigation and transactional legal work.
- They will be able to draft pleadings, court applications, legal contracts, conveyances, and other important legal documents with precision, clarity, and adherence to legal standards.
- This course will prepare students for careers as legal drafters, litigation lawyers, conveyancing solicitors, and transactional attorneys, equipping them with the skills to address a wide range of legal needs in real-world practice.
- Participate in simulated exercises for drafting real-world legal documents and pleadings, based on case studies and practical scenarios.

**Unit-I**

**Drafting:** General Principles of Drafting and relevant Substantive Rules shall be taught.

**Unit-II**

**Pleadings:** (i) Civil—Plaint, Written Statement, Interlocutory Application, Original Petition, Affidavit, Execution Petition, Memorandum of Appeal and Revision.

(ii) Petition under Article 226 and 32 of the Constitution of India - Drafting of Writ Petition and PIL Petition.

(iii) Criminal— Complaint, Criminal Miscellaneous Petition, Bail Application, Memorandum of Appeal and Revision.

**Unit-III**

**Conveyancing:** Sale Deed, Mortgage Deed, Lease Deed, Gift Deed, Promissory Note,

**Practical Exercises**

Apart from teaching the relevant law, the course includes not less than 15 (fifteen) practical exercises in drafting of pleadings carrying a total of 45 marks (3 marks for each) and 15 (fifteen) exercises in conveyancing carrying another 45 marks (3 marks for each exercise) and remaining 10 marks for viva-voce.

These 30 exercises shall be recorded. Each student shall be served with different problems for the purpose of exercise. These exercises shall be assessed and marks may be allotted.

These exercises shall be evaluated by a common committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, O.U.; and (iii) an

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Advocate with 10 years' experience at the Bar. The same committee will also conduct viva-voce on the above concepts. The proceedings of the viva-voce shall be recorded.

### **Note:**

- 1. Attendance of the students for viva-voce shall be compulsory.**
- 2. The above records certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University for Further Verification**

### **Suggested Readings:**

1. R.N. Chaturvedi : Pleadings and Conveyancing, Central Law Publications.
2. De Souza : Conveyancing, Eastern Law House.
3. Tiwari : Drafting, Pleading and Conveyancing, Central Law Agency.
4. Mogha: Indian Conveyancer, Eastern Law House.
5. Mogha: Law of Pleadings in India, Eastern Law House.
6. Shiv Gopal: Conveyancing, Precedents and Forms, Eastern Book Company

**Body Language-I BL 509A**

**Sub. Code: BL 509A**

**L -1,P-6, C -4**

**Course Objectives:**

- To introduce students to the concept and importance of body language.
- To understand the different types of non-verbal communication, including gestures, facial expressions, posture, and eye contact.
- To learn how body language affects interpersonal communication and how to use it effectively in various social and professional situations.
- To develop skills for interpreting body language in diverse settings.
- To enhance personal and professional communication through better understanding of non-verbal cues.

**Unit 1: Introduction to Body Language**

- 1. What is Body Language?**
  - Definition and significance of body language.
  - The role of non-verbal communication in human interactions.
  - Differences between verbal and non-verbal communication.
  - History and development of body language studies.
- 2. Types of Non-Verbal Communication:**
  - Kinesics (gestures, posture, facial expressions).
  - Proxemics (use of space).
  - Haptics (touch).
  - Chronemics (use of time).
  - Paralanguage (tone, pitch, pace of speech).
  - Eye contact and its significance.
- 3. Understanding the Impact of Body Language:**
  - The relationship between body language and emotions.
  - How body language influences perceptions, trust, and relationships.
  - The role of body language in different cultures.
  - Misinterpretations of body language.



## Unit 2: Understanding Facial Expressions and Gestures

### 1. Facial Expressions:

- The six basic facial expressions (happiness, sadness, fear, anger, surprise, and disgust).
- Microexpressions: Understanding fleeting facial expressions.
- The role of facial expressions in emotional communication.
- How to recognize and respond to facial cues.

### 2. Gestures and Posture:

- Types of gestures: Emblems, illustrators, affect displays, regulators, and adaptors.
- Understanding the meaning of common gestures.
- The significance of posture in body language.
- How posture conveys confidence, openness, or defensiveness.

### 3. Cultural Variations in Facial Expressions and Gestures:

- Differences in body language across cultures.
- How to avoid cultural misunderstandings in cross-cultural communication.
- The universality and variability of facial expressions and gestures.

## Unit 3: Eye Contact and Proxemics

### 1. The Power of Eye Contact:

- The importance of eye contact in communication.
- Eye contact and its relationship with confidence, interest, and trust.
- How to interpret eye movement and gaze.
- Cross-cultural differences in the use of eye contact.

### 2. Proxemics:

- Understanding personal space: Intimate, personal, social, and public distances.
- How to use space effectively in social and professional contexts.
- The impact of crowding and proximity in communication.
- Territoriality and how body language signals ownership of space.

### 3. Body Language and Relationship Building:

- How body language affects relationships and emotional connections.
- Using non-verbal communication to enhance personal relationships.
- The role of body language in conflict resolution and negotiation.

## Unit 4: Interpreting and Using Body Language Effectively

### 1. Reading Body Language:

- Identifying congruence between verbal and non-verbal communication.
- Techniques for interpreting body language in others.
- How to detect lies or deception through body language.
- The role of intuition in reading body language.

### 2. Using Body Language to Enhance Communication:

- How to use body language to convey authority, confidence, and openness.
- Non-verbal techniques for effective public speaking and presentations.
- How to use body language in interviews and professional settings.
- The role of mirroring and matching in building rapport.

### 3. Body Language in Social Situations:

- Understanding body language in social interactions (e.g., dating, friendships, networking).
- Reading body language cues in group dynamics.
- Strategies for adjusting your body language in response to others.

## Unit 5: Body Language in Professional Settings

### 1. Body Language in the Workplace:

- How body language affects professional relationships.
- Using body language in job interviews and meetings.
- Understanding body language cues in leadership and team interactions.
- How to convey professionalism and confidence non-verbally.

### 2. Non-Verbal Communication in Negotiations:

- The role of body language in negotiations and conflict resolution.
- How to recognize power dynamics through body language.
- Understanding gestures, facial expressions, and posture during negotiations.

### 3. Public Speaking and Body Language:

- The importance of non-verbal communication in public speaking.
- Techniques for improving posture, gesture, and facial expression during speeches.
- Handling nervousness and projecting confidence through body language.

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### **Suggested Books:**

- *The Definitive Book of Body Language* by Allan and Barbara Pease.
- *Body Language: How to Read Others' Thoughts by Their Gestures* by Allan Pease.
- *The Power of Body Language* by Tonya Reiman.
- *What Every BODY is Saying* by Joe Navarro.
- *The Body Language of Leadership* by Carol Kinsey Goman.
- *Body Language at Work* by Peter Clayton.
- *What Every BODY is Saying* by Joe Navarro.
- *The Body Language of Love* by Allan Pease.
- *Emotions Revealed: Recognizing Faces and Feelings to Improve Communication and Emotional Life* by Paul Ekman.
- *Body Language for Dummies* by Elizabeth Kuhnke.

**Presentation Skills-I BL 509B**

**Sub. Code: BL 509B**

**L -1,P-6, C -4**

**Course Objectives:**

- To equip students with the necessary skills to plan and deliver effective presentations.
- To develop students' ability to engage, inform, and persuade audiences.
- To improve public speaking and presentation techniques through practical exercises.
- To teach students how to use visual aids and other presentation tools effectively.
- To enhance students' confidence in delivering presentations in various professional and academic contexts.

**Unit 1: Introduction to Presentation Skills**

**1. What is a Presentation?**

- Definition and importance of presentations in academic, professional, and social settings.
- Types of presentations: Informative, persuasive, and entertaining.
- Characteristics of an effective presentation.

**2. Understanding Your Audience:**

- The importance of audience analysis.
- Identifying audience expectations and tailoring presentations accordingly.
- Adapting your presentation style for different audience types (e.g., formal, informal, mixed).

**3. Planning and Organizing a Presentation:**

- The steps in planning a presentation.
- Setting objectives and outcomes.
- Structuring the presentation: Introduction, body, conclusion.
- Creating a compelling opening and closing.
- Managing time effectively during a presentation.

**Unit 2: Effective Communication Techniques**

**1. Verbal Communication:**

- Voice modulation: Tone, pitch, speed, and clarity.
- Speaking with confidence and authority.
- Avoiding filler words ("um," "ah," "like").
- Using pauses for emphasis and effect.

**2. Non-Verbal Communication:**

- The importance of body language in presentations.

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- Eye contact: Building trust and engagement.
  - Posture and gesture: How to convey confidence.
  - Facial expressions and their role in communication.
3. **Building Confidence and Reducing Anxiety:**
- Techniques for overcoming stage fright and nervousness.
  - Relaxation exercises before and during the presentation.
  - Power poses and breathing techniques to boost confidence.

### Unit 3: Designing Visual Aids and Supporting Materials

1. **Using Visual Aids:**
- Types of visual aids: Slides, charts, videos, and physical props.
  - Principles of effective slide design: Simplicity, readability, and visual appeal.
  - Do's and don'ts of PowerPoint presentations.
2. **Creating Engaging and Informative Slides:**
- Organizing content visually.
  - Choosing the right visuals: Graphics, images, and diagrams.
  - The role of text in slides: Keeping it brief and clear.
  - Avoiding information overload.
3. **Using Technology in Presentations:**
- Introduction to presentation software (e.g., Microsoft PowerPoint, Google Slides).
  - Using multimedia elements (audio, video) effectively.
  - Incorporating interactive elements (polls, questions, audience participation).

### Unit 4: Delivering a Presentation

1. **Effective Delivery Techniques:**
- The importance of storytelling and structure in maintaining audience engagement.
  - How to present with energy and enthusiasm.
  - Maintaining control of the room: Use of voice, pacing, and movement.
2. **Engaging the Audience:**
- Creating audience rapport: Humor, anecdotes, and questions.
  - Techniques for keeping the audience's attention.
  - Encouraging participation and interaction.
3. **Handling Questions and Feedback:**
- Dealing with questions during and after the presentation.
  - Managing difficult or challenging questions.
  - Techniques for staying calm and composed when answering questions.
  - How to incorporate audience feedback into future presentations.

### Unit 5: Practicing and Refining Your Presentation

#### 1. Rehearsal Techniques:

- The importance of practice: Timing, fluency, and confidence.
- How to rehearse effectively: Alone, with peers, or in front of a mirror.
- Practicing with visual aids and technology.
- Recording your presentation and evaluating it.

#### 2. Self-Evaluation and Peer Feedback:

- Using self-assessment to identify strengths and areas for improvement.
- Giving and receiving constructive feedback.
- Continuous improvement and learning from experience.

#### 3. Final Presentation:

- Students will prepare and deliver a final presentation, demonstrating the skills they have learned throughout the course.
- Emphasis on content, delivery, visual aids, and audience engagement.

### Suggested Books:

- *Presentation Skills 201: How to Take It to the Next Level as a Speaker* by William R. Steele.
- *The Art of Public Speaking* by Stephen E. Lucas.
- *Slide:ology: The Art and Science of Creating Great Presentations* by Nancy Duarte.
- *TED Talks: The Official TED Guide to Public Speaking* by Chris Anderson.
- *Confessions of a Public Speaker* by Scott Berkun.
- *The Art of Public Speaking* by Dale Carnegie.
- *TED Talks: The Official TED Guide to Public Speaking* by Chris Anderson.
- *Resonate: Present Visual Stories that Transform Audiences* by Nancy Duarte.

**Effective Writing Skills-I BL 509C**

**Sub. Code: BL 509C**

**L -1,P-6, C -4**

**Course Objectives:**

- To enhance students' writing skills for academic and professional purposes.
- To improve students' ability to organize their thoughts and present them in a structured manner.
- To develop a strong understanding of the rules of grammar, punctuation, and sentence structure.
- To introduce students to various types of writing, such as essays, reports, and reflective writing.
- To help students develop effective writing strategies, including revision and proofreading techniques.

**Unit 1: Introduction to Writing Skills**

**1. The Importance of Writing:**

- Role of writing in academic and professional life.
- Writing as a tool for communication, expression, and persuasion.
- Overview of different types of writing: Informative, persuasive, descriptive, and narrative.

**2. Basic Writing Concepts:**

- The writing process: Prewriting, drafting, revising, editing, and publishing.
- Elements of good writing: Clarity, coherence, consistency, and conciseness.
- Identifying your audience and purpose in writing.

**3. Fundamentals of Grammar and Style:**

- Parts of speech: Nouns, verbs, adjectives, and adverbs.
- Sentence structure: Simple, compound, and complex sentences.
- Common grammar mistakes to avoid: Subject-verb agreement, punctuation, and articles.
- Developing an effective writing style.

**Unit 2: Paragraph Writing and Structure**

**1. The Structure of a Paragraph:**

- Introduction, body, and conclusion in a paragraph.
- Unity and coherence in paragraphs.
- Topic sentences, supporting details, and concluding sentences.

### 2. **Writing Effective Paragraphs:**

- Organizing ideas logically and cohesively.
- Using transitions between sentences and paragraphs.
- Avoiding run-on sentences and fragments.

### 3. **Paragraph Types:**

- Descriptive, narrative, expository, and persuasive paragraphs.
- Writing introductory and concluding paragraphs effectively.

## **Unit 3: Essay Writing Techniques**

### 1. **Essay Structure and Organization:**

- Introduction, thesis statement, body paragraphs, and conclusion.
- Writing effective thesis statements and topic sentences.
- Developing body paragraphs with clear arguments and evidence.

### 2. **Types of Essays:**

- Descriptive Essays: Writing about a person, place, event, or idea.
- Narrative Essays: Telling a story with a clear beginning, middle, and end.
- Expository Essays: Explaining a topic or process clearly.
- Persuasive Essays: Arguing a position with evidence and reasoning.

### 3. **Essay Revision and Editing:**

- Common pitfalls in essay writing.
- Revising for clarity, coherence, and logical flow.
- Proofreading for grammatical and typographical errors.

## **Unit 4: Writing for Different Purposes**

### 1. **Writing Reports:**

- Structure of a report: Title, introduction, methodology, findings, and conclusion.
- Writing clear, concise, and objective reports.
- Using headings, subheadings, and bullet points for clarity.

### 2. **Business and Professional Writing:**

- Writing emails, memos, and letters in a professional tone.
- Formatting and structuring business correspondence.
- Writing resumes and cover letters effectively.

### 3. **Creative Writing:**

- Elements of creative writing: Character, setting, plot, and theme.
- Writing short stories, poems, and descriptive passages.
- Exploring narrative voice and point of view in creative writing.



## Unit 5: Advanced Writing Techniques

### 1. Improving Vocabulary and Sentence Variety:

- Expanding vocabulary for precise and expressive writing.
- Using synonyms and antonyms effectively.
- Writing with sentence variety to maintain interest and flow.

### 2. Writing with Clarity and Conciseness:

- Eliminating redundancy and wordiness.
- Writing clearly and directly without over-explaining.
- Using active voice over passive voice to enhance clarity.

### 3. Critical Thinking and Argumentation:

- Developing arguments and counterarguments.
- Supporting arguments with credible evidence and examples.
- Writing persuasive arguments with logical reasoning and proper structure.

## Suggested Books:

- *The Elements of Style* by William Strunk Jr. and E.B. White.
- *Writing Academic English* by Alice Oshima and Ann Hogue.
- *On Writing Well* by William Zinsser.
- *The Bedford Handbook* by Diana Hacker.
- *The Little, Brown Handbook* by H. Ramsey Fowler and Jane E. Aaron.
- *On Writing Well: The Classic Guide to Writing Nonfiction* by William Zinsser.
- *Business Writing Essentials* by Gregory L. S. Minter.
- *Creative Writing: A Workbook with Readings* by Julia Bell

**SEMESTER X**

**MOOT COURTS, OBSERVATION OF TRIAL, PRE-TRIAL  
PREPARATIONS AND INTERNSHIP**

**Sub. Code: BALLB 502**

**L-2,P-8, C -6**

**Course Objectives**

- The Moot Court course aims to provide law students with practical experience in oral advocacy, legal research, and drafting of pleadings through simulated court proceedings.
- It is designed to help students develop the skills necessary for real-world legal practice by participating in mock trials, arguing cases before a judge or panel, and presenting legal arguments on behalf of hypothetical clients.
- The course helps students bridge the gap between theory and practice by providing a platform to apply their knowledge of substantive law and procedural rules in a courtroom setting.
- Students will be prepared to represent clients in court, effectively communicate legal arguments, and contribute to legal research and writing, making them ready for future careers in litigation, legal practice, and dispute resolution.

This paper has three components of 30 marks each and viva-voce for 10 marks.

**(A) Moot Court (30 marks):** Every student is required to participate in at least three moot courts in the VI Semester with 10 marks for each. The moot court work will be on an assigned problem and it will be evaluated for 5 marks for written submissions and 5 marks for oral advocacy.

Marks will be given on the basis of written submission and oral advocacy. Written submissions shall include brief summary of facts, issues involved, provisions of laws and arguments, citation, prayer, etc. Marks for oral advocacy may be awarded for communication skills, presentations, language, provisions of law; authorities quoted, court manners, etc. Written Memorials submitted by the students shall be kept by the College for Further Verification.

The performance of student in the moot court shall be evaluated by a committee consisting of (i) Principal of the College (ii) an Advocate with 10 years experience at the Bar; and (iii) the teacher concerned.

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### **(B) Observance of Trial in two cases, one Civil and one Criminal (30 marks):**

Students are required to attend courts to observe at least one civil and one criminal case. They shall maintain a record and enter the various steps observed during their attendance on different days in the court assignment. The Court Observation Record submitted by the students should be evaluated by a committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, and (iii) an Advocate with 10 years experience at the Bar and average be taken. Court attendance shall be compulsory and attendance has to be recorded in a register kept therefor. This may be carried under the supervision of a teacher of the college. This scheme will carry 30 marks.

### **(C) Interviewing Techniques and Pre-Trial Preparations and Internship Diary (30 marks):**

Each student should observe two 'interview sessions' of clients either in the Lawyer's Office or in the Legal Aid Office and record the proceedings in a diary, which will carry 15 marks.

Each student has to further observe the preparation of documents and court papers by the Advocate and the procedure for the filing of the suit / petition. This shall be recorded in the diary which will carry 15 marks.

The diary shall clearly indicate the dates on which the above observations are made and they shall be authenticated by the advocate concerned.

Evaluation of the above diary shall be made by the committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, O.U.; and (iii) an Advocate with 10 years experience at the Bar and average be taken.

### **Note:**

- 1. Attendance of the students in all the four components of the paper shall be compulsory.**
- 2. The above records, diary certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University for Further Verification.**

### **Suggested Readings:**

1. Dr. Kailash Rai: Moot Court Pre-Trial Preparation and Participation in Trial Proceedings, Central Law Publication.
2. Amita Danda: Moot Court for Interactive Legal Education, Gogia Law Agency, Hyderabad.
3. Blackstone's: Books of Moots, Oxford University Press.
4. Mishra: Moot Court Pre-Trial Preparation and Participation in Trial Proceedings, Central Law, Allahabad.

**Body Language-II (BL-502A)**

**Sub. Code: BALLB 502A**

**L-2,P-8, C -4**

**Course Objectives:**

- To introduce students to the phases of trial and pre-trial procedures.
- To enhance understanding of legal terms, courtroom etiquette, and trial strategies.
- To develop skills for preparing cases for trial, including investigation, evidence collection, and witness preparation.
- To expose students to real-world courtroom scenarios through observation of trials.
- To provide opportunities for critical analysis of trial proceedings and the formulation of case strategies.

**Unit 1: Introduction to Trial Procedures**

**1. Overview of the Trial Process:**

- Definition and stages of a trial.
- Key phases: Pre-trial, trial, and post-trial.
- Differences between civil, criminal, and administrative trials.

**2. Participants in a Trial:**

- Roles and responsibilities of judges, attorneys, witnesses, jurors, and court staff.
- Understanding the functions of prosecution and defense counsel.
- Interaction between the judge and counsel during the trial.

**3. Courtroom Etiquette:**

- Formalities and procedures in a courtroom.
- Behavior expectations for lawyers, clients, witnesses, and observers.
- Rules of evidence and courtroom conduct.

**Unit 2: Pre-Trial Preparation and Case Management**

**1. Pre-Trial Motions and Hearings:**

- Understanding pre-trial motions: Motion to dismiss, motion for summary judgment, and motion in limine.
- The role of pre-trial hearings in shaping the trial strategy.
- The discovery process: Gathering evidence and deposing witnesses.
- Developing a pre-trial checklist.

**2. Case Theory Development:**

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- Creating a theory of the case: Crafting a compelling narrative for the court.
  - Identifying key issues in the case and preparing arguments.
  - Legal research and how to use it to develop trial strategy.
  - Preparing exhibits and evidence for presentation in court.
3. **Witness Preparation:**
- Role of witnesses in the trial.
  - Techniques for preparing witnesses for direct and cross-examination.
  - Ethical considerations in witness handling.
  - Mock examination practice for students.

### Unit 3: Observing Trials and Analyzing Courtroom Behavior

1. **The Observation Process:**
- Preparing for trial observation: What to look for in each phase of the trial.
  - Key elements of trial procedure: Opening statements, direct and cross-examination, closing arguments, and jury instructions.
  - Identifying trial tactics: How lawyers build their case and respond to opposing counsel.
2. **Trial Analysis and Case Review:**
- Observing and analyzing the effectiveness of various trial strategies.
  - Understanding the role of the judge and jury during the trial.
  - Ethical considerations for lawyers in trial proceedings.
3. **Courtroom Dynamics:**
- Managing stress and emotion in a courtroom.
  - The role of non-verbal communication (body language, tone) in a trial.
  - The influence of media and public opinion on trial proceedings.

### Unit 4: Trial Strategies and Techniques

1. **Opening Statements and Closing Arguments:**
- Crafting a persuasive opening statement.
  - Closing arguments: Summarizing the case and making a compelling appeal to the jury.
  - Techniques for emphasizing key evidence and witness testimony.
2. **Direct and Cross-Examination:**
- Developing effective questioning strategies.
  - Techniques for managing difficult witnesses.
  - Cross-examination strategies: Impeaching the credibility of witnesses.
  - The role of objections during examination.
3. **Handling Objections and Courtroom Challenges:**

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- Common objections in trial and how to respond.
- Understanding the rules of evidence.
- The importance of timing and courtroom decorum when making objections.

### Unit 5: Post-Trial and Case Reflection

#### 1. Post-Trial Procedures:

- Understanding the judgment phase and what happens after the trial.
- Filing appeals and the appellate process.
- The importance of post-trial motions and the possibility of retrials.

#### 2. Reflection on Trial Observation:

- Discussing observations with instructors and peers.
- Analyzing courtroom strategies used by both parties in observed trials.
- Identifying areas of improvement in trial presentation and strategy.

#### 3. Career Preparation and Legal Practice:

- How trial experience informs legal practice.
- Career paths for lawyers: Litigators, trial consultants, and corporate counsel.
- Professional development through continuous learning and trial experience.

### Suggested Reading:

- *The Anatomy of a Trial* by John M. Conley.
- *Trial Preparation* by William A. Hall.
- *Winning at Trial* by D. Shane Read.
- *The Trial Lawyer's Art* by McElhaney James W.
- *After the Verdict* by Steven M. H. Wallen.
- *The Complete Idiot's Guide to Jury Trials* by David A. Moran.
- *The Anatomy of a Trial* by John M. Conley.
- *The Trial Lawyer: What It Takes to Win* by David Berg.

**Presentation Skills-II BL-502B**

**Sub. Code: BALLB 502B**

**L-2,P-8, C -4**

**Course Objectives:**

- To develop advanced presentation techniques for delivering high-impact presentations.
- To enhance the use of multimedia tools and visual aids in presentations.
- To improve audience engagement strategies and handle diverse audience dynamics.
- To practice dealing with difficult questions and objections during presentations.
- To gain confidence in presenting complex ideas clearly and persuasively.
- To develop personal presentation style and authenticity in delivery.

**Unit 1: Advanced Presentation Structures**

**1. Crafting a Compelling Narrative:**

- Creating a clear and coherent storyline for presentations.
- Using storytelling techniques to engage the audience.
- The structure of persuasive presentations: Introduction, Body, Conclusion.
- Balancing facts with emotional appeal for greater impact.

**2. The 3-Point Rule:**

- Simplifying complex ideas: Focusing on three key takeaways.
- The importance of repetition and emphasis in presenting main ideas.
- Using logical progression to help the audience follow the message.

**3. Developing Powerful Introductions and Conclusions:**

- Crafting powerful openings that grab attention.
- Ending with impact: The importance of strong closing statements.
- Leaving the audience with a memorable call to action.

**Unit 2: Advanced Audience Engagement Techniques**

**1. Understanding Your Audience:**

- Identifying audience needs, interests, and expectations.
- Tailoring your presentation to suit different audience types (e.g., corporate executives, academic audiences, general public).
- Building rapport and establishing credibility with the audience.

**2. Interactive Presentation Techniques:**



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- Using questions, polls, and live feedback to maintain engagement.
  - The art of audience interaction: How to read non-verbal cues from the audience.
  - Techniques for creating a participatory atmosphere in virtual and in-person settings.
- 3. Dealing with Diverse Audiences:**
- Strategies for addressing different types of personalities and communication styles.
  - Techniques for managing difficult or disengaged audiences.
  - Adjusting presentation tone, pace, and language to connect with various groups.

### **Unit 3: Mastering the Use of Visual Aids and Multimedia**

- 1. Designing Effective Visual Aids:**
- Principles of good design: Simplicity, clarity, and consistency.
  - How to use PowerPoint, Prezi, and other tools to create visually appealing slides.
  - Using infographics, charts, and graphs to enhance understanding.
- 2. Integrating Video, Sound, and Interactive Elements:**
- When and how to incorporate multimedia into your presentation.
  - Using video clips and sound effectively to support your message.
  - Avoiding over-reliance on technology and balancing visual aids with your spoken words.
- 3. Non-Verbal Communication and Body Language:**
- Using gestures, posture, and eye contact to enhance your message.
  - Managing stage presence: How to move with purpose and confidence.
  - The impact of facial expressions and tone of voice on audience perception.

### **Unit 4: Handling Questions, Objections, and Difficult Situations**

- 1. Managing Q&A Sessions:**
- How to prepare for and anticipate questions.
  - Techniques for handling difficult or hostile questions.
  - Maintaining composure and confidence during Q&A.
  - Answering questions clearly and concisely.
- 2. Dealing with Objections and Pushback:**
- Techniques for addressing objections with respect and persuasion.
  - Turning challenges into opportunities for engagement.
  - Using body language to handle tension during difficult discussions.
- 3. Handling Unexpected Situations:**
- Staying calm when technology fails or when unexpected disruptions occur.

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- Recovering from mistakes or missteps during a presentation.
- How to maintain control over the presentation in high-pressure situations.

### **Unit 5: Virtual and Hybrid Presentations**

#### **1. Delivering Presentations in Virtual Settings:**

- Best practices for presenting through video conferencing tools (Zoom, MS Teams, etc.).
- Managing virtual audience engagement through chat, polls, and Q&A.
- Adjusting presentation style for virtual environments.

#### **2. Hybrid Presentations:**

- Balancing in-person and online audiences.
- Technical considerations for hybrid presentations (audio, video, screen-sharing).
- Keeping both groups engaged and ensuring equal participation.

#### **3. Overcoming Virtual Presentation Challenges:**

- Handling technical glitches and troubleshooting.
- Managing distractions and ensuring smooth communication in virtual settings.
- Building presence and maintaining confidence on camera.

### **Unit 6: Personal Style and Authenticity in Presentations**

#### **1. Finding Your Unique Presentation Style:**

- Understanding the importance of authenticity in presentation delivery.
- How to develop your natural speaking style and avoid "performing."
- Finding balance between professionalism and personality.

#### **2. Building Confidence and Overcoming Stage Fright:**

- Techniques to boost self-confidence before and during a presentation.
- Overcoming fear of public speaking and managing nerves.
- The role of positive body language in building confidence.

#### **3. Feedback and Continuous Improvement:**

- Techniques for soliciting and incorporating feedback after a presentation.
- Using video recordings of your presentations for self-assessment.
- The role of practice in mastering presentation skills.

### **Suggested Books:**

- *Talk Like TED* by Carmine Gallo.
- *Made to Stick* by Chip Heath & Dan Heath.
- *Presentation Zen* by Garr Reynolds.
- *The Art of Public Speaking* by Dale Carnegie.
- *Virtual Presentations: Best Practices and Strategies for Successful Online Speaking* by Andy Lopata.
- *The Virtual Presenter's Handbook* by Carole Gaskell.
- *The Quick and Easy Way to Effective Speaking* by Dale Carnegie.
- *Crucial Conversations: Tools for Talking When Stakes Are High* by Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler

**Effective Writing Skills II (BL-502C)**

**Sub. Code: BALLB 502C**

**L-2,P-8, C -4**

**Course Objectives:**

By the end of this course, students will be able to:

1. Analyze and apply the principles of effective writing.
2. Organize ideas clearly and logically in various writing formats.
3. Revise and edit their work to enhance clarity and coherence.
4. Adapt writing styles to different audiences and purposes.
5. Utilize research and evidence to support arguments and claims.

**UNIT 1: Introduction to Effective Writing**

- Overview of the writing process: prewriting, drafting, revising, editing, and publishing
- The importance of audience and purpose in writing

**UNIT 2: Writing Fundamentals**

- Grammar and punctuation essentials
- Sentence structure and variety

**UNIT 3: Organizing Ideas**

- Outlining techniques for clarity and coherence
- The structure of essays: introduction, body, and conclusion

**UNIT 4: Academic Writing**

- Writing thesis statements and arguments

### **Suggested Readings:**

1. "On Writing: A Memoir of the Craft" by Stephen King  
A blend of memoir and writing advice, King shares insights on the writing process and his personal journey.
2. "The Elements of Style" by William Strunk Jr. and E.B. White  
A classic guide that emphasizes clarity, brevity, and the fundamental principles of English style.
3. "Writing Down the Bones: Freeing the Writer Within" by Natalie Goldberg  
Encourages writers to find their voice and express themselves freely, blending writing exercises with personal reflections.
4. "Bird by Bird: Some Instructions on Writing and Life" by Anne Lamott  
Offers practical advice and encouragement, emphasizing the importance of perseverance in the writing process.



**Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

**School of Law and Constitutional Studies**

**Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Law (BA LLB) Five Year Integrated Programme (Semester Pattern)**

**(w.e.f. session 2014-15)**

**Approved and adopted in the year 2014 (1<sup>st</sup> meeting Board of Studies)**

**[Scheme & Syllabi from 2014-2021)**

## **PEOs**

### **Programme Educational Objectives (PEO's)**

- **PEO 1** Legal Expertise: Provide foundational knowledge of law and social sciences.
- **PEO 2** Professional Skills: Develop competence for diverse legal careers.
- **PEO 3** Ethics and Leadership: Cultivate ethical values and leadership in advocacy.
- **PEO 4** Lifelong Learning: Promote research and continuous education in law.
- **PEO 5** Social Responsibility: Encourage contributions to justice and societal welfare.

## **PSOs**

### • **Programme Specific Objectives (PSO's)**

- **PSO 1** Develop a comprehensive understanding of substantive and procedural laws, constitutional principles, and their application to address complex legal issues in diverse contexts.
- **PSO 2** Integrate knowledge of humanities, social sciences, and law to analyze societal problems, foster critical thinking, and promote social justice.
- **PSO 3** Prepare for diverse legal careers by fostering skills in legal research, drafting, advocacy, and negotiation, while adhering to ethical and professional standards.
- **PSO 4** Cultivate an understanding of law as an instrument of social change, promoting equality, human rights, and sustainability in legal practices and policymaking.
- **PSO 5** Equip students to navigate the global legal environment, adapt to evolving legal challenges, and pursue continuous professional development to meet emerging societal needs.

## **POOs**

### **Programme Outcome Objectives (POO's)**

- **POO 1** To acquire and apply legal knowledge to the complex socio-legal problems.
- **POO 2** To make students eligible to practice law in courts and industry.
- **POO 3** To engender professional skills required for legal practice such as argument, pleading, drafting, conveyancing etc.
- **POO 4** To conduct themselves with the highest professional ethics standards in legal profession
- **POO 5** To develop skills in legal research, legal reasoning and aptitude, and apply it during the Programme and profession.

## TEACHING SCHEME

### BA,LL.B First Year (First Semester)

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
BL – 101 BL-101A BL-101B	English – I Communication Skills in English-I Personality Development-I	4	0	0	4
BL103 BL103A BL103B BL-103C	History – I Sociology-I Understanding Contemporary Social Issues - I Social Institutions In India-I	4	0	0	4
BL – 105 BL-105A BL-105B	Political Science – I Society and Gender-I Comparative Politics-I	4	0	0	4
BL – 107	Law of Torts Including M. V. Act & Consumer Protection Laws	4	0	0	4
BL – 109	Law of Contract – I	4	0	0	4
BL-111 BL-111A BL-111B BL-111C	Economics – I Indian Economy-I Economics of Money and Banking/ Principle of Sustainable Finance-I	4	0	0	0
	Total	24	0	0	24

### Second Semester

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
BL – 102 BL-102A BL-102B	English – II Communication Skills in English II Personality Development-II	4	0	0	4
BL – 104 BL-104A BL-104B BL-104C	History – II Sociology-II Understanding Contemporary Social Issues-II Social Institutions In India-II	4	0	0	4



BL – 106	Political Science – II	4	0	0	4
BL-106A	Society and Gender-II				
BL-106B	Comparative Politics-II				
BL-106C	Political Theories-II				
BL – 108	Constitutional Law – I	4	0	0	4
BL – 110	Law of Contract – II	4	0	0	4
BL—112	Economics – II	4	0	0	0
BL—112A	Indian Economy-II				
BL—112B	Economics of Money and Banking-II				
	Total	24	0	0	24

**BA.LL.B Second Year**

**Third Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL –201	Constitutional Law – II	4	0	0	4
BL –203	Legal Methods	4	0	0	4
BL –205 BL –205A BL –205B	Political Science – III Society and Gender-III Comparative Politics-III	4	0	0	4
BL –207	History – III/ Sociology-III/Understanding Contemporary Social Issues-III/Social Institutions In India-III	4	0	0	4
BL –209 BL-209A BL-209B	Microeconomics –I Economic Sociology-I Economic Geography-I	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

**Fourth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-202	Human Rights Law	4	0	0	4
BL-204	Legal History	4	0	0	4
BL-206	Law of Evidence	4	0	0	4
BL-208	Law of Crimes (I.P.C.)	4	0	0	4
BL-210 BL-210A BL-210B	Microeconomics- II Economic Sociology-II Economic Geography-II	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

**BA,LL.B Third Year**

**Fifth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-301 BL-301A BL-301B BL-301C BL-301D	Hindi-I Spanish-I German-I Chinese-I French-I	4	0	0	4
BL-303	Family Law-I (Hindu Law)	4	0	0	4
BL -305	Civil Procedure Code and Law of Limitation	4	0	0	4
BL-307	Criminal Procedure Code and Law of Juvenile Justice and Probation of Offenders	4	0	0	4
BL-309 BL-309A BL-309B	Macroeconomics I Economic Anthropology-I Political Economy-I	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

**BA, LLB Third Year**

**Sixth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL302 BL302A BL302B BL302C BL302D	Hindi-II Spanish-II German-II Chinese-II French-II	4	0	0	4
BL-304	Family Law-II (Muslim Law)	4	0	0	4
BL-306	Legal Language and Legal Writing	4	0	0	4
BL-308	Public International Law	4	0	0	4
BL-310 BL-310A BL-310B	Macroeconomics II Economic Anthropology- II Political Economy-II	4	0	0	4
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

**BA,LL.B Fourth Year**

**Seventh Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-401	Labor Law-I	4	0	0	4
BL-403	Jurisprudence	4	0	0	4
BL-405	Company Law	4	0	0	4
BL-407	Administrative Law	4	0	0	4
BL-409	(Clinical Paper) Alternate Dispute Resolution	2	0	8	6
	Skill Enhancement Course: Practical (Qualifying course)				
BL-409A	Data Analysis-1				
BL-409B	Computer Programming-1				
BL-409C	Python Programming-1				
BL409D	Leadership and Management-1				
	<b>Total</b>	<b>18</b>	<b>0</b>	<b>8</b>	<b>22</b>

**Eighth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-402	Labor Law-II	4	0	0	4
BL-404	U.P. Land Laws	4	0	0	4
BL-406	Intellectual Property Law	4	0	0	4
BL-406A	Research Methodology				
BL-406B	Publication Ethics and Emerging Trends in Research				
BL-408	Interpretation of Statutes	2	0	0	4
BL-410	Clinical Paper- II: Professional Ethics and Professional Accounting System	2	0	8	6
	<b><u>Skill Enhancement Course: Practical (Qualifying course)</u></b>				
BL-410A	Data Analysis-II				

BL-410B BL-410C	Computer Programming-II Python Programming-II				
	<b>Total</b>	<b>18</b>	<b>0</b>	<b>8</b>	<b>22</b>

**BA,LL.B Fifth Year**

**Ninth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-501	Law of Taxation Law	4	0	0	4

BL-505	Environmental Law	4	0	0	4
BL-505A	Public Relations				
BL-505B	Global Politics				
BL-505C	Introduction to Sociology				
BL-507	Law of Banking & Negotiable Instruments	4	0	0	4
BL-509	Clinical Paper-III Drafting, Pleading and Conveyance	2	0	8	6
BL-509A	Body Language-I				
BL-509B	Presentation Skills-I				
BL-509C	Effective Writing Skills-I				
BL-503	Law of Property <b>Total</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>
	<b>Total</b>	<b>18</b>	<b>0</b>	<b>8</b>	<b>22</b>

**Tenth Semester**

<b>Paper Code</b>	<b>SUBJECTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
BL-502	Clinical paper-IV Moot Court, Observation of Trial & Pre Trial Preparation	2	0	8	6
BL-502A	Body Language-II				
BL-502B	Presentation Skills-II				
BL-502C	Effective Writing Skills-II				
BL- 504	Internship ( Lawyer/Law Firms)	4	0	12	10
	<b>Total</b>	<b>6</b>	<b>0</b>	<b>20</b>	<b>16</b>

# **SEMESTER I**

## ENGLISH- I

**Subject code: BL -101**

**L-4, C-4**

### **Course Objective**

- I. Develop Proficiency in English Language Skills
- II. Enhance students' abilities in reading, writing, speaking, and listening in English.
- III. Improve vocabulary and grammar to support effective communication and comprehension.
- IV. Foster an understanding of both formal and informal language usage.

### **Unit I:**

**Functional Grammar:** Grammar and Vocabulary (as contained in the first two sections of “Better your English – I) \*

### **Unit II:**

**Communication:** Meaning, Nature and Importance of Communication, Barriers to Effective

Communication, Channels of Communication, Flow of Communication –Downward, Upward, Lateral or Horizontal, Diagonal or Cross-wise.

**Requisites of Sentence writing:** Essentials of good sentence construction, sentence structure, kinds of sentence.

### **Unit IV:**

**Reading cultural texts:**

**Short- Stories:**

1. Eyes are not here – Ruskin Bond (Non- detailed study)
2. Renunciation – Rabindra Nath Tagore (Non- detailed study)

**ORAL:** Discussion in detail, Critical appreciation, grammatical exercises and making student read the stories and essay so that they develop the reading habits with proper stress, intonation, pronunciation & rhythm.



## Suggested Readings

- **Wren and Martin's High School English Grammar and Composition"** by P.C. Wren & H. Martin
- A comprehensive guide for understanding grammar rules and improving language skills.
- **"A Practical English Grammar"** by A.J. Thomson & A.V. Martinet
- Offers in-depth explanations of English grammar, with exercises for practice.
- **"The Elements of Style"** by William Strunk Jr. and E.B. White
- A concise book on the principles of clear, concise, and effective writing.
- **"English Vocabulary in Use"** by Michael McCarthy and Felicity O'Dell
- A practical guide for improving vocabulary, especially useful for non-native speakers.
- **"The Norton Anthology of English Literature"** by Stephen Greenblatt

# Communication Skills in English

**Subject Code: BL- 101 A**

**L-4, C-4**

## **Course Objectives:**

- To develop proficiency in English communication for academic and professional purposes.
- To enhance listening, speaking, reading, and writing skills.
- To foster confidence in public speaking and group communication.
- To enable effective use of English in diverse social and professional contexts.

## **Unit I: Fundamentals of Communication**

Definition, Process, and Types of Communication  
Barriers to Communication and Overcoming Them  
Essentials of Effective Communication  
Verbal vs. Non-Verbal Communication

## **Unit II: Listening and Speaking Skills**

Listening: Active vs. Passive Listening, Note-Taking Techniques  
Speaking: Pronunciation, Accent, Intonation, and Fluency  
Conversational Skills: Formal and Informal Interactions  
Public Speaking: Speech Preparation, Delivery, and Presentation Skills

## **Unit III: Reading Skills**

Types of Reading: Skimming, Scanning, and Intensive Reading  
Comprehension Strategies  
Critical Reading: Identifying Main Ideas, Arguments, and Logical Flow  
Reading for Professional Purposes: Reports, Articles, and Official Documents

## **Unit IV: Writing Skills**

Basic Grammar and Sentence Structure  
Paragraph Writing: Unity, Coherence, and Cohesion  
Formal Writing: Letters, Emails, and Memos  
Creative Writing: Essays, Stories, and Articles  
Academic Writing: Reports and Research Papers

## **Unit V: Professional Communication**

Resume Writing and Cover Letters  
Group Discussions and Interviews  
Business Communication: Reports, Proposals, and Minutes of Meetings  
Etiquette in Digital Communication: Emails and Social Media

**Suggested Books:**

1. "Communication Skills" by Sanjay Kumar and Pushp Lata
2. "Developing Communication Skills" by Krishna Mohan and Meera Banerji
3. "Business Communication" by Meenakshi Raman and Prakash Singh
4. "Effective Communication Skills" by Dale Carnegie
5. "English Grammar in Use" by Raymond Murphy (for grammar support)

# Personality Development I

**Subject Code: BL- 101B**

**L-4, C-4**

## **Course Objectives:**

- Understand the key components of personality and self-concept.
- Develop effective communication and interpersonal skills.
- Enhance emotional intelligence and self-regulation.
- Foster goal-setting and time management skills.
- Promote self-reflection and personal growth strategies.

## **UNIT 1: Introduction to Personality Development**

Definition and importance of personality development

Components of personality: traits, values, and beliefs

Self-assessment: Understanding your personality type

## **UNIT 2: Self-Awareness**

Identifying strengths and weaknesses

Understanding personal values and beliefs

Practice: Journaling for self-reflection

## **UNIT 3: Effective Communication**

Verbal and non-verbal communication skills

Active listening and feedback

Practice: Communication exercises and role-plays

## **UNIT4: Emotional Intelligence**

Components of emotional intelligence: self-awareness, self-regulation, empathy, social skills

Practice: Emotional awareness activities

## **Suggested Readings:**

- "How to Win Friends and Influence People" by Dale Carnegie  
A classic on interpersonal skills, focusing on building relationships and effective communication.
- "The 7 Habits of Highly Effective People" by Stephen R. Covey  
This book offers principles for personal effectiveness and holistic development.
- "Mindset: The New Psychology of Success" by Carol S. Dweck  
Explores the concept of fixed vs. growth mindsets and how they influence personal development.

## History I

Subject Code: BL -103

L 4, C 4

### Course Objective

- Familiarize students with key historical events: Gain an understanding of important events, figures, and movements in history from various time periods and regions.
- Explore historical themes: Analyse themes such as political systems, economic structures, social movements, wars, ideologies, and cultural developments.
- Study different historical periods and contexts: Understand the causes, consequences, and significance of historical events in different cultural, geographical, and temporal contexts.

### Unit 1

1. Indus Valley Civilization:- Sources of Information Social life, Religious life, Town planning.
2. Vedic Period:- Social, Religious Condition,
- 3:- Varna Ashram System.

### Unit 2

1. Jainism:- Causes for the Religious Upheaval,
- 2:- Teaching of Mahavira & Principal of Jainism.
- 3:- Buddhism:- Rise and Growth,

### Unit 3

- 1:- Mauryan Period:- Art and Architecture Gandhar Art,
- 2:- Mathura Art

### Unit 4

- 1:- Post Gupta Temple Architecture.
- 2:- Sculpture and Painting.

### Unit 5

- 1:- Concept of State and Government in Ancient India.

# Sociology-I

**Subject Code: BL- 103 A**

**L-4, C-4**

## **Course Objectives:**

- To introduce students to the foundational concepts and theories of sociology.
- To develop an understanding of the relationship between society, individuals, and institutions.
- To examine social phenomena through sociological perspectives.
- To foster critical thinking about social issues and their relevance to law and society.

## **Unit I: Introduction to Sociology**

Definition, Nature, and Scope of Sociology

Importance and Application of Sociology in Legal Studies

Sociology as a Science: Positivism and its Critique

Relationship with Other Social Sciences

## **Unit II: Basic Concepts**

Society: Characteristics and Types (Tribal, Rural, Urban)

Community, Association, and Institution

Social Structure and Social System

Social Groups: Primary, Secondary, and Reference Groups

## **Unit III: Socialization and Culture**

Socialization: Process, Agents, and Importance

Culture: Meaning, Elements, and Characteristics

Cultural Relativism and Ethnocentrism

Social Norms, Values, and Beliefs

## **Unit IV: Social Stratification**

Definition and Features of Social Stratification

Theories of Social Stratification: Functionalist, Conflict, and Interactionist Perspectives

Forms of Stratification: Caste, Class, Gender, and Race

Social Mobility: Types and Factors Affecting Mobility

## **Unit V: Social Change and Social Control**

Social Change: Meaning, Characteristics, and Factors

Theories of Social Change: Evolutionary, Functionalist, and Conflict

Social Control: Meaning, Types, and Agencies (Formal and Informal)

Law as an Instrument of Social Control and Social Change

## **Suggested Books:**

1. "Sociology" by Anthony Giddens
2. "Introduction to Sociology" by Haralambos and Holborn

3. "Sociology: Principles of Sociology with an Introduction to Social Thought" by C.N. Shankar Rao
4. "An Introduction to Sociology" by Vidya Bhushan and D.R. Sachdeva
5. "Society: An Introductory Analysis" by MacIver and Page

# Understanding Contemporary Social Issues-I

**Subject Code: BL- 103 B**

**L-4, C-4**

## **Course Objectives:**

- To provide insights into contemporary social issues and their impact on individuals and society.
- To analyse the causes, consequences, and possible solutions to current societal challenges.
- To develop a sociological understanding of global and local issues through critical perspectives.
- To explore the role of law, policy, and governance in addressing these issues.

## **Unit I: Understanding Social Issues**

Definition, Nature, and Characteristics of Social Issues

Approaches to Study Social Issues: Sociological, Political, and Economic

Interconnection of Social Issues with Culture, Politics, and Economy

Role of Media in Shaping Perceptions of Social Issues

## **Unit II: Poverty and Inequality**

Concept of Poverty: Absolute and Relative Poverty

Causes and Consequences of Poverty

Dimensions of Inequality: Economic, Social, and Political

Government Policies and Programs to Address Poverty and Inequality

## **Unit III: Gender Issues**

Gender Disparities: Patriarchy, Gender Roles, and Stereotypes

Violence Against Women: Domestic Violence, Harassment, and Trafficking

LGBTQ+ Rights and Inclusion

Legal Frameworks and Movements for Gender Equality

## **Unit IV: Unemployment and Education**

Unemployment: Types, Causes, and Impact on Society

Education and its Role in Social Development

Issues in Education: Inequality, Dropouts, and Access to Quality Education

## **Unit V: Health and Environment**

Public Health Issues: Malnutrition, Epidemics, and Mental Health

Environmental Degradation: Deforestation, Pollution, and Climate Change

Sustainable Development Goals (SDGs) and Global Environmental Efforts

Role of Law and Policy in Addressing Health and Environmental Challenges



**Suggested Books:**

1. "Social Problems in India" by Ram Ahuja
2. "Contemporary Social Problems and Issues" by R.M. MacIver and Charles Page
3. "Modernization of Indian Tradition" by Yogendra Singh
4. "Poverty and Famines" by Amartya Sen
5. "Gender Trouble" by Judith Butler

# Social Institutions in India-I

Subject Code: BL- 103 C

L-4, C-4

## Course Objectives:

- To understand the concept, structure, and significance of social institutions in India.
- To analyse the traditional and contemporary roles of various social institutions.
- To examine the changing dynamics of these institutions in the context of modernization and globalization.
- To explore the interrelation of social institutions with law and governance.

## Unit I: Introduction to Social Institutions

Definition, Features, and Functions of Social Institutions

Types of Social Institutions: Family, Religion, Education, Economy, and Polity

Interdependence of Social Institutions

Role of Social Institutions in Indian Society

## Unit II: Family and Kinship

Types of Family: Joint, Nuclear, and Extended Families

Functions and Changing Patterns of Family in India

Kinship: Meaning, Types, and Kinship System in India

Challenges to Family and Kinship: Urbanization, Industrialization, and Migration

## Unit III: Marriage in India

Marriage as a Social Institution: Definitions and Functions

Forms of Marriage: Monogamy, Polygamy, Endogamy, and Exogamy

Customs and Practices Related to Marriage in India

Contemporary Issues: Dowry, Inter-caste and Interfaith Marriages, and Live-in Relationships

## Unit IV: Religion and Caste

Role of Religion in Indian Society: Unity and Diversity in Practices

Major Religious Traditions in India: Hinduism, Islam, Christianity, Sikhism, and Others

Caste System: Origin, Features, and Functions

Caste and Social Mobility: Sanskritization, Westernization, and Reservation Policies

## Unit V: Political and Economic Institutions

Traditional vs. Modern Political Systems in India

Role of Panchayat Raj and Local Governance

Economic Institutions: Land Tenure Systems, Joint Stock Companies, and Cooperatives

Impact of Liberalization, Privatization, and Globalization on Social Institutions

**Suggested Books:**

1. "Indian Society: Institutions and Change" by N. Jayaram
2. "Social Change in Modern India" by M.N. Srinivas
3. "Caste in Modern India and Other Essays" by M.N. Srinivas
4. "Family and Kinship in India" by Patricia Uberoi
5. "Religion and Society Among the Coorgs of South India" by M.N. Srinivas

## POLITICAL SCIENCE-I

**Sub. Code: BL -105**

**L-4, C-4**

### **Course Objective**

- Compare political systems across different countries: Understand and compare the political institutions, processes, and cultures in different nations, analysing how context influences the functioning of political systems.
- Study political regimes and transitions: Examine different types of political regimes, such as democratic and authoritarian systems, and analyse how regimes change over time through processes like revolutions, coups, or democratic reforms.
- Investigate political development: Understand the challenges and opportunities faced by countries in the process of political development, democratization, and governance.
- Promote understanding of citizenship: Develop an understanding of the rights and responsibilities of citizens within political systems and how they engage with and influence the political process.

### **Unit I: Basic Concepts**

Concepts: Politics and Political Science, Nature and scope, Political Thought,

### **Unit II: Approaches to the study of Political Science**

Normative, Historical, Behavioural Relation of Political Science with other Social Sciences

### **Unit III: Concept of State**

State: Meaning, Elements,

### **Unit IV: Concepts and types of**

Sovereignty, Liberty, Equality

### **Unit V: Concepts and types of:**

Justice,

### **Suggested Readings:**

1. Political Theory, Asirvatham, S.Chand.
2. O.P. Gauba, An Introduction to Political Theory, Macmillan
3. J.C. Johari, Principle of Modern Political Science, Sterling, Delhi.
4. Andrew Heywood, Politics, Palgrave Foundation, New York.
5. S. P. Varma, Modern Political Theory, New Delhi, Vikas .
6. C.E.M Joad, Political Theory, Oxford: Clarendon Press

## **Society and Gender-I**

**Subject Code: BL- 105 A**

**L-4, C-4**

### **Course Objectives:**

- To understand the concept of gender and its social construction.
- To explore the relationship between gender and various social institutions.
- To analyse the impact of patriarchy, gender roles, and stereotypes on individuals and society.
- To examine the intersectionality of gender with caste, class, and other social categories.
- To introduce students to feminist theories and movements.

### **Unit I: Understanding Gender**

Concept of Gender: Difference between Sex and Gender

Gender as a Social Construct

Masculinity and Femininity: Characteristics and Expectations

Intersectionality: Gender, Caste, Class, and Ethnicity

### **Unit II: Theories of Gender**

Feminist Theories: Liberal, Radical, Marxist, and Socialist Feminism

Postmodern Feminism and Queer Theory

Patriarchy: Meaning, Characteristics, and Impact on Society

Critique of Gender Binaries

### **Unit III: Gender and Social Institutions**

Family: Gender Roles and Division of Labor

Education: Gender Disparities and Access to Opportunities

Workplace: Gender Discrimination, Glass Ceiling, and Pay Gap

Media: Representation of Gender in Films, Advertisements, and Social Media

### **Unit IV: Gender and Violence**

Understanding Gender-Based Violence: Types and Forms (Domestic Violence, Sexual Harassment, and Honor Crimes)

Laws and Policies Addressing Gender-Based Violence in India

Role of Civil Society and NGOs in Combating Gender Violence

Cultural Practices and Their Impact on Gender (Dowry, Female Infanticide, and Child Marriage)

### **Unit V: Gender and Social Change**

Role of Feminist Movements in India and Abroad

Legal and Policy Frameworks for Gender Equality in India (Reservations, Maternity Benefits, and Workplace Policies) Role of Education, Technology, and Social Media in Challenging Gender Stereotypes ,Case Studies of Inspirational Women Leaders and Gender Activists

**Suggested Books:**

1. "Gender and Society in India" by T.K. Oommen and C.N. Venugopal
2. "Gender: The Basics" by Hilary M. Lips
3. "Patriarchy and the Subordination of Women" by Kamla Bhasin
4. "The Second Sex" by Simone de Beauvoir
5. "Gender Trouble" by Judith Butler
6. "Feminism in India" by Maitrayee Chaudhuri

# Comparative Politics-I

**Subject Code: BL- 105 A**

**L-4, C-4**

## **COURSE OBJECTIVES**

- Analyse global political systems.
- Compare democratic and authoritarian regimes.
- Study political institutions globally.
- Understand political culture and behaviour.
- Develop comparative analytical skills

### **Unit 1: Introduction to Comparative Politics**

Definition and Scope of Comparative Politics

Understanding Comparative Politics as a Subfield of Political Science

Evolution of Comparative Politics as a Discipline

Importance of Comparative Analysis

Significance of Studying Different Political Systems

Approaches to Comparative Politics (Institutionalism, Behaviourism, Structuralism)

### **Unit 2: Approaches and Methods in Comparative Politics**

Traditional vs. Modern Approaches

Institutional and Legal Approaches

Behaviourism and Post-Behaviourism

Contemporary Approaches

Structural-Functional Approach

Political Economy Approach

Dependency and World Systems Theory

Methods of Comparative Analysis

Case Study Method

Comparative Historical Analysis

Quantitative and Qualitative Methods

### **Unit 3: Political Systems and Typologies**

Types of Political Systems

Democratic Systems

Authoritarian and Totalitarian Regimes

Classification of Political Systems

Presidential vs. Parliamentary Systems

Federal vs. Unitary Systems

Hybrid Regimes

Semi-Presidential Systems

#### **Unit 4: Political Culture and Political Socialization**

Political Culture

Definition and Components of Political Culture

Types of Political Culture (Parochial, Subject, Participant)

Political Culture in Different Regimes (Democratic, Authoritarian)

Political Socialization

Agents of Socialization (Family, Education, Media, Political Parties)

Impact of Political Socialization on Political Behavior

#### **Unit 5: Module 5: Political Parties and Party Systems**

Political Parties

Definition and Functions of Political Parties

Evolution of Party Systems

Party Systems

One-Party, Two-Party, and Multi-Party Systems

Cleavages and Party Formation

The Role of Ideology in Party Politics

#### **Suggested Readings:**

- **"Comparative Politics: An Introduction"** by Rod Hague and Martin Harrop
- **"Essentials of Comparative Politics"** by Patrick H. O'Neil
- **"Comparative Government and Politics"** by Rod Hague and Martin Harrop
- **"The Political System"** by David Easton
- **"Patterns of Democracy"** by Arend Lijphart
- **"Democracy and Its Critics"** by Robert Dahl



## **Law of Torts Including M.V. Act and Consumer Protection laws**

**Sub. Code: BL – 107**

**L – 4, C – 4.**

### **Course Objectives**

- Introduce the fundamentals of tort law, provide students with an overview of what torts are and their role in civil law.
- This includes understanding the difference between torts and crimes, as well as the purpose of tort law in compensating victims and deterring harmful conduct.
- Examine different types of torts: Explore various categories of torts, including intentional torts (e.g., battery, assault, false imprisonment), negligence (e.g., duty of care, breach, causation), and strict liability torts (e.g., product liability).
- Study tort elements: Understand the elements that must be proven to establish a tort claim, such as the existence of a duty, breach of duty, causation, and damages.

### **Unit-I:**

Nature of Law of Torts - Definition of Tort - Elements of Tort - Development of Law of Torts in England and India - Wrongful Act and Legal Damage - Damnum Sine Injuria and Injuria Sine Damnum - Tort distinguished from Crime and Breach of Contract - General Principles of Liability in Torts - Fault

### **Unit-II**

General Defenses to an action in Torts – Vicarious Liability - Liability of the State for Torts – Defense of Sovereign Immunity – Joint Liability – Liability of Joint Tortfeasors – Rule of Strict Liability (Rylands V Fletcher) – Rule of Absolute Liability (MC Mehta vs. Union of India) –

### **Unit-III**

Specific Torts - Torts affecting the person - Assault - Battery - False Imprisonment - Malicious Prosecution - Nervous Shock - Torts affecting Immovable Property - Trespass to land - Nuisance - Public Nuisance and Private Nuisance -

### **Unit-IV**

Defamation - Negligence - Torts against Business Relations - Injurious falsehood - Negligent Misstatement - Passing off - Conspiracy - Torts affecting family relations - Remedies - Judicial and Extra-Judicial Remedies – Damages – Kinds of Damages – Assessment of Damages –

### **Unit-V Consumer Laws:**

Common Law and the Consumer - Duty to take care and liability for negligence - Product Liability - Consumerism –

**Suggested Readings:**

1. Winfield & Jolowicz: Law of Tort, XII edition, Sweet and Maxwell, London, 1984.
2. Salmond and Heuston: Law of Torts, XX edition, 2nd Indian reprint, Universal Book traders, New Delhi, 1994.
3. RamaswamyIyer: The Law of Torts, VII edition (Bombay, 1995).
4. Achutan Pillai: Law of Tort, VIII edition, Eastern Book Company, Lucknow, 1987.
5. Durga Das Basu: The Law of Torts, X edition, Prentice Hall of India, New Delhi, 1998.
6. RatanLal& Dhirajlal: The Law of Torts, 22nd edition, Wadhwa& Company Nagpur, 1992.

## LAW OF CONTRACT-I

Sub. Code: BL--109

L – 4, C – 4.

### Course Objectives

- To provide students with a foundational understanding of contract law, including the principles, rules, and regulations that govern the formation, performance, and enforcement of contracts.
- To equip students with the skills to analyze the essential elements of a contract, such as offer, acceptance, consideration, intention to create legal relations, and capacity to contract.
- To enable students to understand the rights and obligations of parties involved in a contract, including performance, breach, and the remedies available under contract law, such as damages, specific performance, and rescission. Exploring Special Types of Contracts:
- To introduce students to various types of contracts governed by the Contract Act, such as contracts of sale, contracts of agency, contracts of partnership, contracts for services, and contracts involving negotiable instruments.

### Unit I:

Definition and essentials of a valid Contract - Definition and essentials of a valid Offer - Definition and essentials of valid Acceptance - Communication of Offer and Acceptance - Revocation of Offer and Acceptance through various modes including electronic medium - Consideration - salient features - Exception to consideration

### Unit-II:

Capacity of the parties - Effect of Minor's Agreement - Contracts with insane persons and persons disqualified by law - Concepts of Free Consent - Coercion - Undue influence - Misrepresentation - Fraud - Mistake - Lawful Object - Immoral agreements and various heads of public policy - illegal agreements -

### Unit-III:

Discharge of Contracts - By performance - Appropriation of payments - Performance by joint promisors - Discharge by Novation - Remission - Accord and Satisfaction - Discharge by impossibility of performance (Doctrine of Frustration) -

### Unit-IV:

Quasi Contract - Necessaries supplied to a person who is incapable of entering into a contract - Payment by an interested person - Liability to pay for non-gratuitous acts - Rights of finder of lost goods - Things delivered by mistake or coercion - Quantum meruit -

### Unit-V:

Specific Relief - Recovering possession of property - Specific performance of the contract - Rectification of instruments -

**Suggested Readings:**

1. Anson: Law of Contract, Clarendon Press, Oxford, 1998.
2. Krishnan Nair: Law of Contract, S.Gogia& Co., Hyderabad 1995.
3. G.C.V. Subba Rao: Law of Contract, S.Gogia& Co., Hyderabad 1995.
4. T.S.VenkatesaIyer: Law of Contract, revised by Dr. Krishnama Chary,
5. S. Gogia& Co.
6. Avtar Singh: Law of Contract, Eastern Book Company, Lucknow, 1998.

## ECONOMICS – I

**Subject Code: BL – 111**

**L 4, C 4**

### Course Objective

- Introduce fundamental economic concepts: Understand the basic principles of economics, such as scarcity, opportunity cost, supply and demand, and the role of incentives in decision-making.
- Distinguish between microeconomics and macroeconomics:
- Learn the difference between microeconomic analysis (which focuses on individual markets, firms, and consumer behavior) and macroeconomic analysis (which focuses on broader economic phenomena like inflation, unemployment, and national economic growth).
- Examine economic systems: Explore the characteristics of different economic systems (market economies, command economies, mixed economies) and how they allocate resources.

**UNIT – I** Economics as a science and its relevance to law, Economics as a basis of Social Welfare and Social Justice, Free Enterprises,

**UNIT – II** General principles of Economics: Demand and Supply, Business Organizations, Labour and Wages,.

**UNIT – III** Markets – Determination of Prices, International comparisons of development strategies and experiences, **UNIT – IV** Control of Monopolies and prevention of economic concentration, Monopolies, **UNIT – V** Banking and Fiscal Policy: Resource mobilization and fiscal resources –

### Suggested Reading:

1. **Alfred W. Stonier and Douglas C. Hague:** The Essentials of Economics (London, 1955).
2. Economics – An Introductory Analysis (International Students Edition) 1961.
3. **Fredrlute Lewis:** Theory of Economic Growth, India Publishing House, 1970.
4. **C.T. Kurien:** Planning, Poverty and Social Transformation, 1926.
5. **M. Dipton:** Why Poor People stay poor Urban Bias in World Development, 1980.
6. **Myrdal, Gunnar:** The Challenges of World Poverty, 1971.
7. **Mahbub Ul Haq:** The Poverty: Certain Choices for the third World, 1976.
8. **Council, Campbell:** Economics (New York: Mc. Graw Hill Mark CB).

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# **Indian Economy-I**

**Subject Code: BL – 111A**

**L 4, C 4**

## **Course Objectives:**

- To understand the structure and characteristics of the Indian economy.
- To analyze the economic development of India since independence.
- To explore the key sectors of the Indian economy and their contributions.
- To critically examine government policies and their impact on economic growth.

## **Unit I: Introduction to the Indian Economy**

- Characteristics of the Indian Economy: A Developing Economy
- Demographic Features and Their Impact on Economic Development
- Natural Resources and Their Utilization in Economic Growth
- Economic Systems: Capitalism, Socialism, and Mixed Economy

## **Unit II: Economic Planning and Development**

- Evolution of Economic Planning in India: Five-Year Plans
- Objectives, Achievements, and Failures of Planning in India
- NITI Aayog: Structure and Role in Policy Formulation
- Sustainable Development Goals (SDGs) and India's Progress

## **Unit III: Agriculture in the Indian Economy**

- Role and Importance of Agriculture in India's Economic Development
- Land Reforms and Green Revolution: Achievements and Challenges
- Agricultural Marketing and Policies
- Current Issues: MSP, Farm Laws, and Food Security

## **Unit IV: Industry and Service Sector**

- Industrial Development in India: Public vs. Private Sector
- Role of MSMEs in Economic Growth
- Make in India and Industrial Policy Reforms
- Growth and Challenges of the Service Sector: IT, Tourism, and Healthcare

## **Unit V: Poverty, Unemployment, and Inequality**

- Poverty: Causes, Measurement, and Government Schemes
- Unemployment: Types, Causes, and Measures to Reduce Unemployment
- Economic Inequality in India: Regional and Income Disparities
- Role of Government and NGOs in Alleviating Poverty and Inequality

**Suggested Books:**

1. **"Indian Economy" by Ramesh Singh**
2. **"Indian Economy: Performance and Policies" by Uma Kapila**
3. **"The Indian Economy: Problems and Prospects" by Bimal Jalan**
4. **"India's Economy in the 21st Century" by Raj Kapila and Uma Kapila**
5. **"Indian Economy Since Independence" by A. Vaidyanathan**

## **Economics of Money and Banking (BL-111B)**

**Subject Code: BL – 111B**

**L 4, C 4**

### **Course Objectives:**

- To understand the fundamental concepts of money, banking, and monetary systems.
- To analyse the role of money in the economy and its impact on economic activities.
- To examine the structure, functions, and role of banks and financial institutions.
- To explore the interplay between monetary policy and the banking system in economic development.

### **Unit I: Introduction to Money**

- Evolution of Money: Barter System to Digital Money
- Definition, Functions, and Characteristics of Money
- Types of Money: Commodity Money, Fiat Money, and Cryptocurrency
- The Role of Money in the Economy: Classical and Keynesian Perspectives

### **Unit II: Money Supply and Demand**

- Measurement of Money Supply: M1, M2, M3, and M4
- Determinants of Money Demand: Transaction, Precautionary, and Speculative Motives
- Theories of Money: Quantity Theory of Money, Fisher and Cambridge Equations
- Factors Influencing Money Supply: Role of Central Bank and Commercial Banks

### **Unit III: Banking System in India**

- Structure of the Indian Banking System: Public, Private, and Cooperative Banks
- Functions and Roles of Commercial Banks
- Banking Regulations in India: Role of the Reserve Bank of India (RBI)
- Non-Banking Financial Institutions (NBFIs): Types and Functions

### **Unit IV: Central Banking and Monetary Policy**

- Role and Functions of a Central Bank
- Objectives and Instruments of Monetary Policy: Repo Rate, Reverse Repo Rate, CRR, and SLR
- Inflation Targeting and Monetary Policy Framework in India
- Relationship between Monetary Policy and Economic Stability



## **Unit V: Money Market and Financial System**

- Money Market: Features, Instruments, and Functions
- Capital Market vs. Money Market: Differences and Importance
- Financial Intermediaries: Role and Impact on Economic Growth
- Global Financial Systems and Emerging Trends: Cryptocurrencies and Digital Banking

### **Suggested Books:**

1. **"Economics of Money, Banking, and Financial Markets" by Frederic S. Mishkin**
2. **"Monetary Economics" by Suraj B. Gupta**
3. **"Money and Banking" by R.S. Sayers**
4. **"Indian Financial System" by M.Y. Khan**
5. **"Modern Banking Theory and Practice" by K.C. Shekhar and Lekshmy Shekhar**

# **Principle of Sustainable Finance-I (BL-111C)**

**Subject Code: BL – 111C**

**L 4, C 4**

## **Course Objectives:**

- To understand the fundamental principles of sustainable finance and its relevance in the modern economy.
- To explore the role of finance in promoting environmental, social, and governance (ESG) objectives.
- To analyse frameworks, strategies, and instruments used in sustainable finance.
- To assess the impact of sustainable finance on corporate performance and societal well-being.

## **Unit I: Introduction to Sustainable Finance**

- Definition, Scope, and Importance of Sustainable Finance
- Principles of Sustainability: Environmental, Social, and Governance (ESG) Factors
- Evolution of Sustainable Finance: Global Trends and Drivers
- The Role of Finance in Achieving the Sustainable Development Goals (SDGs)

## **Unit II: Environmental Finance**

- Green Finance: Concepts and Instruments (Green Bonds, Climate Funds, etc.)
- Financing Renewable Energy Projects and Low-Carbon Technologies
- Impact of Climate Change on Financial Markets
- Regulatory Frameworks and Standards for Environmental Finance

## **Unit III: Social and Governance Aspects of Finance**

- Socially Responsible Investing (SRI): Principles and Practices
- Corporate Social Responsibility (CSR) and its Financial Implications
- Governance in Financial Institutions: Transparency, Accountability, and Ethics
- Diversity, Equity, and Inclusion in Financial Decision-Making

## **Unit IV: Sustainable Investment Strategies**

- ESG Integration in Investment Decision-Making
- Risk Assessment in Sustainable Investments: Climate and Social Risks
- Measuring ESG Performance: Metrics and Reporting Standards (GRI, SASB, TCFD)
- The Role of Technology in Advancing Sustainable Finance (FinTech and GreenTech)

## **Unit V: Challenges and Opportunities in Sustainable Finance**

- **Barriers to Sustainable Financing: Market, Policy, and Institutional Challenges**
- **Financing Circular Economy and Sustainable Infrastructure**
- **Innovations in Sustainable Finance: Impact Investing and Social Bonds**
- **Case Studies of Successful Sustainable Finance Projects**

### **Suggested Books:**

1. **"Principles of Sustainable Finance" by Dirk Schoemaker and Willem Schramade**
2. **"Sustainable Investing: Revolutions in Theory and Practice" by Cary Krosinsky and Nick Robins**
3. **"Green Finance and Sustainability" by Magdalena Ziolo and Beata Ziolkowska**
4. **"Environmental Finance: A Guide to Environmental Risk Assessment and Financial Products" by Sonia Labatt and Rodney R. White**
5. **"Sustainable Finance: The Risks and Opportunities That (Some) Banks Ignore" by Molly Scott Cato**

# **SEMESTER II**

## ENGLISH II

Sub. Code: BL 102

L-4, C-4

### Course Objectives

- I. Borrowing from Other Languages: Over its history, English has borrowed words and influences from many languages, including Latin, Old Norse, French, Dutch, and others. This has contributed to its rich vocabulary.
- II. Simplification of Grammar: Over time, English grammar has become simpler. For example, Old English had more cases, gendered nouns, and verb conjugations, many of which have disappeared in Modern English.
- III. Influence of Literature: Writers like Shakespeare, Chaucer, and Milton not only helped shape the language with their creative use of vocabulary and grammar, but they also preserved it for future generations.
- IV. Colonialism and Globalization: British colonialism spread English across the world, and today, English is a global lingua franca, spoken by millions of people as a first or second language.

**Unit-I: Foundation Grammar:** Reading and Writing (as contained in the last two sections of “Better your English – I”) \*.

**Unit II: Technical Communication:** Nature, Origin and Development, Scope and Significance, Forms of Technical Communication, Differences Between Technical Communication and General Communication.

**Unit III: The Structure of sentence:** Sentences: Simple, Compound and Complex, Transformation of Sentence: Simple to Complex and vice-versa, Simple to Compound and vice – versa, Interrogative to Assertive and to Negative and vice – versa.

### Unit IV:

#### Reading Cultural Texts:

**Short – Story:** (Non detailed study).

1. The Lament – Anton Chekov.
2. Barbers’ Trade Union – R. K. Narayan.

**ORAL:** Discussion in detail, critical appreciation, grammatical exercises and making students read the stories and essays so that they may develop the reading habits with proper stress, intonation, pronunciation & rhythm.

**Text Books:**

1. Better your English – I, A Workbook for student, Macmillan India, New Delhi.
2. Singh R. P, An Anthology of English Short Stories –O.U.P., N. Delhi.
3. Singh R.P, An Anthology of English Essay –. O.U.P., N. Delhi.

**Reference Books:**

1. Raman Meenakshi & Sharma Sangeeta, Technical Communication Principle & Practice - O.U.P., N. Delhi.
2. Mohan Krishna & Banerji Meera – Developing Communication Skill – Macmillan India Ltd: N. Delhi.

## **Communication Skills in English II (BL-102 A)**

**Subject Code: BL – 102A**

**L 4, C 4**

### **Course Objectives:**

- To enhance advanced communication skills in English for academic, professional, and social contexts.
- To develop proficiency in written and spoken English with a focus on clarity and coherence.
- To foster critical thinking and analytical skills through effective reading and writing practices.
- To build confidence in delivering presentations, debates, and group discussions.

### **Unit I: Advanced Writing Skills**

- Essay Writing: Structure, Types, and Techniques
- Business Writing: Emails, Reports, and Proposals
- Writing Summaries and Abstracts
- Note-Making and Note-Taking Techniques

### **Unit II: Reading and Comprehension**

- Advanced Reading Strategies: Skimming, Scanning, and Critical Reading
- Analysing Literary and Non-Literary Texts
- Reading for Inference and Interpretation
- Vocabulary Building: Idioms, Phrasal Verbs, and Collocations

### **Unit III: Speaking Skills**

- Public Speaking: Structure and Delivery
- Debates and Group Discussions: Techniques and Practice
- Impromptu Speaking and Extempore
- Pronunciation and Accent Neutralization

### **Unit IV: Listening Skills**

- Listening for Specific Information and Gist
- Understanding Tone, Context, and Speaker's Intent
- Active Listening in Academic and Professional Settings
- Audio-Visual Aids for Listening Practice

### **Unit V: Professional Communication and Soft Skills**

- Preparing for Interviews: Techniques and Mock Practice

- **Presentation Skills: Using Visual Aids Effectively**
- **Workplace Communication: Meetings, Negotiations, and Feedback**
- **Non-Verbal Communication: Body Language and Etiquette**

**Suggested Books:**

1. **"Effective Communication Skills" by MTD Training**
2. **"English for Academic Purposes" by R.R. Jordan**
3. **"Business Communication: Process and Product" by Mary Ellen Guffey and Dana Loewy**
4. **"Cambridge English Skills: Real Listening and Speaking (Levels 3 and 4)" by Sally Logan and Craig Thaine**
5. **"Word Power Made Easy" by Norman Lewis**



## **Personality Development II (BL-102 B)**

**Subject Code: BL – 102B**

**L 4, C 4**

### **Course Objectives:**

- Understand the key components of personality and self-concept.
- Develop effective communication and interpersonal skills.
- Enhance emotional intelligence and self-regulation.
- Foster goal-setting and time management skills.

### **UNIT 1: Building Confidence and Self-Esteem**

- Understanding the impact of self-esteem on personality
- Techniques for boosting confidence
- Practice: Positive affirmations and visualization

### **UNIT 2: Goal Setting and Motivation**

- Smart goals: setting achievable objectives
- Motivation techniques and maintaining focus
- Practice: Goal-setting workshop

### **UNIT 3: Time Management and Organization**

- Importance of time management in personal development
- Techniques for prioritizing tasks
- Practice: Creating a personal time management plan

### **UNIT 4: Interpersonal Skills and Relationship Building**

- Understanding interpersonal dynamics
- Strategies for effective networking and relationship management

## **Suggested Readings**

1. "How to Win Friends and Influence People" by Dale Carnegie  
A classic on interpersonal skills, focusing on building relationships and effective communication.
2. "The 7 Habits of Highly Effective People" by Stephen R. Covey  
This book offers principles for personal effectiveness and holistic development.
3. "Mindset: The New Psychology of Success" by Carol S. Dweck  
Explores the concept of fixed vs. growth mindsets and how they influence personal development.
4. "Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman  
Discusses the importance of emotional intelligence in personal and professional success.

## History-II

Sub. Code: BL 104

L 4, C 4

### Course Objectives

- I. Engage in historical analysis: Develop the ability to interpret primary and secondary sources, assess historical evidence, and identify bias or limitations in sources.
- II. Conduct historical research: Learn to find, evaluate, and interpret historical sources, including documents, artifacts, and secondary literature.
- III. Write coherent historical essays: Develop skills in writing clear, evidence-based arguments, using proper historical methodology and citation.
- IV. Present historical arguments: Organize research findings effectively and present them in both written and oral formats, including formal essays, presentations, and reports.

### UNIT -1:

- Babur: Invasion, Conquests, Personality.
- Humayun: Struggle, Exile, Restoration.
- Shershah suri: Civil, Military and Revenue Administration Achievements.

### UNIT -2

- Jahangir: Deccan Policy, Influence of Nurjahan, Character of Nurjahan
- Shahjahan & Aurangzeb: Early Career, Religious Policy, Rajput policy.
- William Bentink and his policies.

### UNIT -3

- Economic charges: Land Revenue Settlements, Permanent Settlements, Ryotware, Mahalwari System.
- Revolt of 1857: Causes, Nature, Ideology, Programme, Leadership, Peoples

### UNIT-4

- Policies of Lord Canning, Lytton, Ripon and Curzan.
- The acts- 1858, 1892, 1919 and 1935.
- Emergence of organized Nationalism formation of Indian National Congress and its programme.

## UNIT-5

- Gandhian: Movements, Non-Co-operation, Civil Disobedience, Quit India

### Suggested Readings

- **"A History of Modern Europe"** by John Merriman
- Overview of European history from the Renaissance to modern times.
- **"The History of the World"** by J.M. Roberts
- A global perspective on world history and key events.
- **"Modern World History: 1750 to the Present"** by Duiker & Spielvogel
- Focuses on political, economic, and social developments since 1750.
- **"The Origins of the First World War"** by James Joll
- Analyzes the causes of World War I.
- **"History of the French Revolution"** by Georges Lefebvre
- In-depth study of the French Revolution and its effects.

## Sociology-II BL 104 A

**Subject Code: BL – 104A**

**L 4, C 4**

### **Course Objectives:**

- To understand advanced concepts in sociological theory and research.
- To analyse social institutions, structures, and systems.
- To explore contemporary issues related to social change, inequality, and globalization.
- To develop critical thinking skills through the study of social problems and the role of sociology in addressing them.

### **Unit 1: Sociological Theories and Perspectives**

- **1.1 Classical Sociological Theories:**
  - Auguste Comte, Karl Marx, Max Weber, Émile Durkheim, and Herbert Spencer.
  - Key concepts: Social order, social change, materialism, rationalization, the division of labor.
- **1.2 Modern Sociological Theories:**
  - Structural Functionalism (Talcott Parsons, Robert K. Merton).
  - Conflict Theory (Karl Marx, C. Wright Mills).
  - Symbolic Interactionism (George Herbert Mead, Erving Goffman).
  - Feminist Theory (Simone de Beauvoir, Judith Butler, bell hooks).
- **1.3 Post-Modern and Post-Structuralist Approaches:**
  - Michel Foucault, Pierre Bourdieu, Jacques Derrida.

### **Unit 2: Social Institutions**

- **2.1 Family and Kinship Systems:**
  - Types of families (nuclear, extended, single-parent).
  - Kinship: Functions, descent systems, marriage norms.
  - Changing roles of family in modern societies.
- **2.2 Education and Socialization:**
  - The role of education in socializing individuals.
  - Theories of education: Functionalist, conflict, and symbolic interactionist perspectives.

- Education inequalities: Class, caste, and gender disparities.
- **2.3 Religion and Society:**
  - Theories of religion: Functionalism (Durkheim), Conflict Theory (Marx), and Weber's interpretation.
  - Secularization and religious pluralism in contemporary societies.
  - Religion's role in social cohesion, conflict, and change.
- **2.4 Political Systems:**
  - Theories of power, authority, and the state (Weber, Marx).
  - Social movements: Causes, types, and impacts.
  - Democracy, citizenship, and political participation.

### **Unit 3: Social Stratification and Inequality**

- **3.1 Theories of Social Stratification:**
  - Karl Marx: Class and conflict.
  - Max Weber: Class, status, and party.
  - Functionalist theories of stratification (Davis and Moore).
- **3.2 Social Class and Caste Systems:**
  - Social mobility and class stratification.
  - Caste system in India: Traditional and contemporary perspectives.
  - Class in capitalist societies.
- **3.3 Gender, Race, and Ethnicity:**
  - Gender roles and inequality.
  - Feminist theories: Liberal, Marxist, and Radical feminism.
  - Race and ethnicity: Social construction of race and racial inequality.
- **3.4 Poverty and Marginalization:**
  - Theories of poverty: Structural and cultural explanations.
  - Poverty in the global south.
  - Social exclusion and its consequences.

## **Unit 4: Social Change and Development**

- **4.1 Theories of Social Change:**
  - Evolutionary theories of social change.
  - Conflict theories: Marxist perspectives on change.
  - Theories of modernization and dependency.
- **4.2 Development and Underdevelopment:**
  - Theories of development: Modernization vs. dependency theory.
  - The role of colonialism and globalization in shaping development.
  - Sustainable development and the Global South.
- **4.3 Urbanization and Industrialization:**
  - The process of urbanization: Causes and consequences.
  - Industrialization and its social impacts.
  - Urban social problems: Housing, unemployment, and inequality.

## **Unit 5: Contemporary Social Issues**

- **5.1 Crime, Deviance, and Social Control:**
  - Theories of crime: Functionalist, Conflict, and Symbolic Interactionist approaches.
  - Crime and deviance in contemporary societies.
  - The role of institutions in controlling deviance.
- **5.2 Health, Medicine, and Society:**
  - Sociology of health and illness.
  - Health disparities and their social causes.
  - The medicalization of society.
- **5.3 Globalization and Its Social Impacts:**
  - Theories of globalization: Cultural, economic, and political dimensions.
  - Impact of globalization on local cultures and economies.
  - Global social inequalities and transnational issues.

**Suggested Books:**

- Weber, M. (1978). *Economy and Society: An Outline of Interpretive Sociology*. University of California Press.
- Giddens, A. (2013). *Sociology* (8th ed.). Polity Press.
- Haralambos, M., Holborn, M., & Heald, R. (2013). *Sociology: Themes and Perspectives* (8th ed.). HarperCollins.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Haralambos, M., & Holborn, M. (2008). *Sociology: Themes and Perspectives* (7th ed.). HarperCollins Publishers.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Haralambos, M., Holborn, M., & Heald, R. (2013). *Sociology: Themes and Perspectives* (8th ed.). HarperCollins Publishers.
- Ritzer, G. (2017). *Sociological Theory* (9th ed.). McGraw-Hill Education.



## **Understanding Contemporary Social Issues-II (BL 104B)**

**Subject Code: BL – 104B**

**L 4, C 4**

### **Course Objectives:**

- To understand the social, political, and economic roots of contemporary issues.
- To analyze the impact of social problems on individuals and societies.
- To develop an ability to think critically about social issues and their global implications.
- To explore policy responses and social movements aimed at addressing social challenges.
- To foster an understanding of how global issues, intersect with local contexts.

### **Unit 1: Social Inequality and Discrimination**

#### **1. Theories of Social Inequality:**

- Structural-functionalism vs. conflict theory.
- Marxist analysis of class and power.
- Theories of stratification: Weber, Davis and Moore.

#### **2. Social Inequality:**

- Class, caste, and race-based inequality.
- Gender inequality: Feminist perspectives and the gender pay gap.
- The role of education and occupation in perpetuating inequality.

#### **3. Discrimination and Marginalization:**

- Racial and ethnic discrimination.
- Discrimination based on disability, sexuality, and age.
- Social exclusion and its effects on marginalized communities.

### **Unit 2: Globalization and Its Social Impacts**

#### **1. Understanding Globalization:**

- Definitions and key concepts: Economic, cultural, and political globalization.
- Theories of globalization: Modernization theory, world-systems theory, and dependency theory.

#### **2. Economic Globalization:**

- The global economy: Trade, multinational corporations, and economic policies.
- The impact of global economic practices on inequality and poverty.
- Financial crises and global economic interdependence.

#### **3. Cultural and Social Effects of Globalization:**

- Cultural homogenization and cultural imperialism.
- Global media, technology, and social change.
- Migration, transnational communities, and diasporas.

### **Unit 3: Environmental Issues and Social Change**

#### **1. Environmental Degradation:**

- Climate change: Causes, consequences, and global warming.
- Pollution, deforestation, and loss of biodiversity.
- The role of industrialization and consumer culture in environmental destruction.

#### **2. Sustainable Development:**

- The concept of sustainability: Economic, social, and environmental dimensions.
- Sustainable development goals (SDGs) and global efforts.
- Environmental justice and the unequal distribution of environmental harm.

#### **3. Social Movements and the Environment:**

- Environmental movements: Greenpeace, Fridays for Future, and local activism.
- Global environmental conferences and agreements (e.g., Paris Agreement).
- The role of media, advocacy, and policy in promoting sustainability.

### **Unit 4: Health and Social Issues**

#### **1. Health Inequalities:**

- The social determinants of health: Class, race, and access to care.
- Health disparities between countries (Global North vs. Global South).
- The impact of socio-economic status, education, and occupation on health outcomes.

#### **2. Mental Health:**

- The social construction of mental illness.
- Mental health stigma and the impact on treatment.
- Mental health policies and global mental health initiatives.

#### **3. Public Health and Social Movements:**

- The role of public health campaigns in addressing epidemics (e.g., HIV/AIDS, COVID-19).
- Global health issues: Access to healthcare and the impact of global health organizations (WHO).
- Social responses to pandemics and healthcare system challenges.

### **Unit 5: Crime, Deviance, and Social Control**

#### **1. Theories of Crime and Deviance:**

- Functionalist, conflict, and symbolic interactionist theories.
- Deviance and social norms: Labelling theory, strain theory, and conflict theory of crime.
- The relationship between inequality and criminal behaviour.

#### **2. Criminal Justice Systems:**

- Policing, incarceration, and the role of the state in managing crime.
- Mass incarceration and its socio-economic consequences.

- Juvenile delinquency and restorative justice.
- 3. **Social Control and Surveillance:**
  - The role of surveillance in modern societies (e.g., CCTV, social media).
  - Foucault's concept of panopticism and the state's control over individuals.
  - Privacy, civil liberties, and the ethics of surveillance.

#### Unit 6: Social Movements and Activism

1. **Theories of Social Movements:**
  - Resource mobilization theory.
  - Political opportunity structures.
  - New social movements: Environmental, feminist, and human rights movements.
2. **Activism in the Digital Age:**
  - Social media's role in organizing protests and global movements (e.g., #MeToo, Black Lives Matter).
  - Digital activism and online protests.
  - The role of hashtags, crowdfunding, and viral campaigns.
3. **Global and Local Movements:**
  - The influence of global movements on local politics (e.g., anti-globalization, anti-austerity protests).
  - The role of international organizations and grassroots movements in promoting change.

#### Suggested Books:

- Tarrow, S. (2011). *Power in Movement: Social Movements and Contentious Politics* (3rd ed.). Cambridge University Press.
- Castells, M. (2012). *Networks of Outrage and Hope: Social Movements in the Internet Age*. Polity Press.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Merton, R. K. (1968). *Social Theory and Social Structure*. Free Press.

## **Social Institutions in India-II (BL 104C)**

**Subject Code: BL – 104C**

**L 4, C 4**

### **Course Objectives:**

- To understand the historical development and significance of social institutions in India.
- To critically analyse the functioning and transformation of key social institutions in contemporary India.
- To explore the relationship between various social institutions and their impact on societal norms and values.
- To evaluate the impact of modernization, globalization, and policy interventions on social institutions.
- To assess the role of social institutions in shaping issues like inequality, gender, and class in India.

### **Unit 1: The Family and Kinship System in India**

#### **1. Traditional Family Structures:**

- The joint family system in India: History, structure, and significance.
- Kinship networks: Types, roles, and importance in traditional societies.
- Changes in family structure due to urbanization and modernization.

#### **2. Family Roles and Gender:**

- Patriarchy in Indian families: Socialization and division of labour.
- Role of women in the family: Empowerment and challenges.
- Changing roles of men and women in contemporary Indian families.

#### **3. Marriage and Kinship in Modern India:**

- Arranged marriage system and its evolution.
- Inter-caste and inter-religious marriages.
- Impact of globalization and media on marriage norms.

### **Unit 2: The Caste System and Social Stratification**

#### **1. Historical Development of Caste:**

- The origin and evolution of the caste system in India.
- The role of caste in social stratification and its impact on Indian society.
- Caste-based inequalities and the role of religion in sustaining the caste system.

#### **2. Caste in Contemporary India:**

- Caste in the modern Indian economy and politics.
- Affirmative action policies: Reservation system and its impact on caste dynamics.
- Changing role of caste in urban and rural settings.

#### **3. Caste and Social Movements:**

- The role of social reform movements: Brahmi Samaj, Arya Samaj, and Dalit movements.

- Modern Dalit activism and the struggle for caste equality.

### **Unit 3: Religion and Society in India**

#### **1. Religious Diversity and Secularism:**

- India as a land of religious diversity: Major religions and their influence on social life.
- Secularism in India: Theoretical perspectives and practical challenges.
- The role of religion in Indian politics and identity.

#### **2. Religious Institutions and Practices:**

- The role of temples, mosques, churches, and gurdwaras in shaping social behavior.
- Religious rituals and festivals: Their role in community building and social cohesion.
- Modernization and its impact on traditional religious practices.

#### **3. Religious Conflict and Social Change:**

- Communalism, religious intolerance, and inter-religious conflicts in India.
- Role of religion in social movements: Hindu revivalism, Islamic movements, and Christian missionary activities.
- Secularization and its challenges in modern India.

### **Unit 4: The Education System in India**

#### **1. Historical Evolution of Education in India:**

- Traditional education systems: Gurukuls, Madrasas, and indigenous learning.
- Colonial education and its impact on Indian society.
- The rise of modern education: The role of the British and post-independence education reforms.

#### **2. Challenges in the Education System:**

- Access to education: Rural-urban divide, caste, and gender disparities.
- Quality of education: Infrastructure, curriculum, and teacher training.
- Policies for educational reforms: Right to Education Act and skill development programs.

#### **3. Higher Education and Globalization:**

- The growth of higher education institutions: Universities, technical institutes, and research centres.
- Globalization and the rise of private educational institutions.
- Brain drain and the global competition in education.

## **Unit 5: The Political System and Governance in India**

### **1. Constitution and Democracy:**

- The Indian Constitution: Its significance, provisions, and challenges.
- The structure of Indian democracy: Political parties, elections, and the functioning of Parliament.
- Federalism, state vs. central power, and political decentralization.

### **2. Politics of Caste, Class, and Identity:**

- Caste-based politics and the role of affirmative action.
- Role of class and identity politics in shaping electoral outcomes.
- The rise of regional political parties and their impact on national politics.

### **3. Challenges in Indian Governance:**

- Corruption, governance deficits, and policy paralysis.
- Political dynasties and their impact on democracy.
- Social movements and their influence on political change.

### **Suggested Books:**

- Brass, P. R. (1990). *The Politics of India Since Independence*. Cambridge University Press.
- Jain, A. K. (1999). *Indian Politics and Government*. India: Vikas Publishing.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Thorat, S., & P. Sudarshan (2005). *Dalits and the State: Contemporary Indian Issues*. Oxford University Press.
- Desai, A. R. (1996). *Social Background of Indian Nationalism*. Popular Prakashan.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Madan, T. N. (1991). *Religion in India*. Oxford University Press.
- Nandy, A. (2004). *The Intimate Enemy: Loss and Recovery of Self Under Colonialism*. Oxford University Press.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.

## Political Science-II

**Sub. Code: BL 106**

**L 4, C 4**

### Course Objectives

- Build on foundational knowledge by exploring more complex political ideologies and theories, including liberalism, conservatism, socialism, feminism, nationalism, and post-colonialism.
- Examine political institutions in-depth: Analyse the structure, functions, and interactions of political institutions such as legislatures, executives, judiciaries, political parties, and interest groups.
- Explore comparative politics: Compare political systems and regimes across different countries, understanding the factors that shape political stability, democratic governance, and authoritarianism.
- Study political participation: Investigate how individuals and groups participate in political processes through voting, protests, advocacy, and other forms of political action

### Unit-I: Government

Government, Organization of Government: Legislature

### Unit- II: Forms of Government

Dictatorship, Democracy (Features)

### Unit III: Forms of Government

Unitary, Federal (Features)

### Unit IV: Forms of Government

Parliamentary, Presidential (Features)

### Suggested Readings:

1. Asirvatham , Political Theory, S. Chand & Company.
2. A.C. Kapoor, Principles of Political Science, S. Chand & Company.
3. Pennock and Smith, Political Science- An Introduction. Macmillan (New York)
4. Caramani, Daniele, Comparative Politics, Oxford University Press.

## **Society and Gender (BL 106A)**

**Subject Code: BL – 106A**

**L 4, C 4**

### **Course Objectives:**

- To understand the social construction of gender and its impact on various aspects of society.
- To critically analyse gender inequalities in the family, workplace, education, and politics.
- To explore the concept of intersectionality and its application in understanding gender relations.
- To examine global and local feminist movements and their impact on societal change.
- To assess contemporary issues related to gender, such as sexual harassment, gender-based violence, and LGBTQ+ rights.

### **Unit 1: Gender and Socialization**

#### **1. Theories of Gender Socialization:**

- Theories of gender socialization: Freud, Mead, and Parsons.
- Gender roles: How they are learned and perpetuated in society.
- The impact of family, peers, media, and education in shaping gender identities.

#### **2. Gender and Identity Formation:**

- The development of gender identity from childhood to adulthood.
- The role of cultural norms, family structures, and religious teachings in shaping gender roles.
- Gender nonconformity and the fluidity of gender identity.

#### **3. Socialization and Gender Inequality:**

- How gender socialization contributes to inequality: Patriarchy, sexism, and traditional gender roles.
- The influence of gender norms on women's and men's life choices, career paths, and aspirations.

### **Unit 2: Gender and Family**

#### **1. The Family as a Gendered Institution:**

- The role of family in gender socialization: Division of labor and caregiving roles.
- The impact of gender on family structures: Marriage, parenting, and caregiving.
- The changing family dynamics in response to gender equality movements.

#### **2. Reproduction and Gender:**

- The politics of reproduction: Reproductive rights, fertility, and family planning.
- Gendered division of labour in household chores and childcare.
- The concept of motherhood and its social implications.

#### **3. Marriage, Divorce, and Gender Relations:**



- The changing institution of marriage: The impact of feminism and women's rights on marriage norms.
- Gender roles in marital relationships: Power dynamics, decision-making, and economic contributions.
- Divorce and its gendered impact: Economic independence, custody rights, and social stigma.

### **Unit 3: Gender, Work, and Economy**

#### **1. Gender and Labor:**

- Gendered division of labour: Occupational segregation, the wage gap, and vertical and horizontal segregation.
- The role of women in the workforce: History, contributions, and challenges.
- Men and unpaid labour: Changing gender roles in caregiving and household tasks.

#### **2. Feminism and Economic Systems:**

- Feminist perspectives on economic inequality: Marxist, liberal, and socialist feminist views.
- Women in the informal economy: Labour exploitation, domestic work, and global supply chains.
- Gender, globalization, and the impact of transnational corporations on women's labour.

#### **3. Gender and Work-Life Balance:**

- The challenges of work-life balance for women and men.
- The impact of gender on career choices, promotions, and leadership roles.
- Policies and programs for promoting gender equality in the workplace: Affirmative action, maternity leave, and equal pay.

### **Unit 4: Gender and Politics**

#### **1. Gender and Political Representation:**

- The underrepresentation of women in politics: Barriers to political participation and leadership.
- Gender quotas and affirmative action in political offices.
- Women's political activism: Local and global perspectives.

#### **2. Feminist Politics and Social Movements:**

- The history of feminist movements: First, second, and third waves.
- Contemporary feminist activism: Issues such as reproductive rights, violence against women, and LGBTQ+ rights.
- Global feminism: Intersectionality, solidarity, and transnational movements.

#### **3. Gender, Power, and the State:**

- The role of the state in shaping gender relations: Laws, policies, and gender justice.
- Gender and citizenship: Rights, access to services, and social welfare.

- The impact of neoliberalism and globalization on gendered policies.

## Unit 5: Gender, Violence, and Social Change

### 1. **Gender-Based Violence:**

- Forms of gender-based violence: Domestic violence, sexual harassment, trafficking, and femicide.
- Causes and consequences of gender-based violence: Patriarchy, power dynamics, and social structures.
- Legal frameworks and policies addressing gender-based violence.

### 2. **Sexual Harassment and Workplace Violence:**

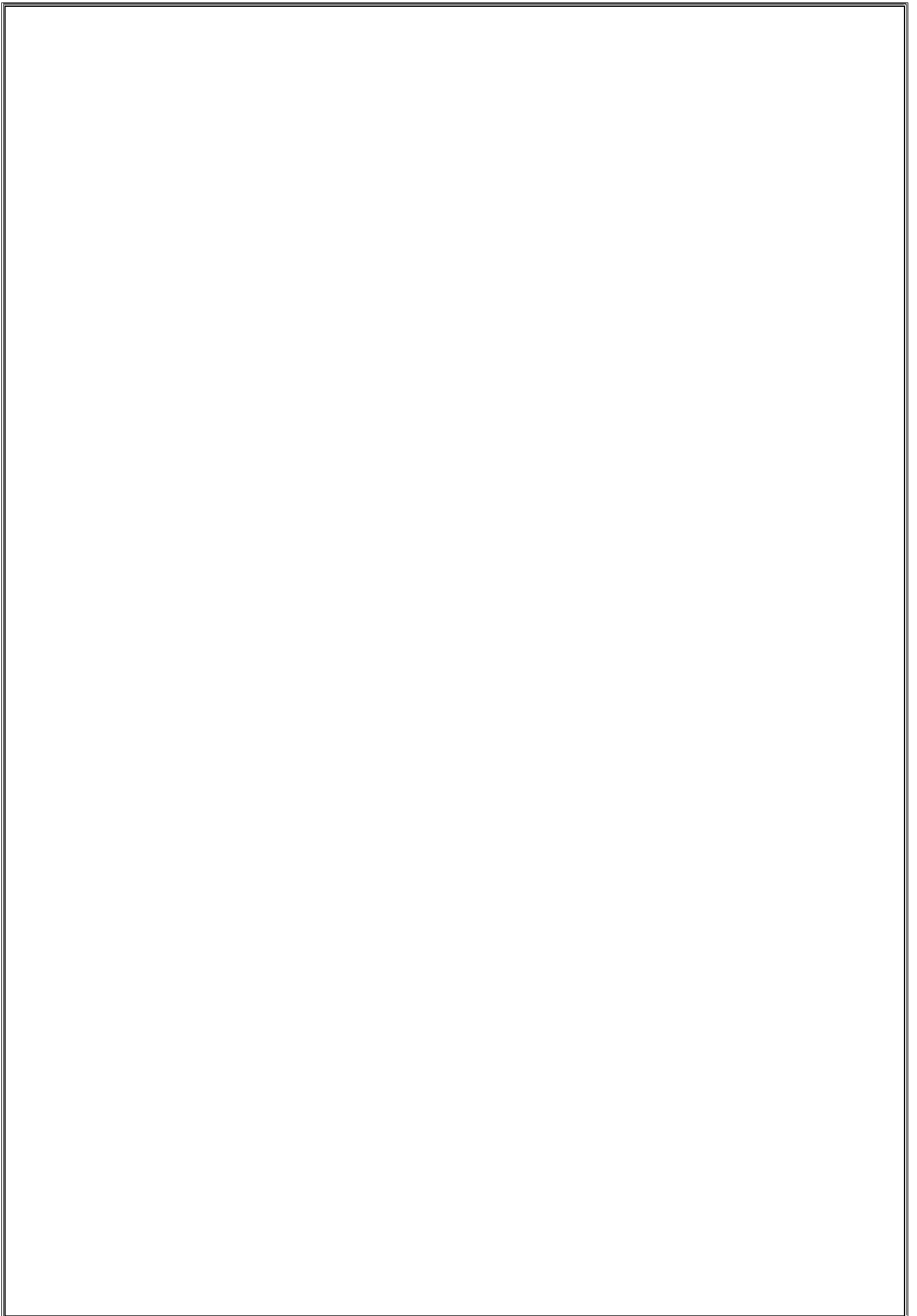
- The #MeToo movement and its impact on social and legal reforms.
- Gender, power, and sexual harassment in different contexts: Workplace, education, and public spaces.
- The role of media in exposing and addressing gender-based violence.

### 3. **Gender and Social Change:**

- Feminist interventions in law, media, and policy.
- Gender mainstreaming and strategies for social change.
- The role of education and social movements in transforming gender norms.

## **Suggested Books:**

- Crenshaw, K. (1991). *Mapping the Margins: Intersectionality, Identity Politics, and Violence Against Women of Color*. Stanford Law Review.
- Mohanty, C. T. (2003). *Feminism Without Borders: Decolonizing Theory, Practicing Solidarity*. Duke University Press.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Walby, S. (1990). *Theorizing Patriarchy*. Blackwell Publishing.
- Nussbaum, M. (1999). *Sex and Social Justice*. Oxford University Press.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Acker, J. (2006). *Hierarchies, Jobs, Bodies: A Theory of Gendered Organizations*. *Gender & Society*, 20(4), 441-464.
- England, P. (2010). *The Gender Revolution: Uneven and Stalled*. *Gender & Society*, 24(2), 149-168.
- Giddens, A., Duneier, M., Appelbaum, R.P., & Carr, D. (2017). *Introduction to Sociology* (10th ed.). W.W. Norton & Company.
- Acker, J. (2006). *Hierarchies, Jobs, Bodies: A Theory of Gendered Organizations*. *Gender & Society*, 20(4), 441-464.
- England, P. (2010). *The Gender Revolution: Uneven and Stalled*. *Gender & Society*, 24(2), 149-168.



## **Comparative Politics-II (BL 106B)**

**Subject Code: BL – 106B**

**L 4, C 4**

### **Course Objectives:**

- To deepen the understanding of different political systems and institutions.
- To develop skills for comparative analysis of political structures, processes, and outcomes.
- To critically evaluate the role of political institutions, political parties, and electoral systems in governance.
- To understand the impact of globalization on state sovereignty, democracy, and governance.
- To analyse the evolving nature of political authority, state capacity, and legitimacy in diverse political systems.

### **Unit 1: Political Systems and Political Structures**

#### **1. Types of Political Systems:**

- The concept of political systems: Democracy, authoritarianism, totalitarianism, and hybrid regimes.
- Characteristics and functioning of parliamentary and presidential systems.
- Comparative analysis of democratic and non-democratic political systems.

#### **2. Political Institutions:**

- Role of executive, legislature, and judiciary in different political systems.
- Analysis of constitutional frameworks: Federal vs. unitary systems.
- Political parties and party systems: Party structure, ideologies, and electoral systems.

#### **3. Government Structures:**

- Presidential, parliamentary, and mixed systems: Their evolution, advantages, and challenges.
- Case studies: USA, UK, France, India, and Brazil.

### **Unit 2: Political Culture and Political Socialization**

#### **1. Political Culture:**

- Definition, types, and components of political culture.
- The role of political culture in shaping democratic values and political behavior.
- The influence of national identity, traditions, and religion on political culture.

#### **2. Political Socialization:**

- Socializing agents: Family, education, media, and peer groups.
- The role of political socialization in the formation of public opinion and political participation.
- Comparative study of political socialization in different political systems.

#### **3. Case Studies in Political Culture:**

- Political culture in democratic societies: USA, India, and France.

- Political culture in authoritarian regimes: China, Russia, and North Korea.

### **Unit 3: Comparative Political Economy**

#### **1. State and Market Relations:**

- Theories of political economy: Capitalism, socialism, and welfare states.
- Economic systems and political governance: Free market vs. planned economies.
- Globalization and its impact on national economies: Trade, investment, and financial flows.

#### **2. Development Models and State Capacity:**

- Theories of state development: Modernization theory, dependency theory, and post-colonial critique.
- The role of the state in economic development: Economic planning and policy-making.
- Comparative analysis of development in different countries: Success stories and failures (e.g., South Korea vs. Sub-Saharan Africa).

#### **3. Political Economy of Transition:**

- The transition from command economies to market economies: Case studies of China, Russia, and Eastern Europe.
- The role of political regimes in economic reforms and transitions.

### **Unit 4: Electoral Systems and Political Participation**

#### **1. Electoral Systems and Voting Behavior:**

- Types of electoral systems: Majoritarian, proportional representation, and mixed systems.
- The impact of electoral systems on party systems, voter behavior, and political representation.
- Comparative analysis of electoral systems in the UK, USA, India, and Germany.

#### **2. Political Participation and Public Opinion:**

- Voter turnout and the factors affecting political participation.
- Political participation beyond voting: Protests, strikes, and civil society movements.
- The role of media in shaping public opinion and electoral outcomes.

#### **3. Party Systems and Political Representation:**

- Major political party systems: Single-party, two-party, multi-party systems.
- The role of political parties in democratic and authoritarian regimes.
- Case studies: Political parties in the USA, India, and France.

## **Unit 5: Political Institutions and Governance**

### **1. Legislatures and Lawmaking:**

- The role of legislatures in policy-making and governance.
- Bicameral vs. unicameral systems: Their advantages and challenges.
- Comparative analysis of legislative systems: UK, USA, India, and Brazil.

### **2. Judiciaries and Legal Systems:**

- The role of judicial independence and its relation to democracy.
- Comparative study of judicial systems: Common law vs. civil law traditions.
- The role of the judiciary in protecting human rights and the rule of law.

### **3. Bureaucracy and Governance:**

- The role of the bureaucracy in policy implementation.
- Civil service reform: The challenges of corruption and inefficiency.
- Case studies on governance: Comparative analysis of administrative systems.

## **Suggested Books:**

- Diamond, L. (2008). *The Spirit of Democracy: The Struggle to Build Free Societies Throughout the World*. Times Books.
- Linz, J. J. (2000). *Totalitarian and Authoritarian Regimes*. Lynne Rienner Publishers.
- Huntington, S. P. (1991). *The Third Wave: Democratization in the Late Twentieth Century*. University of Oklahoma Press.
- Bagehot, W. (2001). *The English Constitution*. Blackmask Online.
- Shapiro, I., & Stokes, S. (2008). *Democracy's Edges*. Cambridge University Press.
- Lijphart, A. (2012). *Democracy in Plural Societies: A Comparative Exploration*. Yale University Press.
- Heywood, A. (2013). *Politics* (4th ed.). Palgrave Macmillan.
- Stiglitz, J. E. (2002). *Globalization and its Discontents*. W.W. Norton & Company.
- Rodrik, D. (2011). *The Globalization Paradox: Democracy and the Future of the World Economy*. W.W. Norton & Company.

## Political Theories-II (BL 106C)

Subject Code: BL – 106C

L 4, C 4

### Course Objectives:

- To understand the development of key political ideologies and thinkers.
- To critically analyse political thought in relation to contemporary issues such as human rights, democracy, and governance.
- To examine the evolution of core political concepts such as liberty, equality, justice, and power.
- To explore the intersection of political theory with social, economic, and cultural factors in shaping modern political systems.

### Unit 1: Classical Political Thought

#### 1. Plato and Aristotle:

- Plato's *Republic* and his concept of justice, the philosopher-king, and the ideal state.
- Aristotle's *Politics* and his views on democracy, polity, and the role of the citizen in governance.
- Comparison between Plato's and Aristotle's views on the state and politics.

#### 2. Machiavelli:

- Machiavelli's *The Prince* and his views on power, the role of the ruler, and the use of deceit and force in politics.
- The concept of *virtù* and *fortuna*, and their application to modern political analysis.
- Machiavelli's republicanism in *Discourses on Livy*.

#### 3. Hobbes, Locke, and Rousseau:

- Hobbes's theory of the state of nature, the social contract, and the need for an absolute sovereign (*Leviathan*).
- Locke's theories of natural rights, private property, and the limited government (*Two Treatises of Government*).
- Rousseau's general will, social contract, and critique of inequality (*The Social Contract*).

### Unit 2: Modern Political Thought

#### 1. John Stuart Mill:

- Mill's liberalism: *On Liberty*, utilitarianism, and the principle of harm.
- The concept of individual liberty, freedom of speech, and women's rights (e.g., *The Subjection of Women*).
- The limits of state intervention and the idea of a free market.

## 2. **Karl Marx:**

- Marx's critique of capitalism: Historical materialism, class struggle, and the theory of surplus value (*The Communist Manifesto*).
- Marxist views on the state, revolution, and the dictatorship of the proletariat.
- Influence of Marxist thought on modern political movements.

## 3. **Friedrich Hayek and Milton Friedman:**

- Hayek's critique of central planning and socialism (*The Road to Serfdom*).
- Friedman's advocacy for free markets and minimal state intervention (*Capitalism and Freedom*).

### **Unit 3: Political Ideologies**

#### 1. **Liberalism:**

- The core tenets of liberal thought: Individualism, freedom, equality, and democracy.
- Classical vs. modern liberalism: From Locke and Mill to Rawls and Nozick.
- The liberal critique of state intervention and the role of the market.

#### 2. **Socialism and Communism:**

- Marxist socialism and the critique of capitalism.
- Democratic socialism and the welfare state.
- Communism as an ideology of revolutionary change, from Marx to Lenin.

#### 3. **Conservatism:**

- Key ideas of conservatism: Tradition, authority, gradual change, and skepticism of revolution.
- Edmund Burke's defense of tradition and society.
- Modern conservatism: The role of the state, free market, and cultural values.

#### 4. **Feminism and Gender Theories:**

- Feminist political theory: Equality, justice, and critique of patriarchy.
- Liberal feminism, Marxist feminism, and radical feminism.
- Gender and political power: Theories of sexual politics and intersectionality.

### **Unit 4: Contemporary Political Thought**

#### 1. **Postmodernism and Critical Theory:**

- Michel Foucault's views on power, knowledge, and discipline.
- Postmodern critiques of grand narratives and ideologies.
- Critical Theory and the Frankfurt School: Adorno, Horkheimer, and Habermas.

#### 2. **Globalization and Political Thought:**

- Global justice and the ethics of globalization.
- Cosmopolitanism vs. nationalism: Theories of global governance.
- The role of international organizations, such as the UN and WTO.

#### 3. **Environmental Political Thought:**



- Green political thought: Environmental justice, sustainability, and eco-feminism.
- The critique of industrialism and the quest for eco-socialism.
- The politics of climate change and global environmental movements.

## **Unit 5: Modern Political Issues and Ideas**

### **1. Democracy and Its Challenges:**

- Theories of democracy: Deliberative democracy, participatory democracy, and liberal democracy.
- Challenges to democracy: Populism, authoritarianism, and illiberal democracy.
- Democratic backsliding: Case studies from Eastern Europe and Latin America.

### **2. Nationalism and Multiculturalism:**

- Theories of nationalism: Ethnic vs. civic nationalism.
- Multiculturalism and its political implications.
- Nationalism, citizenship, and global migration.

### **3. Human Rights and Justice:**

- The evolution of human rights theory: Natural rights, civil rights, and social rights.
- Justice theories: Distributive justice, global justice, and reparative justice.
- Human rights in practice: International law and humanitarian interventions.

## **Suggested Books:**

- Dahl, R.A. (1989). *Democracy and Its Critics*. Yale University Press.
- Smith, A.D. (1998). *Nationalism and Modernism*. Routledge.
- Kymlicka, W. (1995). *Multicultural Citizenship: A Liberal Theory of Minority Rights*. Oxford University Press.
- Rawls, J. (1993). *Political Liberalism*. Columbia University Press.

## **Unit 6: Contemporary Political Theory and Applications**

### **1. Global Political Theory:**

- Cosmopolitanism and global ethics.
- Theories of international justice: Global poverty, migration, and conflict.
- Postcolonial political theory: Colonialism, decolonization, and the politics of identity.

### **2. Political Theory and the Environment:**

- Ecological justice: Environmental ethics and political theory.
- The relationship between political economy and environmental sustainability.
- Green political movements and the global climate crisis.

### **Suggested Books:**

- Held, D. (2010). *Global Political Theory*. Polity Press.
- Nussbaum, M.C. (2006). *Frontiers of Justice: Disability, Nationality, Species Membership*. Belknap Press.
- Scruton, R. (2008). \*Green
- Plato. (2003). *The Republic*. Trans. G.M.A. Grube. Hackett Publishing.
- Aristotle. (2009). *Politics*. Trans. C.D.C. Reeve. Hackett Publishing.
- Machiavelli, N. (1998). *The Prince*. Trans. W. K. Marriott. Dover Publications.
- Hobbes, T. (1994). *Leviathan*. Cambridge University Press.
- Locke, J. (1980). *Two Treatises of Government*. Cambridge University Press.
- Rousseau, J.J. (2002). *The Social Contract*. Trans. G.D.H. Cole. Dover Publications
- Dahl, R.A. (1989). *Democracy and Its Critics*. Yale University Press.
- Smith, A.D. (1998). *Nationalism and Modernism*. Routledge.
- Kymlicka, W. (1995). *Multicultural Citizenship: A Liberal Theory of Minority Rights*. Oxford University Press.
- Rawls, J. (1993). *Political Liberalism*. Columbia University Press.

# Constitutional Law - I

**Sub. Code: BL 108**

**L – 4, C – 4.**

## Course Objectives

- Examine federalism and state powers: Explore the relationship between federal and state governments, including the distribution of powers and how conflicts are resolved, with an emphasis on landmark cases in federalism.
- Study separation of powers: Analyse the separation of powers among the three branches of government (executive, legislative, and judiciary) and the checks and balances system designed to prevent any one branch from becoming too powerful.
- Understand the role of the judiciary: Study the judicial power in interpreting and applying the Constitution, including the principle of judicial review, and the role of courts in constitutional interpretation.
- Study fundamental rights and liberties: Delve into the rights protected by the Constitution, particularly those in the Bill of Rights and the Fourteenth Amendment, including freedom of speech, religion, and privacy.

## Unit-I

Constitution-Meaning and Significance - Evolution of Modern Constitutions -Classification of Constitutions-Indian Constitution - Historical Perspectives - Government of India Act, 1919 -

## Unit-II

Nature and Salient Features of Indian Constitution - Preamble to Indian Constitution - Union and its Territories-Citizenship - General Principles relating to Fundamental Rights (Art.13) -

## Unit-III

Right to Equality (Art.14-18) – Freedoms and Restrictions under Art.19 - Protection against Ex-post facto law - Guarantee against Double Jeopardy - Privilege against Self-incrimination - Right to Life and Personal Liberty -

## Unit-IV

Rights against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Limitations on Fundamental Rights (Art.31-A,B and C)

## Unit-V

Directive Principles of State Policy

**Suggested Readings:**

1. M.P.Jain, Indian Constitutional Law, Wadhwa& Co, Nagpur
2. V.N.Shukla, Constitution of India, Eastern Book Company, Lucknow
3. Granville Austin, Indian Constitution-Cornerstone of a Nation, OUP, New Delhi
4. H.M.Seervai, Constitutional Law of India (in 3 Volumes), N.M.Tripathi, Bombay
5. G.C.V.Subba Rao, Indian Constitutional Law, S.Gogia& Co., Hyderabad
6. B.Shiva Rao: Framing of India's Constitution (in 5 Volumes), Indian Institute of Public Administration, New Delhi
7. J.N.Pandey, Constitutional Law of India, Central Law Agency, Allahabad

## Law of Contract - II

Sub. Code: BL 110

L – 4, C – 4.

### Course Objectives

- Study advanced elements of contract formation: Explore the essential components for a valid contract (offer, acceptance, consideration, capacity, and legality) in more depth, including situations involving ambiguous terms, pre-contractual negotiations, and implied contracts.
- Analyze unilateral and bilateral contracts: Understand the differences between unilateral and bilateral contracts, and explore how each is formed, enforced, and discharged.
- Explore contract formation in specialized areas: Examine contracts involving commercial transactions, construction, and complex agreements, and analyze how standard industry practices influence contract formation. Study express and implied terms: Learn to differentiate between express terms (clearly stated in the contract) and implied terms (those inserted by law or custom) and their enforceability.
- Analyze standard form contracts: Investigate the use of standard terms or "boilerplate" clauses, focusing on their fairness, enforceability, and the potential for unconscionability or other defenses.

### Unit-I:

Indemnity and Guarantee - Contract of Indemnity, definition - Rights of Indemnity holder - Liability of the indemnified - Contract of Guarantee - Definition of Guarantee - Essential characteristics of Contract of Guarantee - Distinction between Indemnity and Guarantee - Kinds of Guarantee - Rights and liabilities of Surety - Discharge of surety. Contract of Bailment -

### Unit-II:

Contract of Agency - Definition of Agent - Creation of Agency - Rights and duties of Agent - Delegation of authority - Personal liability of agent - Relations of principal and agent with third parties

### Unit-III:

Contract of Sale of Goods - Formation of contract - Subject matter of sale - Conditions and Warranties -

### Unit-IV:

Property - Possession and Rules relating to passing of property - Sale by non-owner - Nemo dat quod non habet - Delivery of goods - Rights and duties of seller and buyer before and after sale -

### Unit-V:

Contract of Partnership - Definition and nature of partnership - Formation of partnership- Test of partnership - Partnership and other associations.

**Suggested Readings:**

1. Anson's Law of Contract, 25th Ed. 1998, Oxford University Press, London.
2. Venkatesh Iyyer: The Law of Contracts and Tenders, Gogia & Company Hyderabad.
3. Cheshire & Fifoot: Law of Contract, Butterworth, London, 1976.
4. Mulla: The Indian Contract Act, N.M. Tripathi (P) Ltd. Bombay, 1984.
5. G.C.V. Subba Rao: Law of Contracts, S. Gogia & Co., Hyderabad, 1995.
6. Krishnan Nair: Law of Contracts, S. Gogia & Co. Hyderabad, 1995.
7. Avtar Singh: Law of Contracts, Eastern Book Company, Lucknow, 1998.
8. A Ramaiah's Sale of Goods Act, 4th Ed. 1998, The Law Book Co., Allahabad.
9. Benjamin's Sale of Goods, 1st Ed. 1978, Sweet & Maxwell, London.
10. P.S. Atiyah: Sale of Goods Act, 9th Ed. 1997, Universal Book Traders, Delhi.

## **Economics-II**

**Sub. Code: BL 112**

**L 4, C 4**

### **Course Objectives**

- Examine taxation and public finance: Study the theory of taxation, including different types of taxes (income, sales, property), their effects on individuals and businesses, and how they impact economic efficiency and equity.
- Understand government intervention and market failure: Analyze the role of government in correcting market failures, such as through regulation, public goods provision, externality correction, and income redistribution.
- Study social welfare and redistribution policies: Examine policies aimed at reducing inequality, such as progressive taxation, welfare programs, and social insurance. Investigate the efficiency and equity of various redistributive mechanisms.
- Explore fiscal policy and its impact on the economy: Understand how governments use fiscal policy (public spending and taxation) to influence economic activity, manage inflation, and address unemployment.

### **Unit-I: Introduction**

- (a). Structural Changes in Indian Economy in Post 1991 period.
- (b). New Economic policy, Liberalizations and Privatization.

### **Unit-II: Agriculture Sector**

- (a). Features and problems in Indian Agriculture.
- (b). Land Reforms in India

### **Unit-III: Industrial Sector**

- (a). Industrial Policy in India since 1948 and recent Changes in with reference to economic Problems.
- (b). Industrial Sickness, Causes and its remedies.

### **Unit-IV: Economic Institutions in India**

- (a). Single Proprietorship, Partnership.
- (b). Trust and Cooperative Societies.

### **Unit-V: Foreign Trade & Investment**

- (a). Foreign Trade Policy, major problems of Indian Export Sector.

### **Suggested Readings**

1. Aggarwal A.N., Indian Economy, Vikas Publication, New Delhi.
2. Hanumanta Rao C.H. & Joshi F.C., Reflections of Economic Development and Social Changes.
3. Rudder Dutt & KPM Sundaram, Indian Economy, S. Chand & Co.



## **Indian Economy-II (BL-112 A)**

**Subject Code: BL – 112A**

**L 4, C 4**

### **Course Objectives:**

- To deepen understanding of key economic concepts and theories related to the Indian economy.
- To examine India's economic growth trajectory, sectoral transformations, and the policy measures implemented by the government.
- To critically analyse the challenges and opportunities facing the Indian economy.
- To explore the role of India in the global economy and its economic relations with other nations.
- To evaluate the effectiveness of various policy interventions in addressing socio-economic issues in India.

### **Unit 1: Economic Growth and Planning in India**

#### **1. Economic Growth in India:**

- Trends in India's economic growth post-independence.
- Factors influencing India's economic growth: Population, infrastructure, investment, and human capital.
- Growth theories and their application to the Indian context.

#### **2. Planning in India:**

- Evolution of planning in India: From Five-Year Plans to NITI Aayog.
- Role of public sector in planning and industrial development.
- Issues in the planning process: Targets, allocation of resources, and plan implementation.

#### **3. Economic Reforms and Liberalization:**

- The 1991 economic reforms: Structural adjustments, liberalization, privatization, and globalization.
- Impact of reforms on India's industrial, trade, and financial sectors.
- Critiques of economic reforms and the challenges faced in inclusive growth.

### **Unit 2: Sectoral Composition of Indian Economy**

#### **1. Agriculture:**

- Role of agriculture in India's economy: Employment, GDP contribution, and food security.
- Agricultural policies and reforms: Green Revolution, land reforms, and current challenges.

- Issues in rural development, agriculture sustainability, and the impact of climate change on agriculture.
- 2. **Industry and Manufacturing:**
  - Structure of the industrial sector in India: MSMEs, large industries, and the role of technology.
  - Industrial policy and reforms: Post-liberalization changes in the industrial landscape.
  - Make in India initiative and its impact on manufacturing.
- 3. **Services Sector:**
  - Growth and significance of the services sector in India: IT, financial services, tourism, and healthcare.
  - Contribution of the services sector to GDP and employment.
  - Challenges facing the services sector, including skill development, infrastructure, and regulation.

### **Unit 3: Fiscal and Monetary Policy in India**

1. **Fiscal Policy:**
  - Overview of India's fiscal system: Structure of government revenues and expenditure.
  - Fiscal policy tools: Taxation, public debt, and fiscal deficit.
  - Budgetary policy and the role of Finance Commission.
  - The role of fiscal policy in economic stabilization and growth.
2. **Monetary Policy:**
  - Role of Reserve Bank of India (RBI) in monetary policy formulation.
  - Objectives of monetary policy: Inflation targeting, interest rates, and exchange rates.
  - Recent developments in monetary policy: Liquidity management, credit control, and financial inclusion.
  - The impact of demonetization and GST on India's monetary policy.

### **Unit 4: External Sector and India's Foreign Trade**

1. **Trade and Balance of Payments:**
  - India's trade pattern and composition: Major exports and imports.
  - Issues related to India's balance of payments (BoP): Deficits, capital flows, and exchange rates.
  - India's exchange rate policies and its impact on international trade.
2. **Trade Policies and Agreements:**
  - Evolution of India's trade policy: From import substitution to export-led growth.
  - WTO and regional trade agreements: SAFTA, ASEAN, and RCEP.
  - Foreign trade policy and its role in promoting exports and economic growth.
3. **Foreign Direct Investment (FDI) and Capital Flows:**
  - Role of FDI in India's economic development.
  - Government policies to attract FDI: Make in India, Start-Up India.

## Unit 5: Poverty, Unemployment, and Inequality in India

### 1. Poverty in India:

- Measurement of poverty: Poverty lines, multidimensional poverty.
- Causes of poverty: Structural, social, and economic factors.
- Government initiatives for poverty alleviation: MGNREGA, PMAY, and direct benefit transfers (DBT).

### 2. Unemployment and Employment Policies:

- Types of unemployment: Frictional, structural, and disguised unemployment.
- Employment generation policies and programs: Skill development, employment guarantee schemes.
- Challenges in the labor market: Informal sector, wage disparity, and gender inequality.

### 3. Inequality:

- Economic inequality: Income and wealth disparities.
- Social inequality: Caste, class, and gender-based disparities.
- Government policies aimed at reducing inequality: Reservation policies, inclusive growth programs.

## Suggested Books:

- Desai, V. (2022). *Indian Economy: A Comprehensive Overview*. Pearson India.
- S.R. Mehta (2017). *Contemporary Issues in Indian Economy*. Macmillan India.
- Raghuram Rajan (2019). *The Third Pillar: How Markets and the State Leave the Community Behind*. Penguin Books.
- Datt, R., & Sundharam, K.P.M. (2021). *Indian Economy* (79th ed.). S. Chand & Co.
- Bhatia, H. L. (2005). *Public Finance*. Vikas Publishing House.
- Joshi, V., & Little, I. M. D. (1996). *India's Economic Reforms: 1991–2001*. Oxford University Press.
- Government of India (2023). *Union Budget of India* (Annual Publication).
- Reserve Bank of India (2023). *Annual Report of RBI* (Annual Publication).
- Mishra, S. K., & Puri, V. K. (2014). *Indian Economy* (30th ed.). Himalaya Publishing House.
- Government of India (2023). *Union Budget of India* (Annual Publication).
- Reserve Bank of India (2023). *Annual Report of RBI* (Annual Publication).
- Mishra, S. K., & Puri, V. K. (2014). *Indian Economy* (30th ed.). Himalaya Publishing House.

## **ECONOMY OF MONEY AND BANKING -II (BL-112 B)**

**Subject Code: BL – 112B**

**L 4, C 4**

### **COURSE OBJECTIVES**

- Develop a Strong Understanding of Monetary Theories  
To explore and critically analyse various theories related to the demand and supply of money, including classical, Keynesian, and modern approaches.
- Understand the Conduct of Monetary Policy  
To study the objectives, tools, and mechanisms through which central banks implement monetary policy, and assess how policy decisions impact inflation, growth, and employment.
- analyse the Role of Central Banks

#### **Unit 1: Money**

- Understanding concept and functions of money
- Measurement of money supply
- Analytics and Methodology of computation of money supply
- Theories of money supply determination.

#### **Unit 2: Financial markets:**

- Role of financial markets and institutions
- Problems of Asymmetric information
- Financial Crises; Financial derivatives: Futures, Options and Swaps
- Financial markets and Institutions in India: Organization, Structure and Reforms in India

#### **Unit 3: Determination of interest rates:**

- Sources of interest rates differentials and risk
- Theories of term structure of interest rates
- Interest rates in India.

#### **Unit 4: Banking**

- Theory of Separation of Powers and Checks and Balances
- N.G.O. Civil Society Campaigns and role of Mass Media

### **Unit 5: Historical context: Money and Banking**

- Introduction to banking system
- Types of banks

#### **Suggested Readings:**

1. F J Fabozzi et al: Foundations of Financial Markets and Institutions, Pearson
2. F S Mishkin , S G Eakins, T Jayakumar, R K Pattnaik : Financial Markets and Institutions Pearson
3. N Jadhav: Monetary Policy, Financial stability and Central Banking in India Macmillan
4. M.R. Baye and D.W. Jansen Money, Banking and Financial Markets AITBS, 1996
5. Report of the Working Group: Money Supply Analytics and Methodology of Compilation, 1998 Annual Report; Master Circular - Prudential Norms on Capital Adequacy - Basel I Framework - 2011;
6. Dua, P., "Monetary Policy Framework in India", Indian Economic Review, Vol. 55, Issue 1, June 2020

# **SEMESTER III**

## **Constitutional Law – II**

**Sub. Code: BL 201**

**L – 4, C – 4.**

### **Course Objective**

- Examine the scope of individual rights: Study advanced topics related to individual rights guaranteed by the Constitution, focusing on the Due Process Clause, Equal Protection Clause, and First Amendment rights (including freedom of speech, freedom of religion, and freedom of association).
- Analyse the evolving jurisprudence of civil rights: Understand the historical development and contemporary application of civil rights protections, particularly regarding race, gender, and sexual orientation.
- Study substantive due process and privacy rights: Delve into the principles of substantive due process and the development of privacy rights, including landmark cases like *Griswold v. Connecticut*, *Roe v. Wade*, and *Lawrence v. Texas*.
- Explore procedural due process: Understand the constitutional requirements of fair procedures when individuals are deprived of life, liberty, or property, focusing on judicial review and the protections offered by the Fifth and Fourteenth Amendments.

### **Unit-I**

Legislature under Indian Constitution - Union and State Legislatures - Composition, Powers, Functions and Privileges - Anti-Defection Law - Executive under Indian Constitution - President and Union Council of Ministers.

### **Unit-II**

Judiciary under Constitution - Supreme Court - Appointment of Judges, Powers and Jurisdiction - High Courts - Appointment and Transfer of Judges - Powers and Jurisdiction - Subordinate Judiciary.

### **Unit-III**

Centre State Relations - Legislative, Administrative and Financial Relations - Cooperation and Coordination between the Centre and States.

### **Unit-IV**

Liability of State in Torts and Contracts - Freedom of Interstate Trade, Commerce and Inter course.

### **Unit-V**

Emergency – Need of Emergency Powers - Different kinds of Emergency - National, State and

**Suggested Readings:**

1. M.P.Jain, Indian Constitutional Law, Wadhwa& Co, Nagpur
2. V.N.Shukla, Constitution of India, Eastern Book Company, Lucknow
3. Granville Austin, Indian Constitution-Cornerstone of a Nation, OUP, New Delhi
4. H.M.Seervai, Constitutional Law of India (in 3 Volumes), N.M.Tripathi, Bombay
5. G.C.V.Subba Rao, Indian Constitutional Law, S.Gogia& Co., Hyderabad
6. B.Shiva Rao, Framing of India's Constitution (in 5 Volumes), Indian Institute of Public Administration, New Delhi
7. J.N.Pandey, Constitutional Law of India, Central Law Agency, Allahabad



## Legal Methods

Sub. Code: BL – 203

L-4, C-4

### Course Objectives

- Understand the structure of legal systems: Introduce students to the basics of the legal system, including the different types of law (e.g., common law, statutory law, constitutional law), and the role of courts, legislatures, and executive bodies in shaping law.
- Familiarize with sources of law.
- Help students identify and understand the different sources of law, including primary sources (e.g., statutes, case law, constitutions) and secondary sources (e.g., legal commentary, law review articles, legal dictionaries).
- Develop legal research skills: Equip students with the skills to conduct effective legal research using legal databases (e.g., Westlaw, LexisNexis) and traditional research methods (e.g., library research, casebooks, and law reports).

### Unit-I: Introduction

Law as an independent discipline has its own materials and methods. Though related to and reflective of social processes, its development is unique in several respects. The character and content of legal knowledge are explained to the student in a systematic fashion. Familiarity with the sources of law and with legal materials and competence to find the law by the use of the law library are major concerns of this course.

### Unit-II: Introduction to Law

#### I. Meaning and Classification of Laws

- a. What is law?
- b. Meaning and definition
- c. How is law made?
- d. What are the uses and functions of law?
- e. Classification of laws:

### Unit-III : Sources of Law

- a. Custom
- b. Precedent
- c. Legislation

### Unit-IV: Basic Concepts of Indian Legal System

- a. Common Law
- b. Constitution as the Basic Law
- c. Rule of Law

## **Unit-V : Legal Writing and Research**

Legal materials – Case law, b. Statutes, Reports, Journals.

### **Suggested Readings**

- **"Introduction to Legal Research and Methodology"** by S.K. Verma and Kusum Verma
  - A detailed guide on legal research techniques and methodologies, focusing on Indian law.
- **"Legal Research and Writing"** by Nancy L. Schultz and Linda H. Edwards
  - Provides a comprehensive understanding of legal research and writing skills.
- **"Legal Method"** by S.P. Sathe
  - A foundational text on the principles of legal reasoning and methodology.
- **"The Legal System: A Social Science Perspective"** by Lawrence M. Friedman
  - Explores the structure and functioning of legal systems from a sociological viewpoint.
- **"An Introduction to Legal Theory"** by Peter G. Stein
  - Focuses on the philosophical underpinnings of law and its methods.

## POLITICAL SCIENCE-III

Sub. Code: BL – 205

L-4, C-4

### Course Objectives

- Understand the role of the state: Study the state's role in governance, lawmaking, security, and economic management. Analyze how states interact with citizens and non-state actors.
- Examine executive power and leadership: Understand the functions and powers of executive branches, focusing on the head of state/government and their relationship with the legislature and judiciary.
- Analyze the role of legislatures: Study how legislative bodies operate in different political systems, focusing on lawmaking, representation, and the relationship between the legislature and the executive.
- Study the judiciary and judicial review: Examine the role of courts in interpreting laws, ensuring the constitutionality of laws, and protecting individual rights and liberties.

**Unit I: Western Political Thought:** Plato (Ethics), Aristotle (State, Citizenship)

**Unit II: Western Political Thought:** Lock (Rights), Rousseau (Inequality), Marx (State)

**Unit III: Indian Political Thought:** Kautilya(State), Vivekanand (Vedanta, Education)

**Unit IV: Indian Political Thought:** Gandhi (Swaraj), Ambedkar (Social Justice),

### Suggested Readings:

1. Appadorai, Indian Political Thinking through the Ages, Khanna Publishers, Delhi,
2. Urmila Sharma, S K Sharma, Indian Political Thought, Atlantic
3. V. R. Mehta, Foundations of Indian Political Thought, New Delhi, Manohar
4. C.L. Wayper, Political Thought, New Delhi, (English & Hindi).
5. S. Mukherjee and S. Ramaswamy, A History of Political Thought: Plato to Marx, New Delhi, Prentice Hall.

Ian Adams & R.W. Dyson, Fifty Great Political Thinkers, Routledge

## **Society and Gender-III (BL – 205 A)**

**Subject Code: BL – 205A**

**L 4, C 4**

### **Course Objectives:**

- To understand and critically analyse the evolving concepts of gender and their impact on social structures.
- To explore the intersectionality of gender with other social categories like race, caste, class, and sexuality.
- To examine feminist theories, ideologies, and movements, both historical and contemporary.
- To evaluate the role of gender in key social institutions like family, education, politics, and media.
- To explore contemporary gender issues in a global context and discuss policies addressing gender inequality.

### **Unit 1: Foundations of Gender Studies**

#### **1. Introduction to Gender Studies:**

- Definition and conceptualization of gender, sex, and sexuality.
- Historical development of gender studies as an interdisciplinary field.
- The role of gender in social theory: Contributions of key theorists (Simone de Beauvoir, Judith Butler, Michel Foucault).

#### **2. Gender and Socialization:**

- Social construction of gender roles and identities.
- Gender socialization in family, school, and media.
- The impact of patriarchy, heteronormativity, and gender norms on individual lives.

#### **3. Intersectionality in Gender Studies:**

- Concept of intersectionality: Kimberlé Crenshaw's theory.
- The interconnectedness of gender, class, race, caste, and sexuality.
- Case studies exploring intersectional experiences of women and marginalized groups.

### **Unit 2: Feminist Theories and Movements**

#### **1. Classical Feminist Theories:**

- Liberal feminism: Emphasis on individual rights, equality, and legal reforms (e.g., Mary Wollstonecraft, John Stuart Mill).
- Socialist feminism: Connection between gender and class oppression (e.g., Engels, Simone de Beauvoir).

- Radical feminism: Focus on patriarchy and systemic oppression of women (e.g., Shulamith Firestone, Andrea Dworkin).
- 2. **Postmodern and Postcolonial Feminisms:**
  - Postmodern feminism: Critique of universalizing narratives and essentialism (e.g., Judith Butler, bell hooks).
  - Postcolonial feminism: The impact of colonialism on gender and identity, experiences of Third World women (e.g., Gayatri Spivak, Chandra Talpade Mohanty).
- 3. **Contemporary Feminist Movements:**
  - Global feminist movements and the fight for reproductive rights, gender-based violence, and equal pay.
  - #MeToo, Time's Up, and other social media-driven movements.
  - Feminism in India and the Global South: Challenges and perspectives.

### **Unit 3: Gender and Social Institutions**

1. **Gender in the Family:**
  - Family as a site of gender roles and power dynamics.
  - The evolution of family structures and the impact of globalization and migration.
  - Gendered division of labor in the household and caregiving responsibilities.
2. **Gender in Education:**
  - Gender stereotypes in textbooks, curriculum, and teacher-student interactions.
  - Gender disparities in access to education: Global and national perspectives.
  - Gender and academic achievement: Women's access to higher education and barriers faced.
3. **Gender and Work:**
  - Gendered labor markets: The feminization of certain jobs and gender pay gaps.
  - Occupational segregation: The glass ceiling, leadership roles, and the corporate ladder.
  - Feminist perspectives on unpaid work and the value of caregiving roles.
  -

### **Unit 4: Gender, Sexuality, and the Law**

1. **Legal Frameworks for Gender Equality:**
  - International laws and conventions on women's rights (e.g., CEDAW).
  - Indian Constitution and gender equality: Fundamental rights, Directive Principles of State Policy, and laws for women's protection.
  - Gender-based violence and the legal system: Domestic violence, sexual harassment, and trafficking.
2. **Gender and Reproductive Rights:**
  - Feminist perspectives on reproductive justice and autonomy.
  - Laws surrounding reproductive health: Abortion, contraception, and maternal health.
  - The role of the state in regulating and controlling women's bodies.

### 3. **LGBTQ+ Rights and Gender:**

- Gender identity, sexuality, and the law: Legal recognition of transgender rights.
- Decriminalization of homosexuality in India and the global fight for LGBTQ+ rights.
- Intersection of gender and sexuality in the context of marriage, adoption, and family law.

## **Unit 5: Gender, Media, and Culture**

### 1. **Gender Representation in Media:**

- Media as a tool for perpetuating gender stereotypes and roles.
- Representation of women in film, television, advertisements, and social media.
- Feminist media criticism and the portrayal of men and women in the media.

### 2. **Cultural Practices and Gender:**

- Gender and tradition: The role of cultural practices in shaping gender identities and roles.
- Rituals, religion, and gender: How gender roles are embedded in cultural practices and beliefs.
- The politics of gender and culture in the Global South: The debate on cultural relativism vs. universalism.

### 3. **Digital Feminism and Gender Activism:**

- Online gender activism and the impact of social media platforms.
- Cyber feminism and the role of technology in addressing gender inequalities.
- Virtual communities and their influence on gender discourse.

## **Suggested Books:**

- Walby, S. (2011). *The Future of Feminism*. Polity Press.
- Sen, A. (2001). *Development as Freedom*. Oxford University Press.
- Nanda, M. (2017). *Transgender Rights and Politics in India*. University of California Press.
- Mulvey, L. (2009). *Visual and Other Pleasures*. Palgrave Macmillan.
- Gill, R. (2007). *Gender and the Media*. Polity Press.
- Duffy, B. E. (2017). *(Not) Getting Paid to Do What You Love: Gender, Social Media, and Aspirational Work*. Yale University Press.
- Kabeer, N. (2005). *Gender, Poverty and Livelihoods: Issues for Social Protection*. Routledge.
- Reddy, A. (2011). *With Respect to Sex: Negotiating Hijra Identity in South India*. University of Chicago Press.
- Nussbaum, M. C. (2009). *Sexual Justice in a Liberal State*. Oxford University Press.

## **Comparative Politics-III (BL-205 B)**

**Subject Code: BL – 205 B**

**L 4, C 4**

### **COURSE OBJECTIVES**

- To deepen students' knowledge of advanced theories in comparative politics, including structuralism, institutionalism, and rational choice theory.
- To critically examine the methodological approaches used in comparative political analysis.
- To explore and compare different types of political systems, including democracies, authoritarian regimes, and hybrid systems.
- To understand the role of institutions such as legislatures, executives, and judiciaries in shaping political outcomes across different countries.

#### **Unit 1:**

- Introduction to Comparative Politics
- Human Nature and the Ends of Political Life.
- Approaches of the study of Comparative politics.
- Comparative Government and politics

#### **Unit 2:**

- Political Culture and political Socialization.
- Constitution and Constitutionalism.
- Development: Underdevelopment and dependency.
- Political Development, Democracy and Political Decay.

#### **Unit 3:**

- Organization of Government: Institution and Procedures.
- Rule Making Structure- The Legislature
- Rule Application Structure – The Executive
- Rule Adjudication Structure- The Judiciary.

#### **Unit 4:**

- Theory of Separation of Powers and Checks and Balances
- N.G.O. Civil Society Campaigns and role of Mass Media

#### **Unit 5:**

- Importance of the study Informal Institution in Comparative Politics.
- Electoral System and Voting Behavior.

### **Suggested Readings:**

- Bruce J. Dickson, *The Dictator's Dilemma: The Chinese Communist Party's Strategy for Survival* (New York: Oxford University Press, 2016).
- Robert Guest, *Borderless Economics: Chinese Sea Turtles, Indian Fridges and the New Fruits of Global Capitalism* (New York: St. Martin's Griffith, 2013).
- Steven Levitsky and Daniel Ziblatt, *How Democracies Die* (New York: Crown, 2019)
- Dambisa Moyo, *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa* (Farrar, Straus and Giroux, 1st reprint ed., 2010).



## HISTORY-III

Sub. Code: BL 207

L 4, C4

### Course Objectives

- Understand the origins of British imperialism: Study the early stages of British expansion, including the Age of Discovery, the establishment of early colonies, and the economic, political, and military motivations behind imperial ventures.
- Analyze the development of the British Empire: Examine how Britain built its empire through the colonization of the Americas, Africa, India, and the Pacific, and the impact of trade routes, naval power, and colonial administration.
- Investigate the role of British explorers and merchants: Study the contributions of key figures like Francis Drake, Robert Clive, and Cecil Rhodes, and their roles in expanding British influence globally.

### Unit 1

- 1:- Advent of European in India.
- 2:- Governor General of Bengal.
- 3:- William Bentinck and his Policies.

### Unit 2

- 1:- Regulating Act 1773,
- 2:- Act of Settlement 1781,
- 3:- Pits India Act 1784,

### Unit 3

- 1:- Revolt of 1857: Causes, Nature and Programme.
- 2:- Leadership, People Participation.
- 3:- British Repression and Response.

### Unit 4

- 1:- The Act of 1858,
- 2:- The Act of 1892,
- 3:- The Act of 1994,

### Unit 5

- 1:- Emergence of Organized Nationalism: Formation of Indian National Congress.
- 2:- Gandhian Movement: Nature, Programme, Social Composition.

### **Suggested Reading:**

- **"A History of India"** by Romila Thapar
- A comprehensive account of ancient and medieval Indian history, exploring cultural, political, and social aspects.
- **"The Wonder That Was India"** by A.L. Basham
- A classic work on the history, culture, and achievements of ancient India, covering a broad range of topics.
- **"India: A History"** by John Keay
- A concise yet detailed history of India from ancient times to the present, examining key events and figures.
- **"Medieval India: From Sultanat to the Mughals"** by Satish Chandra
- A scholarly work on the political, social, and economic changes in India from the Sultanate period to the Mughal era.
- **"Modern India: 1885-1947"** by Sumit Sarkar
- Focuses on India's modern history, especially the freedom struggle, the role of key figures, and social reforms.
- **"The British in India: A History of the British Empire in India"** by Nicholas B. Dirks
- Explores the British colonial impact on India, examining political, economic, and cultural changes.

## **Sociology-III (BL 207A)**

**Sub. Code: BL 207A**

**L 4, C4**

### **Course Objectives**

- Understand the relationship between law and society.
- Analyze the role of law in social change and justice.
- Examine legal responses to social stratification and inequality.
- Study the sociological aspects of social problems and legal remedies.
- Explore contemporary legal challenges in a globalized society.

### **Unit 1: Introduction to Law and Society**

- Concept and Functions of Law in Society
- Relationship Between Law, Society, and Social Control
- Customary Law and Legal Pluralism
- Sociology of Legal Institutions

### **Unit 2: Law and Social Change**

- Role of Law in Social Change
- Law as an Instrument of Social Transformation
- Resistance to Legal Change
- Case Studies: Social Reforms and Legal Impact

### **Unit 3: Social Stratification and Law**

- Caste, Class, and Gender in Legal Contexts
- Intersectionality and Legal Protection
- Affirmative Action and Reservation Policies
- Human Rights and Social Justice

### **Unit 4: Law and Social Problems**

- Law and Issues of Crime, Violence, and Deviance
- Poverty, Unemployment, and Legal Remedies
- Environmental Degradation and Legal Responses
- Cybercrimes and Modern Legal Challenges

### **Unit 5: Contemporary Issues in Law and Society**

- Globalization and Legal Systems

- Digital Society and Legal Challenges
- Role of NGOs and Civil Society in Legal Advocacy

### **Suggested Readings**

1. Emerging Trends: Artificial Intelligence and Law
2. **"Law and Society in India"** by Upendra Baxi
3. A critical analysis of the interaction between law and society in India.
4. **"On Law and Society"** by Roscoe Pound
5. Explores the relationship between law and societal needs from a jurisprudential perspective.
6. **"Sociology of Law"** by Steven Vago
7. A comprehensive introduction to the sociology of law, covering theory and applications.
8. **"The Spirit of Laws"** by Montesquieu
9. A foundational text discussing how societal factors influence laws and governance.
10. **"Law and Social Change in India"** by Agnes Flavia
11. Examines the impact of law on societal transformations, particularly in gender justice.
12. **"Social Stratification"** by Dipankar Gupta
13. Explores caste, class, and social hierarchies in India and their interaction with the legal system.

# Understanding Contemporary Social Issues-III

Sub. Code: BL 207B

L 4,C 4

## Course Objectives

- Analyse key contemporary social issues.
- Understand the impact of globalization and technology.
- Examine environmental and gender-related challenges.
- Explore legal frameworks for social justice.
- Develop critical thinking on emerging societal problems.

## Unit 1: Introduction to Contemporary Social Issues

- Concept of Social Issues: Definition and Characteristics
- Framework for Understanding Social Problems
- Role of Law in Addressing Social Issues

## Unit 2: Globalization and Its Impact

- Economic and Cultural Globalization
- Impact on Marginalized Communities
- Legal and Policy Responses to Globalization

## Unit 3: Environment and Sustainability

- Climate Change and Environmental Degradation
- Legal Framework for Environmental Protection
- Sustainable Development Goals (SDGs) and Social Justice

## Unit 4: Gender and Society

- Gender Inequality and Violence
- LGBTQIA+ Rights and Legal Recognition
- Role of Law in Promoting Gender Justice

## Unit 5: Technology and Society

- Digital Divide and Social Exclusion
- Cybercrime and Data Privacy Issues
- Legal Challenges in Regulating Technology

## Unit 6: Emerging Social Issues

- Urbanization and Housing Crisis
- Mental Health and Legal Frameworks
- Drug Abuse and
- Decriminalization Policies

### **Suggested Readings**

1. **"Globalization and Its Discontents"** by Joseph E. Stiglitz
2. Explores the impacts of globalization on societies and economies.
3. **"The Gendered Society"** by Michael Kimmel
4. Analyzes gender dynamics and their impact on contemporary social issues.
5. **"Development as Freedom"** by Amartya Sen
6. Examines the relationship between freedom, social issues, and development.
7. **"Silent Spring"** by Rachel Carson
8. A landmark work on environmental issues and their social impact.
9. **"The Net Delusion: The Dark Side of Internet Freedom"** by Evgeny Morozov
10. Discusses the societal challenges posed by technology and digitalization.

## **Social Institutions In India-III**

**Sub. Code: BL 207C**

**L 4, C 4**

### **Course Objectives**

- Understand key social institutions in India.
- Analyze family, caste, and class structures.
- Explore the role of religion and politics in society.
- Study the impact of education on social change.
- Examine legal frameworks shaping social institutions.

### **Unit 1: Introduction to Social Institutions**

- Definition, Nature, and Functions of Social Institutions
- Role of Social Institutions in Indian Society
- Interrelation between Law and Social Institutions

### **Unit 2: Family and Kinship**

- Types of Families in India: Joint and Nuclear
- Changing Dynamics of Family Structures
- Laws Related to Marriage, Divorce, and Succession

### **Unit 3: Caste and Class**

- Caste System in India: Historical and Contemporary Perspectives
- Class Structure and Social Mobility
- Legal Measures against Caste Discrimination

### **Unit 4: Religion and Society**

- Role of Religion in Indian Society
- Secularism and Religious Pluralism in India
- Legal Framework Governing Religious Practices

### **Unit 5: Political and Economic Institutions**

- Panchayati Raj and Local Governance
- Role of Political Parties and Electoral Processes
- Economic Institutions and Their Social Impact

### **Unit 6: Education as a Social Institution**

- Education and Social Change in India
- Right to Education and Related Policies
- Challenges in the Indian Education System

### **Suggested Readings**

1. **"Indian Society: Themes and Social Issues"** by Nadeem Hasnain
2. A comprehensive overview of social institutions and issues in India.
3. **"Caste in Modern India and Other Essays"** by M.N. Srinivas
4. Explores the caste system and its relevance in contemporary India.
5. **"Family and Kinship in India"** by Patricia Uberoi
6. Analyzes family and kinship structures in Indian society.
7. **"Religion and Society among the Coorgs of South India"** by M.N. Srinivas
8. Examines the interplay of religion and social institutions in India.
9. **"Social Background of Indian Nationalism"** by A.R. Desai
10. Discusses the role of social institutions in shaping Indian nationalism.
11. **"Education and Social Change in India"** by Satya Bhushan Verma
12. Studies the transformative role of education in Indian society.



## **Microeconomics-I**

**Sub. Code: BL 209**

**L 4, C 4**

### **Course Objectives**

- The Microeconomics course is designed to provide students with a deep understanding of the decision-making processes of individuals, firms, and markets, and how these decisions shape resource allocation, pricing, and the distribution of goods and services.
- By exploring the concepts of supply and demand, market structures, consumer and producer behaviour, market failures, and government intervention.
- students are equipped with the analytical tools necessary to understand and address a wide range of economic issues.
- This course lays a strong foundation for further studies in economics and prepares students for careers in areas such as business, finance, policy analysis, and economic research.

### **Unit I: Introduction to Microeconomics**

Definition & Scope, Production Possibility Curve, Demand, Quantity Demanded, Law of Demand, Supply, Quantity Supplied, Law of Supply,

### **Unit II: Consumer Theory I**

Consumer Budget Constraint, Elasticity of Demand – its types, Types of Goods

### **Unit III: Consumer Theory II**

Concept of Utility (TU, MU), Law of Diminishing Marginal Utility (LDMU),

### **Unit IV: Consumer Theory III**

Indifference Curves (IC) (Properties, Types), Consumer Equilibrium using IC

### **Unit V: Market Dynamics**

### **Suggested Readings:**

1. Jhinga M.L., Microeconomics Theory, Vrinda Publishing House.
2. Samuelson & Nordhaus, Economics, Tata Mc Graw Hill.
3. Hal.R. Varian, Intermediate Microeconomics, W.W. Norton & Company.
4. Koutsoyiannis A., Modern Microeconomics, Mac Millan Press.

## **Economic Sociology-I (BL 209A)**

**Sub. Code: BL 209A**

**L 4, C 4**

### **Course Objectives:**

- To introduce students to the field of economic sociology and its key concepts.
- To understand how social structures, relationships, and institutions shape economic behaviour and decision-making.
- To explore the role of culture, power, and inequality in economic processes.
- To critically assess economic systems, institutions, and their social implications.
- To examine contemporary economic issues such as globalization, informal economies, and economic inequality from a sociological perspective.

### **Unit 1: Introduction to Economic Sociology**

#### **1. Definition and Scope of Economic Sociology:**

- What is economic sociology? Its historical development and evolution as a field of study.
- Economic sociology vs. economics: Key differences and interdisciplinary nature.
- The role of sociology in understanding economic processes and social structures.

#### **2. Basic Concepts in Economic Sociology:**

- Social structure, social relations, and economic behaviour.
- Markets, institutions, organizations, and networks in economic processes.
- The concept of embeddedness: Economic action as embedded in social networks and institutions.

#### **3. Key Theoretical Approaches:**

- Classical approaches: Max Weber's theory of economic action, Karl Marx's views on capitalism and class.
- Contemporary approaches: Rational choice theory, social network theory, and institutional theory.

### **Unit 2: Social Structure and Economic Behaviour**

#### **1. Social Class and Economic Behavior:**

- Theories of social class: Marxist, Weberian, and functionalist perspectives.
- The relationship between social class and economic behavior: Consumption patterns, labor markets, and mobility.
- The role of class in shaping access to resources, opportunities, and decision-making.

#### **2. Social Networks and Economic Action:**

- Social networks as a form of capital: Networks and economic outcomes.
  - Embeddedness of economic action in social relationships (Granovetter's theory of embeddedness).
  - The role of trust and reciprocity in economic transactions.
- 3. Economic Organizations and Institutions:**
- The structure of economic organizations: Firms, markets, and bureaucracies.
  - The role of institutions in shaping economic behavior: Legal systems, property rights, and labor laws.
  - Institutional theories of the economy: Institutional isomorphism and path dependency.

### **Unit 3: Markets and Economic Systems**

**1. Markets and Social Order:**

- The sociology of markets: How markets emerge, function, and shape economic behavior.
- Market structures: Competitive, oligopolistic, and monopolistic markets.
- The role of social order in market behavior: Norms, regulations, and informal market practices.

**2. Market and State:**

- The role of the state in market regulation and intervention.
- Market failures and the state's role in correcting them: Public goods, externalities, and monopolies.
- The debate between market liberalization and state intervention: Neoliberalism vs. state-led development.

**3. Globalization and Market Dynamics:**

- Globalization and its impact on local and global markets.
- The social dimensions of global markets: Transnational corporations, global labor markets, and economic inequality.
- The role of culture and identity in shaping global markets.

### **Unit 4: Economic Inequality and Power**

**1. Economic Inequality:**

- Theories of economic inequality: Marxist, functionalist, and neo-liberal perspectives.
- The impact of economic inequality on social structures: Class, gender, and race.
- Measuring economic inequality: Income inequality, wealth inequality, and social mobility.

**2. Power and Economic Systems:**

- The concept of power in economic sociology: Economic elites, political power, and decision-making.
- Theories of power: Weberian and Marxist views on economic power.
- Corporate power, labor relations, and the state's role in mediating power relations.

**3. Gender, Race, and Class in Economic Inequality:**

- Intersectionality and economic inequality: How gender, race, and class interact in shaping economic outcomes.
- Discrimination in the labor market: Gender pay gaps, racial discrimination, and the role of social networks.
- The impact of economic policies on marginalized groups.

## **Unit 5: Informal Economies and Globalization**

### **1. Informal Economies:**

- Defining informal economies: Unorganized labor, self-employment, and small enterprises.
- The role of the informal economy in developing countries: Informality as a survival strategy.
- Social networks and the informal economy: How informal work is organized and sustained.

### **2. Globalization and the Informal Economy:**

- Globalization's impact on informal labor markets: Global supply chains, migrant labor, and economic precarity.
- The rise of gig economies and platform-based labor.
- Informality in the context of global capitalism and neoliberal policies.

### **3. Global Capitalism and Its Sociological Impacts:**

- Theories of globalization in economic sociology: The rise of transnational capitalism and its social consequences.
- Cultural dimensions of globalization: The spread of consumerism, media, and global identities.
- The social impact of economic crises: Case studies on financial crises, austerity, and economic inequalities.

## **Unit 6: Sociology of Development and Economic Change**

### **1. Development and Economic Sociology:**

- Theories of economic development: Modernization theory, dependency theory, and world-systems theory.
- The role of social relations and institutions in shaping economic development.
- Social capital and its contribution to development: Trust, networks, and community.

### **2. Economic Change and Social Transformation:**

- The relationship between economic change and social transformation: Industrialization, urbanization, and globalization.
- The role of technology and innovation in economic change: Technological revolutions and their social implications.
- Development and sustainability: Social and environmental dimensions of economic change.

## **Suggested Books:**

- Sen, A. (1999). *Development as Freedom*. Oxford University Press.
- Sachs, J. D. (2005). *The End of Poverty: Economic Possibilities for Our Time*. Penguin Books.
- Giddens, A. (2009). *Sociology*. Polity Press.
- Granovetter, M. (1985). *Economic Action and Social Structure: The Problem of Embeddedness*. *American Journal of Sociology*.
- Smelser, N. J., & Swedberg, R. (2005). *The Handbook of Economic Sociology*. Princeton University Press.
- Bourdieu, P. (2005). *The Social Structures of the Economy*. Polity Press
- Castells, M. (1996). *The Rise of the Network Society*. Blackwell Publishers.
- Portes, A., Castells, M., & Benton, L. A. (1989). *The Informal Economy: Studies in Advanced and Less Developed Countries*. Johns Hopkins University Press.
- Harvey, D. (2005). *A Brief History of Neoliberalism*. Oxford University Press.

## **Economic Geography I (BL-209B)**

**Sub. Code: BL 209B**

**L 4, C 4**

### **Course Objectives**

- This course examines the spatial organization of economic activities and the relationships between geography, economics, and human behavior.
- It explores topics such as globalization, regional development, and the impact of location on economic practices.

### **Unit 1: Introduction to Economic Geography**

- Definition and scope of economic geography
- Key concepts and theories
- The importance of location in economic activities

### **Unit 2: Theoretical Foundations**

- Overview of economic theories (e.g., von Thünen, Weber, Christaller)
- Location theory and its applications
- Regional economic development theories

### **Unit 3: Globalization and Economic Networks**

- The role of globalization in economic geography
- Global supply chains and trade networks
- Impact of technology on economic connectivity

### **Unit 4: Economic Systems and Structures**

- Comparison of different economic systems (capitalism, socialism, mixed economies)

### **Suggested Readings:**

1. "Geography of Economic Activity" by Edward J. Malecki
2. An analysis of how economic activities are distributed across space and the factors influencing these patterns.
3. "Globalization and Its Discontents" by Joseph E. Stiglitz
4. Discusses the economic impacts of globalization, including its geographic implications and consequences.
5. "Regional Development and Planning for the 21st Century: Economic and Spatial Considerations" by Roger R. Stough
6. Focuses on regional economic development theories and planning practices in a global context.
7. "Industrial Clusters and Regional Business Networks in China" by J. Liu and Y. Wang
8. Examines the development of industrial clusters in China

# HUMAN RIGHTS LAW

**Sub Code: BL 202**

**L -4, C -4**

## **Course Objectives**

- Define human rights: Understand the fundamental concept of human rights as universal, inalienable rights that every individual possesses by virtue of being human, irrespective of nationality, ethnicity, gender, or religion.
- Explore the historical development of human rights: Study the evolution of human rights from ancient civilizations, through key historical events such as the Magna Carta, the French Revolution, and the abolition of slavery, leading to the modern concept of human rights.
- Differentiate between civil, political, economic, social, and cultural rights: Understand the different categories of human rights and how they contribute to the protection of individual freedoms and dignity.

### **Unit-I**

Meaning and definition of Human Rights - Evolution of Human Rights

### **Unit-II**

Adoption of Human Rights by the UN Charter - U.N.Commission on Human Rights - Universal Declaration of Human Rights

### **Unit-III**

Regional Conventions on Human Rights - European Convention on Human Rights

### **Unit-IV**

International Conventions on Human Rights - Genocide Convention, Convention against Torture, CEDAW, Child Rights Convention, Convention on Statelessness, Convention against Slavery, Convention on Refugees - International Conference on Human Rights (1968)

## **Suggested Readings:**

- 1 P.R. Gandhi (ed): Blackstone's International Human Rights Documents, Universal Law Publishing Co. Delhi.
- 2 Richard B. Lillich and Frank C. Newman: International Human Rights - Problems of Law and Policy, Little Brown and Company, Boston and Toronto.
3. Frederick Quinn: Human Rights and You, OSCE/ ODIHR, Warsaw, Poland
4. T.S. Batra: Human Rights – A Critique, Metropolitan Book Company Pvt. Ltd., New Delhi.
5. Dr.U. Chandra: Human Rights, Allahabad Law Agency Publications, Allahabad.

## Legal History

**Sub Code: BL 204**

**L 4, C 4**

### Course Objectives

- Introduce the concept of legal history: Study the evolution of law as a social institution, with a focus on how different societies have developed legal systems to regulate behavior, resolve disputes, and maintain order.
- Examine the origins of law: Investigate the earliest forms of law, including customary law, religious law, and tribal codes in ancient societies.
- Understand the concept of justice: Analyze how different cultures have defined and approached justice, and how those definitions influenced the structure and function of legal systems.
- Explore how religious beliefs shaped the legal systems in various cultures, including Jewish law, Islamic law (Sharia), and Canon law (the law of the Catholic Church).

### Unit I: Early Developments (1600- 1836)

- a. Charters of the East India Company: 1600, 1661, 1726 and 1753
- b. Settlements: Surat, Madras, Bombay and Calcutta
- c. Courts: Mayor's Court of 1726 and Supreme Court of 1774

### Unit II: Early Developments (1600- 1836)

- a. Conflict: Raja Nanad Kumar, Kamaluddin, Patna Case, and Cossijurah
- b. Warren Hastings: Judicial Plans of 1772, 1774 and 1780
- c. Lord Cornwallis: Judicial Plans of 1787, 1790 and 1793

### Unit III: Evolution of Law and Legal Institutions

- a. Development of Personal Laws
- b. Development of Law in Presidency Towns
- c. Development of Civil law in Mufassil: Special Emphasis on Justice, Equity and Good Conscience

### Unit IV:

- a. The Second Law Commission
- b. Establishment of High Courts, 1861
- c. Privy Council and Federal Court: Appeals and working of Privy Council
- d. Privy Council, Features of Federal Court

### Suggested Readings:

1. M.P. Jain – Outlines of Indian Legal History
2. V.D. Kulshrethta – Landmarks of Indian Legal and Constitutional History



## LAW OF EVIDENCE

Sub. Code: BL 206

L – 4, C – 4.

### Course Objectives

- Understand the burden of proof: Study the concept of the burden of proof, which dictates which party is responsible for proving the facts of a case. Understand the difference between the prosecution's burden in criminal cases and the plaintiff's burden in civil cases.
- Examine the standard of proof: Learn about the standard of proof required in different types of cases, including the higher standard of beyond a reasonable doubt in criminal cases and the lower standard of preponderance of the evidence in civil cases.
- Study presumptions in evidence law: Explore legal presumptions (e.g., presumption of innocence in criminal law) and their role in shifting the burden of proof to the opposing party.
- Study the Admissibility and Use of Expert Evidence

### Unit-I:

The Indian Evidence Act, 1872 — Salient features of the Act – Meaning and kinds of Evidence — Interpretation clause — May Presume, shall presume and Conclusive proof - Fact, Fact in issue and Relevant facts — Distinction between Relevancy and Admissibility - Doctrine of Res Gestae — Motive, preparation and conduct.

### Unit-II:

Admissions & Confessions: General Principles concerning Admissions — Differences between "Admission" and "Confession" — Confessions obtained by inducement, threat or promise – Confessions made to police officer - Statement made in the custody of a police officer leading to the discovery of incriminating material Dying Declarations and their evidentiary value — Other Statements by persons who cannot be called as Witnesses.

### Unit-III:

Relevancy of Judgments — Opinion of witnesses — Expert's opinion — Opinion on Relationship especially proof of marriage — Facts which need not be proved — Oral and Documentary Evidence - General Principles concerning oral evidence and documentary evidence — Primary and Secondary evidence — Modes of proof of execution of documents **Unit-IV:**

Rules relating to Burden of Proof - Presumption as to Dowry Death — Estoppel — Kinds of estoppel — Res Judicata, Waiver and Presumption.

### Suggested Readings:

1. BatukLal: The Law of Evidence, 13th Edition, Central Law Agency, Allahabad, 1998.
2. M. Munir: Principles and Digest of the Law of Evidence, 10th Edition (in 2 vols), Universal Book Agency, Allahabad, 1994.
3. Vepa P. Saradhi: Law of Evidence 4th Edn. Eastern Book Co., Lucknow, 1989.
4. Avtar Singh: Principles of the Law of Evidence, 11th Edn. Central Law Publications.
5. V. Krishnama Chary: The Law of Evidence, 4th Edn. S.Gogia & Company, Hyderabad.

## LAW OF CRIMES

**Sub. Code: BL 208**

**L – 4, C – 4.**

- I. Understand the elements of a crime: Learn about the essential elements required to establish a crime under the IPC, including actus reus (guilty act) and mens rea (guilty mind).
- II. Examine criminal responsibility: Study the concept of criminal capacity and the factors that may affect liability, such as age, insanity, intoxication, duress, and consent.
- III. Explore the classifications of crimes: Understand the different classifications of crimes under the IPC, including cognizable offenses, non-cognizable offenses, bailable offenses, non-bailable offenses, and compoundable offenses.
- IV. Examine offenses against the state: Study crimes related to national security and sovereignty, such as treason, sedition, and terrorism (Sections 121 to 130 of IPC).

### **Unit-I:**

Concept of crime - Definition and meaning of crime - Distinction between crime and tort - Stages of crime - Intention, Preparation, Attempt and Commission of Crime - Elements of Crime - Actus Reus and Mensrea - Codification of Law of Crimes in India

### **Unit-II:**

General exceptions - Abetment - Criminal Conspiracy - Offences against the State -

### **Unit-III:**

Offences affecting human body (offences affecting human life) Culpable Homicide and Murder – Hurt and Grievous Hurt - Wrongful restraint and Wrongful confinement -

### **Unit-IV:**

Offences affecting the public health, safety, convenience, decency and morals - Offences against Property - Theft - Extortion - Robbery & Dacoity - Cheating - Mischief - Criminal Trespass

### **Suggested Readings:**

1. RatanLal and DhirajLal: Indian Penal Code, Wadhwa& Co., 2000.
2. Achutan Pillai: Criminal Law, Butterworth Co., 2000.
3. Gour K.D.: Criminal Law - Cases and Materials, Butterworth Co., 1999.
4. Kenny's: Outlines of Criminal Law, (1998 Edition)

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## MICRO ECONOMICS II

Sub. Code: BL – 210

L-4, C-4

### Course Objectives

- Examine advanced consumer behaviour: Build on the theory of consumer preferences and indifference curves. Study revealed preference theory and how it differs from traditional utility theory.
- Explore consumer choice under uncertainty: analyse how consumers make choices under conditions of risk and uncertainty using concepts like expected utility theory, risk aversion, and portfolio theory.
- Understand intertemporal choice: Study how consumers make decisions over time, particularly with regard to savings and consumption, and the concepts of present value and discount rates.
- Review advanced production theory: Study production functions in detail, including the law of variable proportions, returns to scale, and isoquants.

### Unit-I: Production Theory

Production Function, Production (TP) curve, Laws of variable proportions, Returns to Factor (Average and Marginal Product) and

### Unit-II: Revenue & Cost theory

General theories and types of Cost (FC, VC), Cost concepts & Curves (TC, AC, MC) & relationship between them, SR & LR Cost theory (SAC, SMC, LAC, LMC etc.), Revenue – Types, Curves & Characteristics (TR, MR, AR etc)

### Unit-III: Markets

Types & Characteristics [PC, Monopoly (inclusive of price discrimination), Oligopoly, Monopolistic Competition], Market Equilibrium (SR & LR) of firm & Industry under PC.

### Unit-IV: Market Dynamics

Effect of Shift in Market Demand & Supply & Shift in Firms Production

### Suggested Readings:

1. Jhingan M.L., Microeconomics Theory, Vrinda Pub.
2. Samuelson & Nordhaus, Economics, Tata Mc Graw Hill.
3. Hal.R. Varian, Intermediate Microeconomics, W.W. Norton & Company.
4. Koutsoyiannis A., Modern Microeconomics, Mac Millan Press.

## **Economic Sociology II (BL-210A)**

**Sub. Code: BL – 210A**

**L-4, C-4**

### **Course Objectives:**

- To explore the social aspects of economic life, including the relationship between economic behavior and social structures.
- To understand how social, political, and cultural factors influence economic processes and institutions.
- To analyze the evolution of economic systems in different societies, focusing on the role of economic sociology in contemporary global economies.
- To examine key theories, concepts, and empirical studies in economic sociology, including the study of capitalism, labor markets, and economic inequality.

### **Unit I: Theories of Economic Sociology**

- Classical Theories: Max Weber, Karl Marx, and Émile Durkheim's Contributions
- Neo-Classical and Institutional Economic Sociology
- Social Embeddedness of Economic Action: Granovetter's Theory
- Social Capital and Economic Development: Pierre Bourdieu and Robert Putnam
- The Role of Trust and Social Networks in Economic Transactions

### **Unit II: The Sociology of Markets and Consumption**

- Markets as Social Institutions: Social Structure of Markets and Market Behavior
- Cultural Dimensions of Consumption: Consumption Patterns and Identity
- Social Networks and Consumer Behavior
- The Role of Advertising, Media, and Branding in Shaping Consumption
- Globalization and its Impact on Local Markets and Consumption

### **Unit III: Labor Markets and Employment**

- Labor as a Social Institution: The Division of Labor and Labor Markets
- Labor Mobility, Migration, and Globalization of Labor
- The Informal Economy: Characteristics and Importance
- Social Stratification and Inequality in Labor Markets: Gender, Class, and Ethnicity
- Employment Relations: Work, Power, and Conflict in the Workplace

### **Unit IV: Capitalism, Socialism, and Development**

- Capitalism: Social, Political, and Economic Dimensions
- Theories of Capitalism: From Max Weber to Contemporary Capitalism
- Socialism and Planned Economies: The Role of State and Central Planning
- Development and Underdevelopment: Theories and Critiques
- Global Economic Inequality: North-South Divide and the Impact of Globalization

## **Unit V: Economic Sociology and Contemporary Issues**

- The Role of the State in Economic Development: Welfare State and Neoliberalism
- Financial Crises and Economic Sociology: The 2008 Global Financial Crisis
- Environmental Sociology and Sustainable Development
- Economic Sociology and the Informal Economy: Migrant Labor and Informal Markets
- Digital Economy and the Impact of Technology on Economic Relations

### **Suggested Books:**

1. "Economic Sociology: An Introduction" by Frank Dobbin
2. "The Social Economy: Market Society and the State" by Roger A. Friedland and Robert R. Alford
3. "The Sociology of Economic Life" by Mark Granovetter and Richard Swedberg
4. "Theories of Economic Sociology" by Neil J. Smelser and Richard Swedberg
5. "Capitalism and Modern Social Theory" by Anthony Giddens

## **Economic Geography II (BL-210B)**

**Sub. Code: BL – 210B**

**L-4, C-4**

### **Course Objectives**

- This course examines the spatial organization of economic activities the relationships between geography, economics, and human behavior.
- It explores topics such as globalization, regional development,
- The impact of location on economic practices.

### **Unit 1: Services and the Knowledge Economy**

- The growth of the service sector in the economy
- Geographic concentrations of knowledge-based industries
- The impact of technology on service delivery and innovation

### **Unit 2: Economic Geography of Trade**

- Patterns and theories of international trade
- Trade agreements and their geographic implications
- The role of logistics and transportation in trade

### **UNIT 3: Environmental Impact of Economic Activities**

- The relationship between economic development and environmental change
- Case studies on pollution, climate change, and resource depletion
- Strategies for sustainable economic practices

### **UNIT 4: Future Trends in Economic Geography**

- The impact of digital economies and e-commerce

### **Suggested Readings:**

1. "Geography of Economic Activity" by Edward J. Malecki
2. An analysis of how economic activities are distributed across space and the factors influencing these patterns.
3. "Globalization and Its Discontents" by Joseph E. Stiglitz
4. Discusses the economic impacts of globalization, including its geographic implications and consequences.
5. "Regional Development and Planning for the 21st Century: Economic and Spatial Considerations" by Roger R. Stough
6. Focuses on regional economic development theories and planning practices in a global context.
7. "Industrial Clusters and Regional Business Networks in China" by J. Liu and Y. Wang
8. Examines the development of industrial clusters in China and their implications for regional economic geography.

# **SEMESTER V**

## HINDI-I

Sub. Code : 301

L 4, C 4

### Course Objectives

- Enhance writing skills: Focus on improving the students' ability to write in Hindi across various forms, including essays, letters, stories, reports, and dialogues.
- This objective aims at developing grammatical accuracy, coherence, and clarity in written communication.
- Strengthen oral communication: Encourage students to converse in Hindi to improve fluency, pronunciation, and vocabulary. This includes group discussions, debates, and presentations to build confidence in speaking.
- Promote listening comprehension: Develop the ability to understand spoken Hindi through various mediums, including audio clips, films, and lectures. Focus on comprehension and interpretation skills.

### Unit I

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### Unit II

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### Unit III

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## **SPANISH I (BL- 301A)**

**Sub. Code: BL – 301A**

**L-4, C-4**

### **Course Objectives**

By the end of this course, students will be able to:

- Understand and use basic Spanish vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in Spanish.
- Write basic sentences and paragraphs in Spanish.

### **Unit 1: Introduction to Spanish**

- Overview of the Spanish language and its global significance
- Alphabet and pronunciation
- Basic greetings and introductions

### **Unit 2: Basic Grammar and Vocabulary**

- Nouns, articles, and gender
- Common adjectives and their agreement with nouns
- Essential vocabulary: family, colors, numbers

### **Unit 3: Present Tense Verbs**

- Introduction to regular verbs (AR, ER, IR)
- Conjugation patterns and usage
- Practical exercises and dialogues

### **Unit 4: Common Expressions and Questions**

- Essential phrases for everyday conversation
- Forming questions and negation

### **Suggested Readings:**

1. Madrigal's Magic Key to Spanish" by Margarita Madrigal
2. A classic introductory book that simplifies grammar and vocabulary, making it accessible for beginners.
3. "Practice Makes Perfect: Spanish Verb Tenses" by Dorothy Richmond
4. Focuses on mastering verb tenses with clear explanations and exercises.
5. "Easy Spanish Step-By-Step" by Barbara Bregstein
6. A structured approach to learning Spanish, emphasizing grammar and vocabulary in a logical progression.
7. "Living Language Spanish" (Complete Course)
8. A comprehensive language course that includes audio components and a

variety of exercises.

## **German- I (BL-301B)**

**Sub. Code: BL – 301B**

**L-4, C-4**

### **Course Objectives:**

- To develop proficiency in understanding, speaking, reading, and writing German at an introductory level.
- To build a solid foundation in German grammar and vocabulary.
- To practice listening and speaking skills through interactive exercises, role plays, and dialogues.
- To understand and engage with basic German texts, including short stories, articles, and everyday conversations.
- To appreciate German culture, traditions, and history through authentic materials like songs, films, and cultural readings.

### **Unit 1: Introduction to German Language**

#### **1. The German Alphabet and Pronunciation:**

- The German alphabet: Letters, sounds, and pronunciation rules.
- Pronunciation of common German vowels and consonants (e.g., ä, ö, ü, ß).
- Stress and intonation patterns in German.

#### **2. Basic Greetings and Introductions:**

- Introducing oneself: Name, nationality, profession, etc.
- Common greetings: "Hallo," "Guten Morgen," "Wie geht's?"
- Phrases for polite conversation: "Danke," "Bitte," "Entschuldigung."

#### **3. Numbers and Basic Vocabulary:**

- Counting in German: Numbers 1-100.
- Days of the week, months, seasons.
- Family members, colors, and simple adjectives.

### **Unit 2: Grammar Fundamentals**

#### **1. Nouns, Articles, and Gender:**

- Understanding German noun genders (masculine, feminine, neuter).
- Definite and indefinite articles: der, die, das, ein, eine.
- Plural forms of nouns.

#### **2. Present Tense of Regular Verbs:**

- Conjugation of regular verbs in the present tense (e.g., spielen, arbeiten).
- Common regular verbs and their usage in sentences.
- Sentence structure: Subject-verb-object.

#### **3. Personal Pronouns and Possessive Adjectives:**

- Forms of personal pronouns (ich, du, er/sie/es, wir, ihr, sie/Sie).
- Possessive pronouns (mein, dein, sein, ihr, unser).

### **Unit 3: Expanding Vocabulary and Communication**

- 1. Describing People, Places, and Things:**
  - Describing appearance, personality, and characteristics.
  - Vocabulary for everyday objects, places, and locations.
  - Describing where things are (prepositions of place).
- 2. Asking and Answering Questions:**
  - Formulating simple questions: “Wie?”, “Was?”, “Wo?”, “Wann?”
  - Yes/no questions and question words.
  - Asking for directions, time, and information.
- 3. Useful Phrases for Everyday Situations:**
  - At the supermarket, restaurant, or doctor's office.
  - Making requests and giving polite commands.
  - Expressing likes, dislikes, and preferences.

### **Unit 4: German Sentence Structure and Verb Conjugation**

- 1. Present Tense of Irregular Verbs:**
  - Conjugation of common irregular verbs (e.g., sein, haben, gehen, essen).
  - Using irregular verbs in questions and negative sentences.
  - Common sentence patterns: Affirmative, negative, and questions.
- 2. Word Order in Sentences:**
  - Basic word order in German (SVO structure).
  - Word order with time expressions and negation.
  - Position of adverbs and objects in a sentence.
- 3. Modal Verbs:**
  - Introduction to modal verbs: können, wollen, müssen, dürfen, sollen, mögen.
  - Using modal verbs in the present tense to express necessity, permission, and ability.

### **Unit 5: Reading Comprehension and Writing Skills**

- 1. Short Texts and Dialogues:**
  - Reading and understanding short dialogues and texts on familiar topics.
  - Answering comprehension questions based on short readings.
  - Expanding vocabulary through reading.
- 2. Writing Simple Sentences and Paragraphs:**
  - Writing descriptions, letters, and simple emails in German.
  - Correct sentence structure and grammar in written communication.
  - Writing about oneself, hobbies, daily activities, and family.
- 3. Introduction to German Culture Through Texts:**

- Basic cultural readings: Traditional German foods, holidays, and festivals.
- Understanding German customs and social etiquette.

## **Unit 6: German Culture and Traditions**

### **1. German Holidays and Traditions:**

- Celebrating Christmas, Easter, and other German traditions.
- Understanding cultural significance: Oktoberfest, Karneval, and more.
- The importance of family and social customs in German-speaking countries.

### **2. Introduction to German Music, Films, and Art:**

- German classical music and famous composers (e.g., Beethoven, Bach).
- German cinema: Key films, directors, and genres.
- The influence of German art and philosophy on world culture.

## **Suggested Books:**

1. *Culture Smart! Germany* by Barry Tomalin
2. *A Concise History of Germany* by Mary Fulbrook
3. *German Short Stories for Beginners* by Olly Richards
4. *Deutsch im Blick (University of Texas Online Textbook, Free Resource)*
5. *German Grammar in a Nutshell* by Christine Stiefel (Langenscheidt)
6. *Practice Makes Perfect: German Sentence Builder* by Ed Swick
7. *German Grammar for Beginners* by Jenny Russ
8. *Practice Makes Perfect: German Verb Tenses* by Ed Swick

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## Chinese-I (BL-301C)

Sub. Code: BL – 301C

L-4, C-4

### Course Objectives:

- To develop basic proficiency in the Chinese language in speaking, listening, reading, and writing.
- To learn the fundamental grammar rules and sentence structures in Mandarin Chinese.
- To master basic vocabulary, focusing on daily life topics such as greetings, food, travel, and family.
- To acquire a solid understanding of Chinese characters and their formation.
- To introduce students to the cultural, social, and historical context of China.

### Unit 1: Introduction to Chinese Language

#### 1. Overview of the Chinese Language:

- Introduction to Mandarin Chinese as the official language of China.
- Importance of Chinese dialects: Mandarin vs. Cantonese.
- The role of Chinese in the global context.

#### 2. Chinese Pronunciation: Pinyin System:

- The Pinyin system: Tones, initials, and finals.
- Pronunciation practice with tone marks and common sounds (e.g., “x,” “q,” “zh,” “ch”).
- The importance of tones in Chinese communication.

#### 3. Basic Greetings and Introductions:

- Common greetings: 你好 (nǐ hǎo), 您好 (nín hǎo), 再见 (zài jiàn), 谢谢 (xièxiè).
- Introducing oneself: Name, nationality, and occupation.
- Phrases for everyday conversations: 你好吗? (nǐ hǎo ma?) How are you?

### Unit 2: Chinese Characters and Basic Grammar

#### 1. Introduction to Chinese Characters:

- Structure of Chinese characters: Radicals, strokes, and components.
- Simplified vs. traditional characters.
- Writing practice: Basic characters and their meanings (e.g., 我 (wǒ), 你 (nǐ), 中 (zhōng)).

#### 2. Basic Sentence Structure:

- Word order in Chinese: Subject-Verb-Object (SVO) sentence structure.
- Simple affirmative sentences: 我是学生 (wǒ shì xuéshēng) – I am a student.
- Basic negation: 不 (bù) and 没有 (méiyǒu) for negating verbs.

### 3. Pronouns and Possessives:

- Personal pronouns: 我 (wǒ), 你 (nǐ), 他 (tā), 她 (tā), 它 (tā).
- Possessive pronouns: 我的 (wǒ de), 你的 (nǐ de), 他的 (tā de).

## Unit 3: Expanding Vocabulary and Communication

### 1. Daily Life Vocabulary:

- Family members: 父亲 (fùqīn), 母亲 (mǔqīn), 哥哥 (gēgē), 妹妹 (mèimei).
- Numbers: 1-100 (一, 二, 三, ..., 一百).
- Days of the week and time expressions: 今天 (jīntiān), 昨天 (zuótiān), 明天 (míngtiān), 星期 (xīngqī).

### 2. Food and Drink:

- Common foods and drinks: 饺子 (jiǎozi), 米饭 (mǐfàn), 茶 (chá), 水 (shuǐ).
- Ordering food: 我想要 (wǒ xiǎng yào) – I would like.
- Phrases for eating out: 请给我菜单 (qǐng gěi wǒ càidān) – Please give me the menu.

### 3. Expressing Preferences and Asking Questions:

- Expressing likes and dislikes: 我喜欢 (wǒ xǐhuān) – I like.
- Asking for clarification: 什么? (shénme?), 怎么样? (zěnmeyàng?).
- Using question words: 什么 (shénme), 哪 (nǎ), 多少 (duōshǎo), 为什么 (wèishéme).

## Unit 4: Chinese Grammar and Verb Conjugation

### 1. Verbs and Verb Usage:

- Conjugating verbs in the present tense.
- Common verbs: 做 (zuò), 看 (kàn), 听 (tīng), 学习 (xuéxí).
- Verbal phrases: 喜欢做 (xǐhuān zuò) – to like doing, 能做 (néng zuò) – can do.

### 2. Questions and Negations:

- Forming yes/no questions using 吗 (ma).
- Negative sentence structure using 不 (bù) for habitual actions and 没 (méi) for past actions.
- Using “了” (le) to indicate a change of state or action completion.

### 3. Time Expressions and Using the Verb "to be":

- Expressing time: 上午 (shàngwǔ), 下午 (xiàwǔ), 点 (diǎn), 分 (fēn).
- Talking about past, present, and future events: 昨天 (zuótiān), 今天 (jīntiān), 明天 (míngtiān).

## **Unit 5: Reading, Writing, and Listening Skills**

### **1. Reading Short Texts and Dialogues:**

- Reading simple dialogues and short stories based on everyday situations.
- Answering comprehension questions based on reading materials.
- Expanding vocabulary through context.

### **2. Writing Simple Sentences and Paragraphs:**

- Writing about daily routines, hobbies, and interests.
- Practicing basic sentence structures: 我每天都去学校 (wǒ měitiān dōu qù xuéxiào) – I go to school every day.
- Introducing personal information in writing.

### **3. Listening Practice:**

- Listening to audio clips and simple conversations.
- Identifying key words and phrases in spoken Mandarin.
- Developing skills for responding to basic listening exercises.

## **Unit 6: Chinese Culture and Social Context**

### **1. Understanding Chinese Culture and Society:**

- Overview of Chinese culture: Family, respect for elders, and social hierarchy.
- Chinese festivals: 春节 (Chūnjié) – Chinese New Year, 中秋节 (Zhōngqiū Jié) – Mid-Autumn Festival.
- Chinese art and calligraphy: Introduction to Chinese painting and traditional arts.

### **2. Social Etiquette and Communication:**

- Proper etiquette for greetings, gifts, and dining.
- The significance of "face" (面子) and politeness in Chinese culture.
- Understanding social hierarchies and addressing people with respect.

## **Suggested Books:**

- *Integrated Chinese: Level 1, Part 1* by Tao-chung Yao, Yuehua Liu (Cheng & Tsui)
- *Chinese Made Easy for Beginners* by Yamin Ma and Xinying Li
- *Chinese for Beginners* by Yi Ren
- *Culture Smart! China* by Kerry Brown
- *Culture Smart! China* by Kerry Brown
- *China: A History* by John Keay
- *Mandarin Chinese: A Functional Reference Grammar* by Charles N. Li and Sandra A. Thompson
- *The Complete Guide to Chinese Grammar* by Philip Yungkin Lee
- *New Practical Chinese Reader: Volume 1* by Liu Xun (Beijing Language and Culture University Press)



## FRENCH I (BL-301D)

Sub. Code: BL – 301D

L-4, C-4

### Course Objectives

- Understand and use basic French vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in French.
- Write basic sentences and paragraphs in French.

### Unit 1: Introduction to French

- Alphabet and pronunciation
- Basic greetings and introductions

### Unit 2: Numbers and Colors

- Counting (1-100)
- Basic colors and their use in sentences

### Unit 3: Days, Months, and Time

- Days of the week and months of the year
- Telling time

### Unit 4: Family and Descriptions

- Vocabulary related to family and relationships

### Suggested Readings:

1. Easy French Step-By-Step" by Myrna Bell Rochester
2. A clear, gradual approach to learning French grammar and vocabulary.
3. "French for Dummies" by Dodi-Katrin Schmidt and Michelle M. Williams
4. Practice Makes Perfect: Complete French Grammar" by Annie Heminway
5. Comprehensive grammar explanations with exercises for practice.
6. "Fluent in French: The Most Complete Study Guide to Learn French" by Frederic Bibard
7. Covers vocabulary, grammar, and cultural insights

## **FAMILY LAW–I (Hindu Law)**

**Sub. Code: BL 303**

**L – 4, C – 4.**

### **Course Objectives**

- Study modern reforms in Hindu law: Understand the role of various reforms, such as the Hindu Marriage Act, 1955, Hindu Adoption and Maintenance Act, 1956, Hindu Succession Act, 1956, and how they have contributed to the modernization of Hindu law.
- Evaluate the role of the Hindu Code Bill: Examine the significance of the Hindu Code Bill in bringing about reforms in marriage, inheritance, and succession, and its impact on the status of Hindu women.
- Assess the challenges and future reforms: Discuss current issues in Hindu law, such as the need for uniform civil code, the treatment of inter-caste marriages, and
- the integration of Hindu law with the principles of gender equality.

### **Unit-I:**

Sources of Hindu Law – Scope and application of Hindu Law – Schools of Hindu Law - Mitakshara and Dayabhaga Schools – Concept of Joint Family, Coparcenary, Joint Family Property and Coparcenary Property

### **Unit-II:**

Marriage - Definition - Importance of institution of marriage under Hindu Law – Conditions of Hindu Marriage

### **Unit-III:**

**Matrimonial Remedies** under the Hindu Marriage Act, 1955 - Restitution of Conjugal Rights – Nullity of marriage – Judicial separation – Divorce

### **Unit-IV:**

Concept of Adoption - Law of Maintenance - Law of Guardianship - Hindu Adoption and Maintenance Act, 1956

### **Suggested Readings:**

1. Paras Diwan : Modern Hindu Law, 13th Edition 2000, Allahabad Agency, Delhi.
2. Paras Diwan: Family Law, 1994 Edition, Allahabad Agency, Delhi.
3. Mayne: Hindu Law - Customs and Usages , Bharat Law House, New Delhi.
4. Sharaf: Law of Marriage and Divorce , 1999.

# CIVIL PROCEDURE CODE AND LAW OF LIMITATION

**Sub. Code: BL 305**

**L -4, C -4**

## **Course objective**

- Understand the nature of civil litigation: Introduce students to the basic concepts of civil law and civil procedure, explaining the difference between civil and criminal procedures.
- Study the objectives of the CPC: Examine the aims of the CPC, which include ensuring justice through fair trial procedures, speedy disposal of cases, and effective enforcement of judgments.
- Familiarize with key terms: Define essential legal terms such as plaintiff, defendant, suit, civil court, jurisdiction, and cause of action.
- Understand the hierarchy of civil courts: Study the structure of the civil courts in India, including district courts, subordinate courts, and high courts, and their functions in the administration of civil justice.

## **Unit-I :**

Codification of Civil Procedure and Introduction to CPC — Principal features of the Civil Procedure Code — Suits — Parties to Suit — Framing of Suit — Institution of Suits — Bars of Suit - Doctrines of Sub Judice and Res Judicata — Place of Suing — Transfer of suits — Territorial Jurisdiction

## **Unit-II :**

Pleadings — Contents of pleadings — Forms of Pleading — Striking out / Amendment of Pleadings - Complaint— Essentials of Complaint - Return of Complaint—Rejection of Complaint—Production and marking of Documents

## **Unit-III :**

Appearance and Examination of parties & Adjournments — Ex-parte Procedure — Summoning and Attendance of Witnesses — Examination — Admissions — Production, Impounding, Return of Documents — Hearing — Affidavit — Judgment and Decree — Concepts of Judgment, Decree, and Interim Orders and Stay — Injunctions — Appointment of Receivers and Commissions — Costs -- Execution — Concept of Execution — General Principles of Execution

## **Unit-IV:**

Suits in Particular Cases — Suits by or against Government — Suits relating to public matters; — Suits by or against minors, persons with unsound mind, - Suits by indigent persons -- Interpleader suits — Incidental and supplementary proceedings - Appeals, Reference, Review and Revision — Appeals from Original Decrees

**Suggested Readings:**

1. Mulla: Code of Civil Procedure:
2. Tripathi (Abridged Edition), 11th Edn.(StudentEdition) Edited by P.M. Bakshi, Bombay, 1985.
3. A.N. Saha: Code of Civil Procedure.
4. C.K. Takwani: Civil Procedure, 4th Edn. Eastern Book Co., Lucknow, 1974.
5. B.B. Mitra: Limitation Act, 17th Edn. Eastern Law House, Calcutta, 1974, Allahabad.
6. Sanjiva Row: Limitation Act, 7th Edn. (in 2 Vols), Law Book Co., Allahabad,



# **CRIMINAL PROCEDURE CODE, LAW OF JUVENILE JUSTICE AND PROBATION OF OFFENDERS**

**Sub. Code: BL 307**

**L -4, C -4**

## **Course Objectives**

- Understand the nature of civil litigation: Introduce students to the basic concepts of civil law and civil procedure, explaining the difference between civil and criminal procedures.
- Study the objectives of the CPC: Examine the aims of the CPC, which include ensuring justice through fair trial procedures, speedy disposal of cases, and effective enforcement of judgments.
- Familiarize with key terms: Define essential legal terms such as plaintiff, defendant, suit, civil court, jurisdiction, and cause of action. Understand the hierarchy of civil courts: Study the structure of the civil courts in India, including district courts, subordinate courts, and high courts, and their functions in the administration of civil justice.
- Examine jurisdiction in civil cases: Discuss the concepts of territorial, pecuniary, and subject-matter jurisdiction in civil courts. Understand how to determine the appropriate court for filing a suit.

## **Unit-I :**

The Code of Criminal Procedure, 1973 : The rationale of Criminal Procedure — The importance of fair trial — Constitutional Perspectives : Articles 14, 20 & 21 — The organization of Police, Prosecutor and Defence Counsel — Pre-trial Process — Arrest — Distinction between “cognizable” and “non-cognizable” offences — Steps to ensure presence of accused at trial -- Warrant and Summons cases — Arrest with and without Warrant — The absconder status — !

## **Unit-II:**

Search and Seizure — Search with and without warrant — Police search during investigation — General Principles of Search

## **Unit-III :**

Trial Process: Commencement of Proceedings — Dismissal of Complaint — Bail, Bailable and Non-bailable Offences — Cancellation of Bails — Anticipatory Bail — General Principles concerning Bail Bond — Preliminary pleas to bar trial — Jurisdiction — Time Limitations — Pleas of Autrefois Acquit and Autrefois Convict — Fair Trial — Concept of fair trial — Presumption of innocence — Venue of trial — Jurisdiction of Criminal Courts — Rights of accused

## **Unit-IV:**

Judgment: Form and content -- Summary trial — Post-conviction orders in lieu of punishment —.

## **Unit-V:**

Probation and Parole: Authority granting Parole — Supervision — Conditional release -- suspension of sentence — Procedure under Probation of Offenders Act, 1958 -- Salient features of the Act.

**Suggested Reading**

1. Kelkar R.V.: Criminal Procedure, 3rd Edn. Eastern Book Co., Lucknow, 1993.
2. Ratanlal and Dhirajlal: The Code of Criminal Procedure, 15th Edn. Wadhwa & Co.,
3. Padala Rama Reddi: The Code of Criminal Procedure, 1973, Asia Law House, Hyderabad.
4. Prof. S.N. Misra: The Code of Criminal Procedure, Central Law Agency.
5. M.P. Tandon: Criminal Procedure Code, Allahabad Law Agency.
6. Shoorvir Tyagi: The Code of Criminal Procedure, Allahabad Law Agency.

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## MACRO ECONOMICS I

Sub. Code: BL – 309

L-4, C-4

### Course Objectives

- Understanding the scope and nature of macroeconomics: Introduce students to the basic concepts and framework of macroeconomics, including the distinction between microeconomics (study of individual markets and agents) and macroeconomics (study of aggregate economic variables).
- Focus on national economy aggregates: Explain the study of aggregate variables such as GDP (Gross Domestic Product), national income, and the factors that influence them at the national level.
- Understanding the importance of macroeconomic analysis: Discuss the significance of macroeconomic policies in shaping national economic performance, maintaining economic stability, and promoting economic growth.
- Understanding how national income is measured: Introduce students to the methods of calculating national income, such as the income method, expenditure method, and output method.

### Unit-I: Introduction

Difference between Micro & Macroeconomics, Introduction to basic Theories in Macroeconomics

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### Unit-II: National Income Accounting

Circular flow of Income Model – Two & Three sector models (Closed only) National & Domestic Product – different types & their significance

**Unit-III: Money & Interest** Types & Functions of money, Classification of Money, Demand for & Supply of Money (inclusive of Money Multiplier) Theories of Money – Cambridge & Fisher Theory Inflation & Deflation – Types, .

### Unit-IV: Short Run Analysis

Characteristics of Short Run, Simple Keynesian Model /Theory – Consumption Function,

### Suggested Readings

1. Dwivedi D.N. ,Macroeconomic Theory &Policy, Tata Mac Graw Hill
2. Samuelson & Nordhaus ,Economics, Tata Mac Graw Hill
3. Shapiro, Macroeconomic Analysis,

## **Anthropology-I BL – 309 A**

**Sub. Code: BL – 309A**

**L-4, C-4**

### **Course Objectives:**

- To understand the key concepts and theoretical frameworks in economic anthropology.
- To explore the diversity of economic systems, including traditional, modern, and mixed economies.
- To analyze the role of culture in shaping economic behaviors and systems.
- To examine global economic issues through the lens of anthropological theory.
- To develop critical thinking skills regarding the impact of economic processes on individuals, communities, and societies.

### **Unit 1: Introduction to Economic Anthropology**

- 1. Definition and Scope of Economic Anthropology:**
  - Overview of Economic Anthropology as a subfield of anthropology.
  - The relationship between economic anthropology and traditional economics.
  - Key questions and approaches in economic anthropology.
- 2. Historical Development of Economic Anthropology:**
  - Early theoretical perspectives: From classical political economy to anthropological insights.
  - The influence of Marx, Weber, and other theorists on the study of economic systems.
  - The emergence of key anthropologists: Malinowski, Mauss, Boas, and others.
- 3. The Economic System:**
  - The concept of economic systems in anthropology.
  - Overview of different economic systems: Foraging, horticulture, pastoralism, and industrial economies.
  - Subsistence economy vs. market economy.

### **Unit 2: Theoretical Foundations in Economic Anthropology**

- 1. Classical Economic Theories:**
  - Theories of Adam Smith, Karl Marx, and Max Weber.
  - The labor theory of value and its influence on anthropology.
  - The notion of exchange and market relations.
- 2. Formal vs. Substantive Economics (Karl Polanyi's Approach):**



- Formalism: Economics as a universal set of rules.
  - Substantivism: Economic systems as part of broader cultural systems.
  - Polanyi's critique of Western economic assumptions in non-Western societies.
3. **Reciprocity, Redistribution, and Market Exchange:**
- Types of exchange: Generalized reciprocity, balanced reciprocity, and negative reciprocity.
  - The concept of redistribution in traditional societies (e.g., potlatch).
  - Market exchange in both traditional and modern societies.

### **Unit 3: Production and Labor**

1. **Modes of Production:**
- The concept of modes of production: Kin-based, household, and capitalist systems.
  - Foraging, horticulture, pastoralism, and agriculture as modes of production.
  - Industrial and post-industrial production systems.
2. **Labor and Work:**
- The division of labor in different societies: Gender, age, and status.
  - The anthropology of labor and the concept of "alienation" in capitalist societies.
  - Rituals, kinship, and labor in traditional societies.
3. **The Impact of Capitalism:**
- The rise of capitalism and its impact on traditional economies.
  - Labor migration, wage labor, and the global workforce.
  - Globalization and labor in the 21st century.

### **Unit 4: Consumption and Exchange**

1. **Consumption and Social Status:**
- The role of consumption in defining social identity and status.
  - The relationship between consumption and social relations (e.g., conspicuous consumption).
  - The anthropology of food, housing, and material culture.
2. **The Role of Markets:**
- The development and functioning of markets in various cultures.
  - Comparative perspectives on markets: Local, national, and global markets.
  - The anthropology of money and its role in exchange.
3. **Gift Exchange and Reciprocity:**
- Marcel Mauss and the theory of the gift economy.
  - The social and cultural significance of gift exchange in different societies.
  - Reciprocity and its link to social cohesion and solidarity.

## **Unit 5: Globalization and Economic Change**

### **1. Global Economic Systems and the Anthropology of Development:**

- The anthropology of development and modernization theories.
- Impact of globalization on traditional economies.
- Economic anthropology in the context of international development.

### **2. Neoliberalism and Global Capitalism:**

- The spread of neoliberal economic policies and their impacts on local economies.
- Global capitalism and the anthropology of multinational corporations.
- Case studies of economic transformation in various countries (e.g., Latin America, Asia).

### **3. Environmental and Political Economy:**

- The role of economic systems in environmental degradation.
- Political economy of resource management and environmental conservation.
- Anthropological perspectives on sustainable development and indigenous economies.

## **Suggested Books:**

- *Economic Anthropology: A Systematic Approach* by David W. MacKenzie
- *The Anthropology of Economy: A Reader* edited by Karen S. Ho and Lisa R. Procter
- *The Gift* by Marcel Mauss
- *Globalization: A Very Short Introduction* by Manfred B. Steger
- *A World of Struggle: How Power, Law, and Expertise Shape Global Political Economy* by David Kennedy
- *The Yanomami: The Social Anthropology of an Amazonian People* by Reena L. Halperin
- *Globalization: A Very Short Introduction* by Manfred B. Steger
- *The Anthropology of Development and Globalization* by Richard H. Robbins
- *The Great Transformation: The Political and Economic Origins of Our Time* by Karl Polanyi
- *Economic Anthropology* by Eric R. Wolf.

## **Political Economy-I BL – 309 B**

**Sub. Code: BL – 309B**

**L-4, C-4**

### **Course Objectives:**

- To introduce students to the fundamental concepts and theories in political economy.
- To explore the relationship between politics and economics in both historical and contemporary contexts.
- To analyze the role of state, market, and society in the organization and regulation of economic systems.
- To examine how economic systems are influenced by political ideologies, institutions, and global trends.
- To understand the impact of political economy on issues like development, inequality, and globalization.

### **Unit 1: Introduction to Political Economy**

#### **1. Defining Political Economy:**

- What is Political Economy? Scope, relevance, and interdisciplinary nature.
- The relationship between economics, politics, and sociology.
- Key questions in political economy: How do political decisions influence economic outcomes? How do economic systems shape political structures?

#### **2. Historical Overview:**

- Classical political economy and its evolution: From Mercantilism to Adam Smith.
- Early political economists: Karl Marx, David Ricardo, John Stuart Mill, and others.
- The shift from classical to neoclassical economics and its political implications.

#### **3. The Role of the State in Political Economy:**

- The state's role in regulating and shaping economic life.
- Political economy in a capitalist state: Liberalism, welfare state, and neoliberalism.
- Theories of the state: Marxist, Weberian, and pluralist approaches.

### **Unit 2: Classical Political Economy**

#### **1. Adam Smith and the Foundations of Classical Economics:**

- The invisible hand: Free markets and the role of self-interest.
- The division of labor and specialization.
- The nature of wealth and the principle of comparative advantage.

#### **2. David Ricardo and Comparative Advantage:**

- Comparative advantage theory and international trade.
- The law of diminishing returns and its impact on production and distribution.

- Critiques of Ricardian theory.
- 3. **Karl Marx and the Critique of Capitalism:**
  - Marx's historical materialism and the role of class struggle in shaping the economy.
  - The theory of surplus value and exploitation.

### **Unit 3: Neoliberalism and Contemporary Theories**

1. **The Rise of Neoliberalism:**
  - What is neoliberalism? The shift from Keynesian economics to neoliberal policy.
  - Key principles of neoliberalism: Market liberalization, deregulation, and privatization.
  - The political economy of neoliberalism: The role of international institutions like the IMF, World Bank, and WTO.
2. **Post-War Keynesianism and the Welfare State:**
  - Keynesian economics and the role of government intervention in the economy.
  - The development of welfare states in the 20th century.
  - Crisis of Keynesianism and the rise of neoliberalism in the 1970s.
3. **Theories of Global Political Economy:**
  - Globalization and its political and economic implications.
  - Dependency theory, world-systems theory, and the role of imperialism.
  - The politics of economic development in the Global South.

### **Unit 4: Political Economy of Development**

1. **Theories of Economic Development:**
  - The stages of economic development: Modernization theory and its critiques.
  - Dependency theory and the role of the global economic system in underdevelopment.
  - World-systems theory and the development of peripheral nations.
2. **The State and Economic Development:**
  - The role of the state in development: State-led vs. market-led development.
  - Theories of state intervention and development: Import substitution industrialization (ISI) vs. export-oriented industrialization (EOI).
  - The challenges of governance, corruption, and political stability in developing economies.
3. **Globalization and Development:**
  - The impact of globalization on developing countries: Trade, investment, and inequality.
  - The role of international financial institutions in shaping development policies.
  - The debate between economic liberalization and protectionism.

## **Unit 5: Political Economy of Globalization**

### **1. Understanding Globalization:**

- What is globalization? Economic, political, and cultural dimensions.
- The historical roots and modern processes of globalization.
- The role of technology, finance, and communication in driving globalization.

### **2. The Politics of Global Capitalism:**

- The rise of multinational corporations and their global reach.
- Financialization and the global economy: The role of global finance in economic crises.
- The impact of global trade agreements (e.g., NAFTA, TPP, and WTO).

### **3. Global Inequality and Power Dynamics:**

- The distribution of wealth in a globalized economy.
- Global inequality: Rich vs. poor countries and the politics of inequality.
- The role of the global political economy in shaping patterns of migration, labor exploitation, and environmental degradation.

## **Unit 6: Contemporary Political Economy: Issues and Debates**

### **1. Environmental Political Economy:**

- The relationship between economic development and environmental sustainability.
- Theories of environmental degradation: Tragedy of the commons and ecological modernization.
- Global environmental governance: The role of international agreements and institutions (e.g., Paris Agreement).

### **2. Economic Crises and Political Economy:**

- Theories of economic crises: The role of finance, banking, and speculative bubbles.
- Case studies: The 2008 financial crisis and its aftermath.
- The politics of austerity and economic recovery in crisis-hit economies.

### **3. Economic Inequality and Social Justice:**

- The politics of income and wealth inequality: Causes and consequences.
- Theories of distributive justice: Rawlsian justice vs. libertarianism.
- Global efforts to address inequality: The role of international organizations, NGOs, and movements.

## **Suggested Books:**

- *An Introduction to Political Economy* by James A. Caporaso and David P. Levine
- *The Wealth of Nations* by Adam Smith
- *A Brief History of Neoliberalism* by David Harvey
- *Development as Freedom* by Amartya Sen
- *The Shock Doctrine: The Rise of Disaster Capitalism* by Naomi Klein

# **SEMESTER VI**

## HINDI-II ( )

Sub. Code : 302

L 4, C 4

### Unit I :

1:-

2:-

3:-

### Unit II :

1:-

2:- (Paragraph writing)

### Unit III :

1:-

2:-

### Unit IV :

1:-

2:-

### Books :

1. Legal Glossary = Govt. Of india Publication.

2:-

3.

4.

5.

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## **SPANISH II (BL-302 A)**

**Sub. Code: BL – 302A**

**L-4, C-4**

### **Course Objectives**

By the end of this course, students will be able to:

- Understand and use basic Spanish vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in Spanish.
- Write basic sentences and paragraphs in Spanish.

### **Unit 1: Introduction to Spanish**

- Overview of the Spanish language and its global significance
- Alphabet and pronunciation
- Basic greetings and introductions

### **Unit 2: Basic Grammar and Vocabulary**

- Nouns, articles, and gender
- Common adjectives and their agreement with nouns
- Essential vocabulary: family, colors, numbers

### **Unit 3: Present Tense Verbs**

- Introduction to regular verbs (AR, ER, IR)
- Conjugation patterns and usage
- Practical exercises and dialogues

### **Unit 4: Common Expressions and Questions**

- Essential phrases for everyday conversation
- Forming questions and negation



**Suggested Readings:**

1. Madrigal's Magic Key to Spanish" by Margarita Madrigal
2. A classic introductory book that simplifies grammar and vocabulary, making it accessible for beginners.
3. "Practice Makes Perfect: Spanish Verb Tenses" by Dorothy Richmond
4. Focuses on mastering verb tenses with clear explanations and exercises.
5. "Easy Spanish Step-By-Step" by Barbara Bregstein
6. A structured approach to learning Spanish, emphasizing grammar and vocabulary in a logical progression.

## **GERMAN II (BL302 B)**

**Sub. Code: BL – 302B**

**L-4, C-4**

### **Course Objectives**

- Understand and use basic German vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in German
- Write basic sentences and paragraphs in German.

### **Unit 1: Introduction to German**

- German alphabet and pronunciation
- Basic greetings and introductions
- Pronunciation drills
- Icebreaker introductions

### **Unit 2: Numbers and Colors**

- Numbers 1-100
- Basic colors and their usage
- Number games
- Color identification exercises

### **Unit 3: Everyday Vocabulary**

- Family members
- Common nouns (e.g., household items, animals)
- Create a family tree
- Vocabulary flashcard games

### **Unit 4: Basic Grammar and Sentence Structure**

- Introduction to articles (definite and indefinite)
- Subject-verb-object structure

**Suggested Readings:**

1. "German Made Simple: Learn to Speak and Understand German Quickly and Easily"  
Author: Arnold Leitner
2. A straightforward introduction to the language, covering essential vocabulary and grammar.
3. "German for Dummies"
4. Author: Wendy Foster
5. "The Everything Learning German Book"
6. "Practice Makes Perfect: Complete German Grammar"
7. Author: Ed Swick
8. A comprehensive workbook that reinforces grammar concepts with exercises and explanations.

## CHINESE II (BL-302C)

**Sub. Code: BL – 302C**

**L-4, C-4**

### **Course Objectives**

By the end of this course, students will be able to:

- Understand and use basic Chinese vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in Chinese.
- Write basic sentences and paragraphs in Chinese.

### **Unit 1: Introduction to Chinese**

- Pinyin and pronunciation
- Basic greetings and self-introduction
- Pronunciation practice
- Icebreaker introductions

### **Unit 2: Numbers and Dates**

- Numbers 1-100
- Days of the week and months
- Number games
- Calendar exercises

### **Unit 3: Everyday Vocabulary**

- Family members
- Common nouns (e.g., animals, objects)
- Family tree project
- Vocabulary flashcards

### **Unit 4: Basic Grammar and Sentence Structure**

- Subject-verb-object structure

- Introduction to measure words

### **Suggested Readings**

- "Integrated Chinese" (Textbook + Workbook)
  - Authors: Tao-chung Yao, Yuehua Liu, et al.
  - A comprehensive series that covers speaking, reading, and writing. It includes cultural notes and exercises.
- "Chinese Made Easier"
  - Authors: Maureen S. W. D. H. Wong, et al.
  - Focuses on conversational skills with a gradual introduction to reading and writing.
- "New Practical Chinese Reader"
  - Authors: Liu Xun
  - A popular series that integrates language and cultural elements, with a focus on conversational skills.
- "Reading & Writing Chinese"
  - Author: William McNaughton
  - A guide to learning characters, with clear explanations and practice exercises.

## **FRENCH II (BL-302D)**

**Sub. Code: BL – 302D**

**L-4, C-4**

### **Course Objectives**

- Understand and use basic French vocabulary and grammar.
- Engage in simple conversations about everyday topics.
- Read and comprehend short texts in French.
- Write basic sentences and paragraphs in French.

### **Unit 1: Daily Routines**

- Common verbs (aller, être, avoir)
- Talking about daily activities

### **Unit 2: Food and Drink**

- Vocabulary related to food
- Expressing likes and dislikes

### **Unit 3: Clothing and Shopping**

- Vocabulary for clothing
- Shopping dialogue and role-play

### **Unit 4: Directions and Transportation**

- Asking for and giving directions

### **Suggested Readings:**

1. "Easy French Step-By-Step" by Myrna Bell Rochester
2. A clear, gradual approach to learning French grammar and vocabulary.
3. "French for Dummies" by Dodi-Katrin Schmidt and Michelle M. Williams
4. "Practice Makes Perfect: Complete French Grammar" by Annie Heminway
5. Comprehensive grammar explanations with exercises for practice

## **Family Law – II (Muslim Law)**

**Sub. Code: BL 304**

**L – 4, C – 4.**

### **Course objectives**

- The Muslim Law course provides students with an in-depth understanding of Islamic jurisprudence and its application in modern legal contexts.
- Students will gain knowledge about the principles governing family law, inheritance, contractual relationships, and criminal law within the framework of Shari'ah.
- The course also emphasizes the interaction between personal law and secular law in India and the role of judicial intervention and legal reforms in shaping Muslim law practices.
- By the end of the course, students will have a comprehensive understanding of Muslim personal law and its application in the Indian legal system, and will be able to critically assess contemporary issues and challenges faced by Muslim communities in India and other parts of the world.

### **Unit-I :**

Origin and development of Muslim Law - Sources of Muslim Law - Schools of Muslim Law - Difference between the Sunni and Shia Schools – Sub-schools of Sunni Law - Operation and application of Muslim Law - Conversion to Islam - Effects of conversion - Law of Marriage, nature of Muslim Marriage - Essential requirements of valid Marriage - Kinds of Marriages - distinction between void, irregular and valid marriage

### **Unit-II:**

Divorce - Classification of divorce - different modes of Talaq - Legal consequences of divorce - Dissolution of Muslim Marriage Act, 1939 - Maintenance, Principles of maintenance, Persons entitled to maintenance

### **Unit-III:**

Parentage - Maternity and Paternity - Legitimacy and acknowledgment - Guardianship - Meaning - Kinds of guardianship - Removal of guardian - Difference between Shia and Sunni Law. Gift - Definition of Gift - Requisites of valid gift - Gift formalities - Revocation of gift - Kinds of gift.

### **Unit-IV :**

Waqf \_ Definition - Essentials of Waqf - Kinds of Waqf – Creation of Waqf - - Revocation of Waqf - Salient features of the Waqf Act, 1995 – Mutawalli - Who can be Mutawalli - Powers and duties of Mutawalli - Removal of Mutawalli and Management of Waqf property. Succession - Application of the property of a deceased Muslim

**Suggested Readings:**

1. Tahir Mahmood: The Muslim Law of India, 1980, Law Book Company, Allahabad.
  2. Aquil Ahmed: Text Book of Mohammadan Law, 5th Edition 1992, Central 4. Law Agency, Allahabad.
  3. Prof. G.C.V. Subba Rao: Family Law in India, 6th Edition, 1993, S.Gogia & Company, Hyderabad.
  5. Asaf A.A. Fyzee: Outlines of Mohammadan Law, 4th Edition, 1999, Oxford University Press, Delhi.
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## Legal Language and Legal Writing

Sub. Code: BL 306

L -4, C -4

### Course Objectives

- The Legal Language and Legal Writing course aims to build proficiency in the specialized language used in the legal profession, along with developing practical skills for drafting legal documents and writing persuasive legal arguments.
- Students will gain a strong foundation in legal research, drafting, analytical reasoning, and professional communication, all of which are essential for success in legal practice.
- By the end of the course, students will be prepared to write effectively and ethically in a wide range of legal contexts, and they will have the tools necessary for successful legal practice, whether in litigation, contract law, corporate law, or public policy.
- Engage students in simulated legal scenarios, where they apply their legal writing and research skills to draft documents or provide advice based on a hypothetical case.

### Unit I: Meaning and uses of legal terms

#### Commonly used Latin terms in courts

Ab initio', Res judicata, Res– subjudice, Adhoc, Adinfinitum, Adinterim, Adjourn sine die, Ad litem, Advalorem, Alibi, Aliter, Almamater, Amicus Curiae, Animus, Animus possidendi, Alumini, Anti-meridiem, Bonafide, Bona Vacantia, Causeausans, Coram non judice, Corpus Possessionis, Custodia Legis, Composmentis, Cypress, Defacto, DeJure, Denovo, Donati on mortis cause, Enventresamere, Enroute, Exofficio, Exgratia, Exparte, Ex post facto, Factumvalet, Femesole, Filiusnullius, In forma pauperis, Ibid, Inlimine, Inmemoriam, Inparimaterial, Intelligibledifferentia, Interalia, Interse, Ipsojure, Intoto, Ipsofacto, Ininvitum, Inlocoparentis, Inpais, Inpari delicto, potiores condition possidentis (or defendentis), In rem, Intervivos, Intra-vires, Justertii, Juscivile, Jusdivinum, LexFori, Lex Loci delicti, Lispendens, Locusstandi, Malafide, MensRea, Modusoperandi, Modus Vivendi, Non compos mentis, Nonfeasance, NudumPactum, Onusprobandi, PactaSuntServanda, PariPassu, Pendentelite, Perannum, Percapita, Per diem, Permensem, Perstripes, Persona non grata,

#### Unit II: Legal maxims

1. Absolutasententiaexpositore non-indiget
2. A bundanscautela non nocet.
3. Actio-personalismoritur-cum persona
4. Actoriincumbit onus probandi
5. Actus curiae neminemgravabit
6. Actus deineminifacitinjuriam
7. Actus reus
8. Actus legisneminiestdamnosus

9. Actus non-facit reum nisi mens sit rea
10. Ejusdem Generis
11. Exturpi causa non oritur actione
12. Noscitur a sociis
13. Novus actus interveniens
14. Respondent superior
15. Falsus in uno falsus in omnibus
16. Acquitias sequitur legem
17. Allegans contraria non est audiendus
18. Audi alteram partem
19. Caveat emptor
20. Damnum sine injuria
21. De minimis non curat lex
22. Dolus malus pactum se non servabit
23. Delegates non potest delegare
24. Fiat Justitia ruat caelum
25. Ignorantia legis neminem excusat
26. Injuria sine damno

### **Unit III: Paragraph & Precise Writing of Legal Texts**

### **Unit IV: Writing of Moot Memorials**

#### **Suggested Reading:**

1. Myneni S.R., Legal language and Legal Writing, Central Law Agency, Allahabad.
2. Jain R.L., Legal Language, Central Law Agency, Allahabad.
3. Prasad Anirudh, Legal Language, Central Law Publications, Allahabad.

## PUBLIC INTERNATIONAL LAW

**Sub. Code: BL 308**

**L – 4, C – 4.**

### **Course objectives**

- The Public International Law course aims to provide students with a thorough understanding of the legal rules that govern the relations between states and other international actors.
- By the end of the course, students will be familiar with the sources, subjects, and principles of international law, as well as its application in areas such as human rights, international humanitarian law, trade, investment, and conflict resolution.
- The course prepares students to critically engage with global legal challenges and equips them with the tools to understand and navigate the complexities of international law in contemporary global affairs.
- Analyze the role of international law in global development and the protection of economic, social, and cultural rights, particularly in the context of poverty, disaster relief, and humanitarian assistance.

### **Unit-I:**

Definition, Nature, Scope and Importance of International Law — Relation of International Law to Municipal Law

### **Unit-II:**

State Recognition — State Succession — Responsibility of States for International delinquencies

### **Unit-III:**

Position of Individual in International Law — Nationality — Extradition — Asylum — Privileges and Immunities of Diplomatic Envoys

### **Unit-IV:**

The Legal Regime of the Seas – Evolution of the Law of the Sea – Freedoms of the High Seas – Common Heritage of Mankind – United Nations Convention on the Law of the Sea – Legal Regime of Airspace – Important Conventions relating to Airspace – Paris, Havana, Warsaw and Chicago Conventions – Five Freedoms of Air – Legal Regime of Outer space – Important Conventions such as Outer space Treaty

### **Suggested Readings:**

1. S.K. Kapoor, Public International Law, Central Law Agencies, Allahabad.
2. H.O. Agarwal, International Law and Human Rights, Central Law Publications, Allahabad.
3. S.K. Verma, An Introduction to Public International Law, Prentice Hall of India.

# MACRO ECONOMICS II

**Sub. Code: BL – 310**

**L-4, C-4**

## **Course objectives**

- The Macroeconomics II course aims to deepen students' understanding of the complex dynamics that govern national and global economies.
- It combines advanced theoretical analysis with practical policy applications, preparing students to understand and evaluate the impact of economic policies, global trends, and crises.
- By the end of the course, students should be able to critically assess macroeconomic phenomena, formulate policy recommendations, and utilize econometric tools to analyze real-world economic problems.
- Debates in Macroeconomics: Engage students in contemporary policy debates in macroeconomics, such as austerity vs. stimulus, central bank independence, and the role of fiscal policy in economic stabilization.

## **Unit I: Classical Theory/ Long Run Analysis**

Foundation & features of Classical Theory,

## **Unit II: Principles of Aggregate Demand & Aggregate Supply**

Theory of Aggregate Demand

## **Unit III: New Keynesian/Post Keynesian Economics**

Importance & Scope, Different Theories of Post Keynesian Economics (RET Business Cycle theory etc.)

## **Unit IV: Growth & Development**

Concept of Economic Growth & Economic Development, Neo-Classical Growth Theory, Types of Growth & Development, Factors of Growth & Development

## **Suggested Readings:**

1. Jhingan M.L., Development Economic, Vrinda Pub.
2. Dwivedi D.N., Macroeconomic Theory & Policy, Tata Mac Graw Hill
3. Samuelson & Nordhaus, Economics, Tata Mac Graw Hill
4. Shapiro, Macroeconomic Analysis, Galgotia

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## **Anthropology-II (BL – 310 A)**

**Sub. Code: BL – 310 A**

**L-4, C-4**

### **Course Objectives:**

- To deepen the understanding of economic behaviors, institutions, and practices from an anthropological perspective.
- To explore the interplay between culture, economy, and society, focusing on contemporary issues.
- To analyze economic systems and their evolution, emphasizing globalization, development, and inequality.
- To examine the roles of exchange, property, labor, and consumption in different societies, using anthropological theories and empirical studies.

### **Unit I: Theoretical Perspectives in Economic Anthropology**

- Classical Approaches: Marxian, Weberian, and Durkheimian Perspectives on Economic Life
- Cultural Economics: The Role of Culture in Economic Decision-Making
- Neoliberalism, Globalization, and Economic Anthropology
- Post-Colonial Critiques of Economic Anthropology
- Political Economy and Economic Anthropology: Key Concepts and Debates

### **Unit II: Modes of Production and Economic Systems**

- Subsistence Economies: Foraging, Horticulture, Pastoralism, and Agriculture
- The Role of Kinship and Social Structures in Economic Systems
- The Rise of Industrial Capitalism and Its Anthropological Impact
- State-Controlled Economies: Socialism, State Capitalism, and Nationalism
- Transition from Traditional to Modern Economic Systems in Developing Societies

### **Unit III: Exchange, Trade, and Markets**

- Theories of Exchange: Reciprocity, Redistribution, and Market Exchange (Mauss, Sahlins, Polanyi)
- The Role of Barter Systems, Gift Economies, and Money in Different Cultures
- Market Systems: Local, National, and Global Markets
- The Anthropology of Global Trade: Commodities, Global Supply Chains, and Fair Trade
- The Informal Economy: Informal Work, Microenterprises, and the Shadow Economy

### **Unit IV: Labor, Property, and Economic Inequality**

- The Anthropology of Labor: Division of Labor, Gender, and Work Relations
- Property Rights: Land Ownership, Intellectual Property, and Cultural Property
- Social and Economic Inequality: Caste, Class, Race, and Gender Dimensions

- Economic Exploitation and Worker's Rights: Case Studies from the Global South
- Anthropology of Development and Underdevelopment: Economic Anthropology's Role in Policy

### **Unit V: Consumption, Development, and Globalization**

- The Anthropology of Consumption: Material Culture, Consumerism, and Identity
- Development Theories and Practices: From Modernization to Post-Development
- Globalization and Its Impact on Local Economies: Culture, Labor, and Power
- The Role of NGOs and International Organizations in Economic Development
- Environmental Anthropology: Sustainability, Resources, and Development

### **Suggested Books:**

1. "Economic Anthropology: A Systematic Approach" by Stephen Gudeman
2. "The Anthropology of Economy: A Reader" edited by Brian Moeran and Richard Wilk
3. "The Gift: The Form and Reason for Exchange in Archaic Societies" by Marcel Mauss
4. "Markets and Money: A Critical Introduction" by Keith Hart and John Sharp
5. "The Anthropology of Development and Globalization" by Richard H. Robbins
6. "Globalization and Its Discontents" by Joseph E. Stiglitz

## **Political Economy-II BL – 310B**

**Sub. Code: BL – 310 B**

**L-4, C-4**

### **Course Objectives:**

- To analyze the relationship between politics and economics in the context of contemporary global capitalism.
- To examine the historical and theoretical foundations of political economy, including critical perspectives on capitalist systems.
- To understand economic policy choices, their implications for governance, and the role of the state in economic management.
- To explore key issues such as economic globalization, economic inequality, neoliberalism, and sustainable development within a political economy framework.

### **Unit I: Theories of Political Economy**

- Classical Political Economy: Adam Smith, David Ricardo, and John Stuart Mill
- Marxist Political Economy: Karl Marx's Theory of Value, Surplus Value, and Historical Materialism
- Neoclassical Political Economy: Marginalism, Utility, and the Role of Markets
- Keynesian Political Economy: Theories of Aggregate Demand, Government Intervention, and Economic Stability
- The Chicago School and Neoliberalism: Market Fundamentalism and Its Critics

### **Unit II: State and the Economy**

- The Role of the State in Economic Systems: Intervention vs. Laissez-Faire
- State Capitalism: Characteristics, Examples, and Contemporary Relevance
- Theories of State and Market Relations: Marxist, Liberal, and Institutionalist Approaches
- The Political Economy of Welfare States: Social Safety Nets, Redistribution, and Fiscal Policy
- Economic Crises and State Responses: The Role of Government in Economic Recovery

### **Unit III: Globalization and Political Economy**

- Globalization and Its Impacts: Economic, Political, and Cultural Dimensions
- Theories of Global Capitalism: World Systems Theory (Wallerstein) and Globalization of Capital
- Global Trade and Finance: WTO, IMF, World Bank, and Global Financial Institutions
- The Politics of Global Economic Governance: Regionalism, Bilateral Agreements, and Trade Wars
- Global Inequality and the South-North Divide: The Political Economy of Development

#### **Unit IV: Neoliberalism and Its Discontents**

- Neoliberalism: Theory, Policies, and Practices
- Privatization, Deregulation, and Austerity: Global Impact of Neoliberal Policies
- The Rise of Multinational Corporations and Financialization
- The Global Financial Crisis of 2008: Causes, Consequences, and Policy Responses
- Resistance to Neoliberalism: Anti-Globalization Movements and Alternative Economic Models

#### **Unit V: Political Economy of Development and Sustainability**

- Theories of Economic Development: Modernization, Dependency Theory, and Post-Colonial Critiques
- The Political Economy of Sustainable Development: Growth vs. Environmental Sustainability
- Green Political Economy: Environmental Economics, Green New Deal, and Eco-Socialism
- The Role of International Organizations in Development: The UN, World Bank, and Regional Development Banks
- Economic Planning in Developing Countries: Challenges and Policy Alternatives

#### **Suggested Books:**

1. **"The Political Economy of Development and Underdevelopment"** by Charles K. Wilber
2. **"Capitalism and Modern Social Theory"** by Anthony Giddens
3. **"Political Economy: A Marxist Introduction"** by Ben Fine
4. **"Global Political Economy"** by John Ravenhill
5. **"The Political Economy of Neoliberalism"** by David Coates
6. **"Globalization and Its Discontents"** by Joseph E. Stiglitz
7. **"Theories of Political Economy"** by James A. Caporaso and David P. Levine



# **SEMESTER VII**

## **LABOUR LAW –I**

**Sub. Code: BL 401**

**L – 4, C – 4.**

### **Course Objectives**

- Students should have a solid understanding of the legal framework that governs the workplace.
- They will be equipped to critically assess the interplay between labour laws and socio-economic policies, the role of trade unions and employer organizations, and the various protections afforded to workers in different sectors and jurisdictions.
- Students will also develop the skills to address labour law issues both in domestic and international contexts, contributing to discussions on labour market regulation, worker protection, and social justice in a rapidly changing world.
- Understand the obligations of employers in complying with labor laws, including the importance of record-keeping, compliance audits, and training programs for workplace rights and safety.

### **Unit-I**

Trade Unions: History of Trade Union Movement - The Trade Union Act 1926 – Definitions - Registration – Rights and Liabilities of Registered Trade Unions – Immunities – Amalgamation and dissolution of Unions

### **Unit-II**

Prevention and Settlement of Industrial Disputes in India - The role of State in Industrial Relations – The Industrial Disputes Act 1947 - Definition of industry - Industrial Dispute – Individual Dispute - workman- Lay off

### **Unit-III**

Authorities under the IDAct – Works committee – Conciliation - Court of inquiry - Labour Courts- Tribunal – Powers and functions of authorities - Voluntary Arbitration - Provisions under Chapter V-A & V- B of the Act- Alteration of conditions of service – Management rights of action during pendency of proceedings

### **Unit-IV**

Standing Orders -Concept and Nature of Standing Orders – scope and coverage- Certification process – its operation and binding effect – Modification and Temporary application of Model

### **Suggested Readings:**

1. Srivastava: Law of Trade Unions , Eastern Book Company, Lucknow
2. .Goswami : Labour and Industrial Law, Central Law Agency.
3. R.F. Rustomji: Law of Industrial Disputes : Asia Publishing House, Mumbai
4. S.N. Misra : Labour and Industrial Law
5. J.N. Malik : Trade Union Law
6. Khan& Khan : Labour Law , Asia Law House, Hyderabad

## **Jurisprudence**

**Sub. Code: BL 403**

**L – 4, C – 4.**

### **Course Objectives**

- The Jurisprudence course, often referred to as the philosophy of law, aims to introduce students to the fundamental principles and theories underlying the concept of law and legal systems.
- The course explores the nature, function, and purpose of law, providing students with the tools to critically examine how laws are created, interpreted, and enforced. Students will engage with a variety of legal philosophies, schools of thought, and historical perspectives, gaining insight into the relationship between law, morality, justice, and society.
- By the end of the course, students will be able to analyze and evaluate the different schools of jurisprudence, understand the key concepts that shape legal theory, and apply these insights to the practical functioning of legal systems.
- Explore key theories about the nature of law, including natural law, positive law, and legal realism, and understand the distinction between law and morality.

### **Unit-I:**

Meaning and Definition of Jurisprudence — General and Particular Jurisprudence - Elements of Ancient Indian Jurisprudence — Schools of Jurisprudence — Analytical, Historical, Philosophical and Sociological Schools of Jurisprudence. Theories of Law — Meaning and Definition of Law

### **Unit-II :**

Sources of Law — Legal and Historical Sources — Legislation - Definition of legislation - Classification of legislation- Supreme and Subordinate Legislation - Direct and Indirect Legislation - Principles of Statutory Interpretation. Precedent — Definition of Precedent — Kinds of Precedent — Stare Decisis — Original and Declaratory Precedents — Authoritative and Persuasive Precedents. Custom – Definition of Custom – Kinds of Custom – General and Local Custom – Custom and Prescription - Requisites of a valid custom - Relative merits and demerits of Legislation , Precedent and Custom as a source of Law .

### **Unit-III:**

Persons — Nature of personality — Legal Status of Lower Animals, Dead Persons and Unborn persons — Legal Persons — Corporations — Purpose of Incorporation — Nature of Corporate Personality - Rights and Duties — Definition of Right — Classification of Rights and Duties —

### **Unit-IV :**

Obligation — Nature of Obligation — Obligation arising out of Contract, Quasi Contract, trust and breach of obligation etc. — Liability — Nature and kinds of liability — Acts — Mens Rea — Intention and Motive — Relevance of Motive

**Unit-V:**

Ownership — Definition and kinds of Ownership - Possession — Elements of Possession -

**Suggested Readings:**

1. Salmond: Jurisprudence, Universal Publishers 12th Edn. 1966.
2. Rama Jois, Legal and Constitutional History of India, Universal Law Publications, Delhi.
3. N.V. Pranjape – Jurisprudence
4. S.R. Dhyeni – Jurisprudence

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## **Company Law**

**Sub. Code: BL 405**

**L – 4, C – 4.**

### **Course Objectives**

- Students will have gained a thorough understanding of the **legal frameworks** that govern the operation of companies, from their incorporation to their dissolution.
- They will be equipped to critically assess corporate governance issues, company finance, shareholder rights, and the protection of stakeholders in business law.
- Additionally, students will be able to analyze the challenges and opportunities posed by evolving corporate regulations, and the role of company law in the modern global economy.
- Study the different types of shares (e.g., ordinary shares, preference shares), the issue of shares, and the rules regarding share capital. Discuss the legal requirements for subscription, allotment, and transfer of shares.

### **Unit-I:**

Definition and attributes of Company — Distinction between Partnership Firm and Company — Kinds of Companies including Multinational Companies — Advantages and Disadvantages of

### **Unit-II:**

Promoters and Registration — Pre-incorporation contracts — Memorandum of Association —

### **Unit-III:**

Prospectus — Members — Shareholders — Share Capital — Shares and Dividends — Debentures.

### **Unit-IV:**

Director, Manager and Secretary — Meetings — Majority powers and minority rights —

### **Unit-V:**

Modes of winding up of companies.

### **Suggested Readings:**

1. Shah : Lectures on Company Law, N.M.Tripathi, Bombay.
2. Avtar Sing : Company Law, Eastern Book Company, 13th Edn. 2001.
3. Charlesworth: Company Law, Sweet and Maxwell, 1996.
4. Ramaiah: Company Law, Wadhwa& Co. 15th Edn. 2001.
5. Dutta: Company Law, Eastern Law House, Calcutta

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## **ADMINISTRATIVE LAW**

**Sub. Code: BL 407**

**L – 4, C – 4.**

### **Course Objectives**

- Definition and Nature: Understand the basic principles of administrative law, its relationship to constitutional law, and how it regulates the exercise of executive powers by governmental agencies.
- Scope of Administrative Law: Study the scope of administrative law in various contexts, including rule-making, enforcement, and decision-making.
- Examine the role of administrative agencies in the legislative, executive, and judicial functions of government.
- Sources of Administrative Law: Analyze the sources of administrative law, including statutes, regulations, judicial decisions, government orders, and administrative directives.

### **Unit-I:**

Nature and scope of Administrative Law — Meaning, Definition and Evolution of Administrative Law—Reasons for the growth of

### **Unit-II:**

Basic concepts of Administrative Law — Rule of Law — **Interpretation** of Dicey's Principle of Rule of Law — Modern trends

### **Unit-III:**

Classification of Administrative functions — Legislative, Quasi-judicial, Administrative and Ministerial functions — Delegated Legislation — Meaning, Reasons for the growth and Classification of delegated legislation

### **Unit-IV:**

Judicial Control of Administrative Action - Grounds of Judicial Control — Principles of Natural Justice.

### **Unit-V:**

Remedies available against the State — Writs — Lokpal and Lok Ayukta

### **Suggested Readings:**

1. Griffith and Street: Principles of Administrative Law.
2. H.W.R.Wade: Administrative Law, Oxford Publications, 8th Edn. 2000, London.
3. De Smith: Judicial Review of Administrative Action, Sweet and Maxwell, 1998.
4. S.P. Sathe: Administrative Law, Butterworths, 6th Edn. 1998.
5. I.P.Massey: Administrative Law, Eastern Book Company, 5th Edn. 2001.

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## ALTERNATE DISPUTE RESOLUTION

Sub. Code: BL 409

L -4, C -4

### Course Objectives

- The Alternative Dispute Resolution (ADR) course is designed to introduce students to methods of resolving disputes outside the traditional court system.
- ADR techniques, such as mediation, arbitration, negotiation, and conciliation, offer parties an opportunity to resolve conflicts more efficiently, cost-effectively, and with greater control over the outcome than formal litigation.
- The course aims to equip students with the knowledge and skills necessary to understand, apply, and analyze different ADR mechanisms.
- Students will explore the principles, processes, advantages, and challenges of ADR, along with the legal frameworks that govern these alternative methods of dispute resolution. By the end of the course, students will be able to assess the suitability of ADR in various contexts and understand how these methods contribute to access to justice and the reduction of the burden on courts.

This is a first clinical paper of which written examination will be for 60 marks and the remaining 40 marks for record and viva voce. There shall be classroom instruction on the following topics:

### Unit-I:

Alternate Dispute Resolution — Characteristics — Advantages and Disadvantages—Unilateral — Bilateral — Triadic (Third Party) Intervention — Techniques and processes -- Negotiation — Conciliation

### Unit-II:

The Arbitration and Conciliation Act, 1996 — Historical Background and Objectives of the Act — Definitions of Arbitration, Arbitrator, Arbitration Agreement -- Appointment of Arbitrator — Termination of Arbitrator -- Proceedings in Arbitral Tribunal -- Termination of Proceedings — Arbitral Award -- Setting aside of Arbitral Award — Finality and Enforcement of Award — Appeals – Enforcement of Foreign Awards. Conciliation – Appointment of Conciliators – Powers and Functions of Conciliator **Unit-III:**

Other Alternative Dispute Resolution Systems —Tribunals.

### Practical Exercises (30 marks)

(a) The students are required to participate in 5 (five) simulation proceedings relating to Arbitration, Conciliation, Mediation and Negotiation. Participation in each such simulation proceeding shall be evaluated for a maximum of 4 (four) marks (Total 5x4=20marks).

(b) Students are required to attend and observe the proceedings of Lok Adalats, Family Courts, Tribunals and other ADR Systems. Each student shall record the above observations in the diary which will be assessed. Record submitted by the student shall be evaluated for 10 marks by the teacher concerned. The Records of the students duly certified by the University Representative

appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University before the commencement of the theory examinations

**Viva- voce (10marks):** There shall be viva-voce examination on the above components. The Viva-voce Board consisting of (i) Principal of the College/the teacher concerned (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law, and (iii) an advocate with 10 years experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.

**Note: Attendance of the students in all the four components of the paper (written examination, participation in simulation proceedings, submission of record and attendance in viva) shall be compulsory.**

**Suggested Readings:**

1. O.P. Tiwari : The Arbitration and Conciliation Act (2nd Edition): Allahabad Law Agency.
2. Johar's : Commentary on Arbitration and Conciliation Act, 1996: Kamal Law House.
3. Acharya N.K.: Law relating to Arbitration and ADR, Asia Law House, Hyderabad
4. Tripathi S.C.: Arbitration, Conciliation and ADR, Central Law Agency, Allahabad.
5. Avatar Singh: Arbitration and Conciliation, Eastern Law Book House, Lucknow.

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## Data Analysis-1/ (BL-409A)

Sub. Code: BL 409 A

L -4, C -4

### Course Objectives:

- To develop practical skills that complement academic learning.
- To enhance problem-solving abilities and critical thinking.
- To foster creativity and innovation through practical work.
- To improve communication, teamwork, and leadership skills.
- To make students job-ready by providing exposure to real-world scenarios.
- To ensure students gain competence in tools, software, and techniques that are relevant to their field of study.

### Unit 1: Introduction to Practical Skills and Work Ethics

#### 1. Understanding Practical Skills:

- Importance of practical skills in academic and professional success.
- Distinction between theoretical knowledge and practical application.
- Identifying core skills relevant to students' academic fields.

#### 2. Work Ethics and Professionalism:

- Understanding the concept of work ethics: Punctuality, responsibility, and accountability.
- Teamwork and collaboration in professional settings.
- Ethical decision-making and handling conflicts in the workplace.

#### 3. Time Management:

- Techniques for effective time management: Prioritizing tasks, deadlines, and multitasking.
- Tools for personal and professional time management.
- Stress management and maintaining a healthy work-life balance.

### Unit 2: Communication Skills and Presentation

#### 1. Verbal Communication:

- Mastering effective speaking: Clarity, tone, and expression.
- Public speaking and presentation techniques.
- Interview skills: Preparing for and succeeding in job interviews.

#### 2. Written Communication:

- Writing professional emails, reports, and memos.
- Academic writing: Essays, research papers, and citations.
- Resume writing and crafting a cover letter.

#### 3. Non-Verbal Communication:

- The role of body language in communication.
- Understanding and using visual aids effectively in presentations.
- Active listening skills and empathetic communication.

### **Unit 3: Problem-Solving and Critical Thinking**

#### **1. Problem-Solving Techniques:**

- Approaches to problem-solving: Identifying problems, generating solutions, and evaluating outcomes.
- Creative problem-solving techniques: Brainstorming, lateral thinking, and mind mapping.
- Case studies and real-world problems: Analyzing and providing solutions.

#### **2. Critical Thinking Skills:**

- Understanding the concept of critical thinking: Analyzing, evaluating, and interpreting information.
- Logical reasoning and decision-making frameworks.
- Identifying biases and fallacies in problem-solving and decision-making.

#### **3. Decision-Making and Risk Management:**

- Making informed decisions under uncertainty.
- Understanding risk and how to mitigate it.
- Case studies on decision-making in professional environments.

### **Unit 4: Computer Literacy and Technology Tools**

#### **1. Basic Computer Skills:**

- Operating systems: Introduction to Windows, macOS, and Linux.
- File management and software installation.
- Internet navigation and online security.

#### **2. Microsoft Office Suite:**

- MS Word: Document formatting, tables, and references.
- MS Excel: Data entry, formulas, and data analysis tools.
- MS PowerPoint: Creating and designing presentations.

#### **3. Other Relevant Software Tools:**

- Introduction to design tools like Adobe Photoshop and Illustrator (depending on the course).
- Introduction to statistical tools like SPSS, R, or Python (depending on the course).
- Project management software: Using tools like Trello or Asana for task management.

## **Unit 5: Leadership and Teamwork**

### **1. Understanding Leadership Styles:**

- Theories of leadership: Transformational, transactional, and servant leadership.
- The role of a leader in guiding teams and achieving goals.
- Conflict resolution and leadership during crises.

### **2. Teamwork and Collaboration:**

- The importance of teamwork in professional and academic settings.
- Building and managing effective teams.
- Communication and coordination within teams: Achieving shared goals.

### **3. Project Management Skills:**

- The basics of project management: Planning, organizing, and execution.
- Understanding project management tools and methodologies (e.g., Agile, Waterfall).
- Evaluating project success: Time, cost, and quality management.

## **Unit 6: Practical Training or Project Work**

### **1. Internship/Practical Exposure:**

- Hands-on experience in the chosen field (e.g., internship, industry visits, or fieldwork).
- Application of theoretical knowledge in real-world settings.
- Reflection on learning outcomes from the practical exposure.

### **2. Project Work:**

- Undertaking a group or individual project related to the academic discipline.
- Research, data collection, analysis, and presentation of results.
- Collaborative problem-solving and practical application of skills.

### **3. Evaluation and Reporting:**

- Writing a project report or internship report.
- Preparing a presentation on the practical work undertaken.
- Peer and instructor evaluations of performance.

## **Suggested Books:**

- *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses* by Eric Ries
- *The Art of Project Management* by Scott Berkun
  
- *The 7 Habits of Highly Effective People* by Stephen R. Covey
- *How to Win Friends and Influence People* by Dale Carnegie
- *Microsoft Office 365 All-in-One For Dummies* by Peter Weverka
- *Leaders Eat Last* by Simon Sinek
- *Microsoft Office 365 All-in-One For Dummies* by Peter Weverka

# Computer Programming-1 (BL-409B)

Sub. Code: BL 409B

L -4, C -4

## Course Objectives:

- To provide students with a foundational understanding of data analysis techniques.
- To teach students how to organize, clean, and interpret data.
- To introduce students to basic statistical methods and data visualization techniques.
- To familiarize students with data analysis software and tools (Excel, SPSS, or R).
- To develop the ability to apply data analysis techniques to real-world problems.

## Unit 1: Introduction to Data Analysis

### 1. Understanding Data:

- Types of data: Qualitative vs. Quantitative, Continuous vs. Discrete.
- Levels of measurement: Nominal, Ordinal, Interval, and Ratio.
- Data collection methods: Surveys, experiments, observational studies, etc.
- Introduction to data sets and variables.

### 2. The Data Analysis Process:

- Steps in the data analysis process: Data collection, cleaning, analysis, and interpretation.
- Overview of data analysis software tools (Excel, SPSS, and R).
- Understanding the importance of data quality: Accuracy, completeness, and consistency.

### 3. Ethics in Data Analysis:

- Ethical considerations in data collection and analysis.
- Data privacy, confidentiality, and informed consent.
- Avoiding data manipulation and bias.

## Unit 2: Descriptive Statistics

### 1. Measures of Central Tendency:

- Mean, Median, Mode: Definitions, calculations, and applications.
- Understanding the use of each measure in different contexts.
- Interpreting and comparing measures of central tendency.

### 2. Measures of Dispersion:

- Range, Variance, Standard Deviation, Interquartile Range.
- Interpreting measures of variability.
- Importance of dispersion in understanding data distribution.

### 3. Data Distribution and Visualization:

- Introduction to histograms, bar charts, and pie charts.
- Introduction to box plots and frequency distributions.
- Introduction to skewness and kurtosis.

### **Unit 3: Probability and Probability Distributions**

#### **1. Introduction to Probability:**

- Basic probability concepts: Events, sample space, and probability rules.
- Conditional probability and Bayes' theorem.
- The law of large numbers and central limit theorem.

#### **2. Probability Distributions:**

- Discrete probability distributions: Binomial and Poisson distributions.
- Continuous probability distributions: Normal and Exponential distributions.
- Applications of probability distributions in real-world scenarios.

#### **3. Sampling and Sampling Distributions:**

- Introduction to sampling methods: Simple random sampling, stratified sampling, and cluster sampling.
- Sampling distribution of the sample mean and central limit theorem.
- The relationship between sample size and estimation accuracy.

### **Unit 4: Inferential Statistics**

#### **1. Estimation:**

- Point estimates and confidence intervals.
- Confidence intervals for population mean, proportion, and variance.
- Margin of error and its interpretation.

#### **2. Hypothesis Testing:**

- Formulation of null and alternative hypotheses.
- Types of errors: Type I and Type II errors.
- Performing hypothesis tests: Z-test, t-test, chi-square test, and ANOVA.
- p-values and their interpretation in decision-making.

#### **3. Chi-Square Tests and Goodness of Fit:**

- Chi-square test for independence and goodness of fit.
- Applications of chi-square tests in categorical data analysis.
- Interpreting chi-square test results and conclusions.

### **Unit 5: Data Visualization and Presentation**

#### **1. Data Visualization Techniques:**

- Importance of data visualization in communicating results.
- Advanced visualization techniques: Scatter plots, line charts, heatmaps.
- Use of color, size, and shapes in enhancing visualizations.

#### **2. Data Visualization Tools:**

- Introduction to Excel for creating visual representations of data.
- Using SPSS and R for generating statistical graphs and plots.
- Visualization of multiple variables: Bubble charts, 3D plots, and correlation matrices.

#### **3. Creating Reports and Presentations:**

- Best practices for presenting data analysis results.

- Structuring reports: Introduction, methodology, findings, and recommendations.
- Using PowerPoint and other tools to present findings to stakeholders.

## **Unit 6: Introduction to Software for Data Analysis**

### **1. Excel for Data Analysis:**

- Using Excel for basic data analysis: Functions, formulas, and pivot tables.
- Creating charts and graphs in Excel.
- Data manipulation and cleaning techniques in Excel.

### **2. Introduction to SPSS:**

- Overview of SPSS: Data entry, coding, and cleaning.
- Conducting descriptive and inferential statistical analysis in SPSS.
- Visualizing data in SPSS: Graphs, charts, and tables.

### **3. Introduction to R:**

- Introduction to R programming language: Basic syntax, data structures, and functions.
- Data manipulation and analysis in R.
- Visualization using R libraries: ggplot2 and other popular packages.

## **Suggested Books:**

- Excel 2021 For Dummies by Greg Harvey.
- Discovering Statistics Using SPSS by Andy Field.
- R for Data Science by Hadley Wickham and Garrett Grolemund.
  
- Statistics for Business and Economics by Paul Newbold, William L. Karlin, and Betty Thorne.
- Data Science for Business by Foster Provost and Tom Fawcett.
- R for Data Science by Hadley Wickham and Garrett Grolemund.
- The Visual Display of Quantitative Information by Edward R. Tufte.
- Data Visualization: A Practical Introduction by Kieran Healy.

# Python Programming-I (BL-409C)

Sub. Code: BL 409C

L -4, C -4

## Course Objectives

- Learn Python syntax and basic programming concepts.
- Develop skills in using control structures and loops.
- Understand and implement functions and data structures.
- Perform file handling and exception management.
- Gain an introduction to object-oriented programming in Python.

## Unit 1: Introduction to Python

- Overview of Python: History, Features, and Applications
- Setting Up the Python Environment (IDE, Jupyter Notebook, etc.)
- Writing and Executing Python Programs
- Understanding Variables, Data Types, and Basic Syntax

## Unit 2: Control Flow and Loops

- Conditional Statements: if, elif, else
- Looping Structures: for and while loops
- Nested Loops and Conditional Expressions
- Introduction to Iterators and Generators

## Unit 3: Functions

- Defining and Calling Functions
- Parameters and Return Values
- Scope of Variables: Local and Global Scope
- Lambda Functions and Recursion

## Unit 4: Data Structures

- Lists, Tuples, and Dictionaries
- Sets and Strings Manipulation
- List Comprehension and Dictionary Comprehension
- Basic Operations and Iteration on Data Structures

## Unit 5: File Handling

- Reading and Writing Files
- Working with Text and Binary Files
- Exception Handling in File Operations
- File Manipulation Techniques

## Suggested Readings

- **"Python Crash Course"** by Eric Matthes
- A hands-on introduction to Python, ideal for beginners.
- **"Automate the Boring Stuff with Python"** by Al Sweigart
- Focuses on practical Python applications for everyday tasks.
- **"Think Python: How to Think Like a Computer Scientist"** by Allen B. Downey
- Explores Python programming with an emphasis on problem-solving.
- **"Python Programming: An Introduction to Computer Science"** by John M. Zelle
- A beginner-friendly introduction to Python and computer science concepts.
- **"Learning Python"** by Mark Lutz
- A comprehensive guide to mastering Python programming.



## **Leadership and Management I (BL-409D)**

**Sub. Code: BL 409D**

**L -4, C -4**

### **Course Objectives**

- Understand key theories and concepts of leadership and management.
- Develop personal leadership skills and management strategies.
- Analyze organizational structures and dynamics.
- Apply leadership and management principles in real-world scenarios.

### **Unit 1: Change Management**

- Theories of organizational change
- Strategies for effective change implementation

### **Unit 2: Ethical Leadership and Corporate Social Responsibility**

- Ethical decision-making frameworks
- The role of leaders in promoting ethical behavior

### **Unit 3: Conflict Resolution and Negotiation**

- Types of conflicts in organizations
- Techniques for effective negotiation and conflict resolution

### **Unit 4: Leadership in a Global Context**

- Cultural influences on leadership and management practices

### **Suggested Readings:**

1. "The Five Dysfunctions of a Team: A Leadership Fable" by Patrick Lencioni
2. A practical guide on building effective teams and addressing common team challenges.
3. "Leaders Eat Last: Why Some Teams Pull Together and Others Don't" by Simon Sinek
4. Discusses the importance of trust and cooperation in effective leadership.
5. "Leadership and Self-Deception: Getting Out of the Box" by The Arbinger Institute

# **SEMESTER VIII**

## **LABOUR LAW-II**

**Sub. Code: BL402**

**L – 4, C –4.**

### **Course Objectives**

- Constitutional and Understand the constitutional provisions relating to labour rights and the key labour statutes governing industrial relations, such as the Industrial Disputes Act, 1947, Trade Unions Act, 1926, Factories Act, 1948, and Shops and Establishments Act.
- International Labour Explore the role of International Labour Organization (ILO) and its conventions in shaping domestic labour laws, focusing on the fundamental principles of labour rights, such as freedom of association, non-discrimination, and the right to equal pay for equal work.
- Industrial Relations System: Study the structure and importance of industrial relations systems in maintaining harmonious employer-employee relationships. Understand the role of trade unions in representing workers and advocating for their rights.
- Formation and Registration of Trade Unions: Explore the legal provisions governing the formation, registration, and functions of trade unions under the Trade Unions Act, 1926.

### **Unit-I**

The Remunerative Aspects – Wages – Concepts of wages - Minimum, Fair, Living Wages - Wage and Industrial Policies - Whitley Commission Recommendations - Provisions of Payment of Wages Act 1936 - Timely payment of wages - Authorised deductions – Claims -

### **Unit-II**

Bonus – concept - Right to claim Bonus – Full Bench formula - Bonus Commission - Payment of Bonus Act 1965 - Application – Computation of gross profit, available, allocable surplus

### **Unit-III**

Employees Security and Welfare aspect - Social Security - Concept and meaning - Social Insurance - Social Assistance Schemes. Social Security Legislations - Law relating to workmen's compensation - The Workmen's Compensation Act 1923 – Definitions - Employer's liability for compensation - Nexus between injury and employment - payment of compensation - penalty for default

#### **Unit-IV**

Employees Provident Fund and Miscellaneous Provisions Act 1952 – Contributions - Schemes under the Act - Benefits. The Maternity Benefit Act 1961 - Definitions- Application - Benefits.

#### **Suggested Readings**

1. S.N.Misra, Labour and Industrial Laws, Central law publication-22<sup>nd</sup> edition. 2006.
2. N.G. Goswami, Labour and Industrial Laws, Central Law Agency.
3. Khan &Kahan, Labour Law-Asia Law house, Hyderabad
4. K.D. Srivastava, Payment of Bonus Act, Eastern Book Company
5. K.D. Srivastava, Payment of Wages Act
6. K.D. Srivastava, Industrial Employment (Standing Orders) Act 1947
7. S.C.Srivastava, Treatise on Social Security
8. Jidwitesukumar Singh, Labour Economics, Deep& Deep, New Delhi
9. V.J.Rao, Factories Law

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# UTTAR PRADESH LAND LAWS

**Sub. Code: BL 404**

**L-4, C-4**

## **Course Objectives**

- Students will have gained a comprehensive understanding of land-related legal principles, including ownership rights, land acquisition, tenancy laws, land reforms, and the legalities surrounding land use and distribution.
- Students will also be able to critically analyze land disputes, propose legal solutions, and understand the broader social, economic, and environmental issues related to land management.
- Examine the challenges posed by rapid urbanization and land scarcity in urban areas, and how legal mechanisms are being adapted to address the needs of growing cities.
- Study the legal measures to prevent land grabbing and illegal encroachments on both public and private land.

## **Unit I: Introduction**

Interpretation Clause, Objects and Clause of UP Zamindari Abolition

## **Unit II: Classes and Rights of Tenure Holder**

Bhumidhar with Transferable Rights, Bhumidhar with Non-Transferable Rights,

## **Unit III: Succession**

General Order of Succession, Succession as per strips, Critical Approach to Law of Succession,

## **Unit IV: Ejectment**

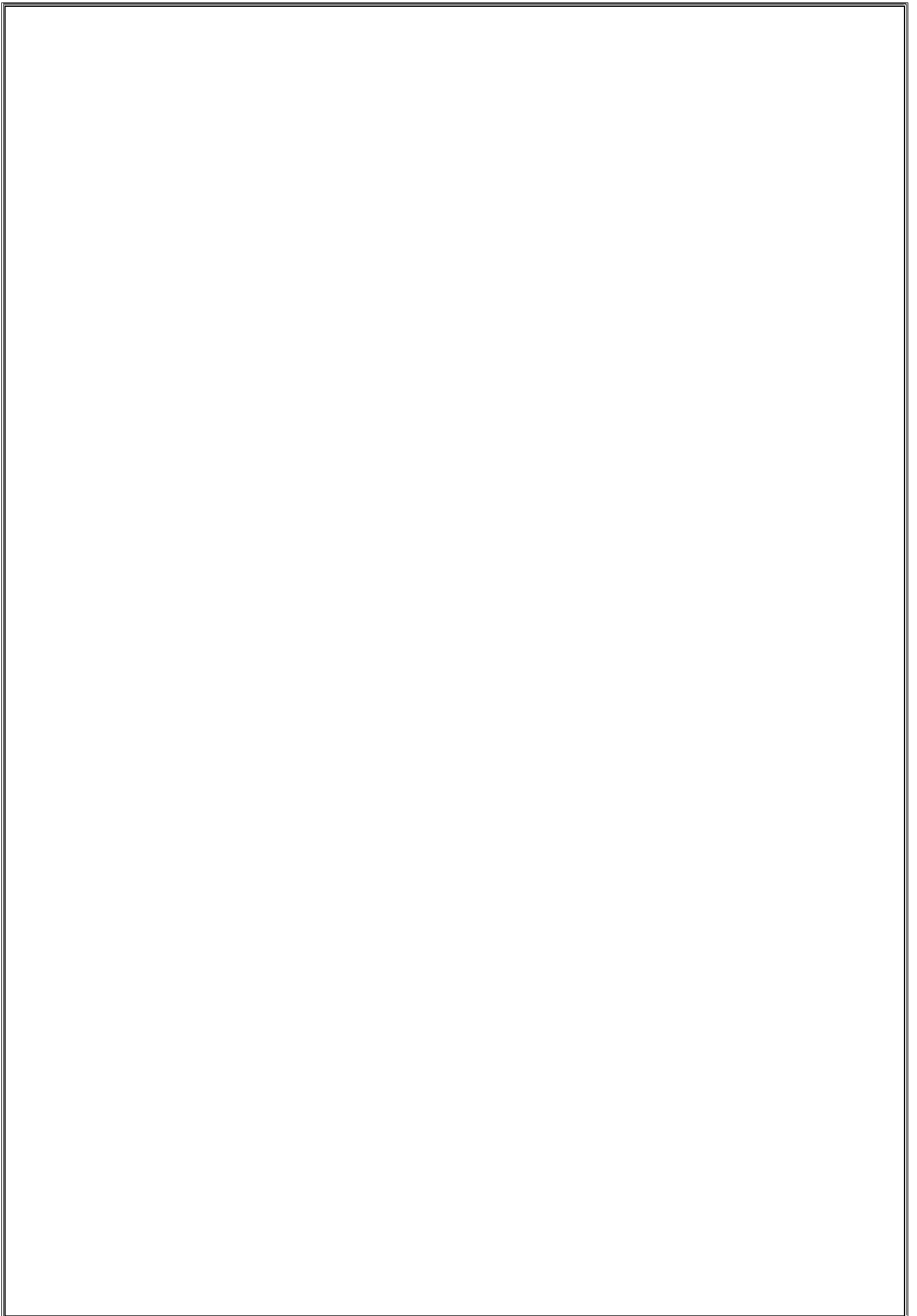
Ejectment of Tenure Holder from the Land of Public Utility, Ejectment of Trespasser, Ejectment of Bhumidhar, Ejectment of Asami, Abandonment and Surrender.

## **Leading Cases For Detail Study**

- \*Abdul Saeed And Another Vs State Of Uttar Pradesh & Others
- \*Smt. Mainia Vs Dy. Director Consolidation
- \*Satyendra Singh Vs State Of Up
- \*Lalsa Vs State Of Up
- \*InduBhushan Vs State Of Up

## **Suggested Reading:**

1. Maurya R.R., Uttar Pradesh Land Laws, Central Law Publications, Allahabad.
2. Singh C.P., Uttar Pradesh Land Laws, Central Law Agency, Allahabad.



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## **Intellectual property law**

**Sub. Code: BL 406**

**L -4, C -4**

### **Course Objectives**

- Students will have a comprehensive understanding of IPR laws and their application in various sectors.
- They will be equipped with the tools necessary to analyze, protect, and enforce intellectual property rights in a globalized digital economy.
- Students will also be able to navigate legal challenges related to IPR and understand the interplay between innovation, regulation, and public interest in the evolving world of intellectual property.
- Examine the debate over IPR and access to medicines, particularly in the context of generic drugs and compulsory licensing.

### **Unit-I:**

Meaning, Nature, Classification and protection of Intellectual Property — The main forms of Intellectual Property — Copyright, Trademarks, Patents, Designs (Industrial and Layout) --

### **Unit-II:**

Introduction to the leading International instruments concerning Intellectual Property Rights — The Berne Convention — Universal Copyright Convention — The Paris Union — Patent Co-operation Treaty -- The World Intellectual Property Organization (WIPO) and the UNEESCO

### **Unit-III :**

Select aspects of the Law of Copyright in India — The Copy Right Act, 1957 - Historical evolution — Meaning of copyright — Copyright in literary, dramatic and musical works, computer programmes and cinematograph films — Neighbouring rights — Rights of performers and broadcasters, etc. — Ownership and Assignment of copyright — Author's special rights — Notion of infringement — Criteria of infringement — Infringement of copyright in films, literary and dramatic works

### **Unit-IV:**

Intellectual Property in Trademarks and the rationale of their protection - The Trade Marks Act, 1999 — Definition of Trademarks — Distinction between Trademark and Property Mark - Registration — Passing off — Infringement of Trademark — Criteria of Infringement — Remedies. The Designs Act, 2000

**Unit-V:**

Patents — Concept of Patent — Historical overview of the Patents Law in India — Patentable Inventions — Kinds of Patents — Procedure for obtaining patent — The Patents Act, 1970

**Suggested Readings:**

1. P. Narayanan: Patent Law, Eastern Law House, 1995.
2. Roy Chowdhary, S.K. & Other: Law of Trademark, Copyrights, Patents and Designs, Kamal Law House, 1999.
3. Dr. G.B. Reddy, Intellectual Property Rights and the Law 5th Ed. 2005 GogiaLaw Agency.
4. John Holyoak and Paul Torremans: Intellectual Property Law.
- 5 B.L. Wadhwa: Intellectual Property



## Research Methodology (BL406A)

Sub. Code: BL406A

L -4, C -4

### Course Objectives:

- To introduce students to the principles and techniques of conducting academic research.
- To provide the necessary tools and methods for designing, executing, and analysing research projects.
- To develop skills in critical thinking, data collection, analysis, and interpretation.
- To understand ethical considerations and the role of research in advancing knowledge.

### Unit I: Introduction to Research and its Types

- **Definition and Importance of Research:** Understanding research, its scope, and significance in various fields.
- **Types of Research:** Basic vs. Applied Research, Quantitative vs. Qualitative Research, Exploratory, Descriptive, and Analytical Research.
- **Research Process:** Stages in Research – Problem Identification, Literature Review, Hypothesis Formulation, Data Collection, Analysis, and Report Writing.
- **Research Paradigms:** Positivism, Interpretivism, and Pragmatism.

### Unit II: Research Design

- **Meaning and Importance of Research Design:** Types of Research Design – Experimental, Correlational, Cross-Sectional, and Longitudinal Studies.
- **Sampling Techniques:** Probability and Non-Probability Sampling, Sampling Methods (Random, Stratified, Systematic, Cluster, etc.).
- **Sampling Error and Sample Size Determination:** Understanding sample size, margin of error, and confidence levels.
- **Variables in Research:** Independent, Dependent, Control, and Confounding Variables.

### Unit III: Data Collection Methods

- **Primary Data Collection:** Surveys, Interviews, Focus Groups, and Observations.
- **Secondary Data Collection:** Using Existing Data Sources like Databases, Reports, and Published Research.
- **Questionnaire Design:** Types of questions (Closed, Open, Likert Scale, etc.), reliability, and validity of instruments.
- **Fieldwork Techniques:** Participant Observation, Case Studies, Ethnography.
- **Ethical Issues in Data Collection:** Informed Consent, Privacy, Confidentiality, and Ethical Approval.

#### **Unit IV: Data Analysis**

- **Quantitative Data Analysis:** Descriptive and Inferential Statistics, Measures of Central Tendency (Mean, Median, Mode), Variability (Range, Standard Deviation), and Hypothesis Testing (t-tests, chi-square tests, ANOVA).
- **Qualitative Data Analysis:** Thematic Analysis, Content Analysis, Narrative Analysis.
- **Use of Software in Data Analysis:** Introduction to SPSS, Excel, and NVivo for quantitative and qualitative data analysis.
- **Interpreting Research Results:** Drawing Conclusions, Identifying Patterns, and Making Recommendations.

#### **Unit V: Research Report Writing and Presentation**

- **Structure of a Research Report:** Introduction, Literature Review, Methodology, Results, Discussion, Conclusion, and References.
- **Writing the Research Proposal:** Objectives, Scope, Methodology, Timeline, and Budgeting for Research.
- **Academic Writing and Citation Styles:** APA, MLA, Chicago, and Harvard referencing styles.
- **Presenting Research Findings:** Writing and presenting research papers, posters, and oral presentations at academic conferences.
- **Avoiding Plagiarism:** Importance of Originality, Citation Practices, and Ethical Use of Sources.

#### **Unit VI: Ethical Issues in Research**

- **Ethics in Research:** Ethical Principles, Institutional Review Boards (IRB), Research Integrity.
- **Conflict of Interest and Bias:** Recognizing and addressing biases in data collection, analysis, and reporting.
- **Data Integrity and Misuse:** Issues related to falsification, fabrication, and manipulation of data.
- **Research Misconduct:** Types of misconduct and how to avoid them.

#### **Suggested Books:**

1. **"Research Methodology: A Step-by-Step Guide for Beginners"** by Ranjit Kumar
2. **"Research Methodology: Methods and Techniques"** by C.R. Kothari
3. **"Qualitative Research Methods for the Social Sciences"** by Bruce L. Berg
4. **"The Craft of Research"** by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams
5. **"Research Methods in Education"** by Louis Cohen, Lawrence Manion, and Keith Morrison
6. **"Practical Research: Planning and Design"** by Paul D. Leedy and Jeanne Ellis Ormrod

# **Publication Ethics and Emerging Trends in Research (BL406B)**

**Sub. Code: BL406B**

**L -4, C -4**

## **Course Objectives:**

- To provide students with a comprehensive understanding of ethical issues in research and publication.
- To explore emerging trends in research methodologies, technology, and publication processes.
- To develop skills in ethical decision-making, responsible conduct of research, and academic writing.
- To prepare students to navigate the complex landscape of modern academic publishing, including open access, peer review, and copyright issues.

## **Unit I: Introduction to Research Ethics**

- **Overview of Research Ethics:** Importance of ethics in research and its role in ensuring integrity, trust, and quality.
- **Ethical Guidelines for Research:** Overview of key ethical principles like respect for persons, beneficence, and justice.
- **Ethical Approval:** Institutional Review Boards (IRB) and ethics committees.
- **Plagiarism:** Definition, types, consequences, and how to avoid it.
- **Authorship and Acknowledgments:** Determining authorship, responsibilities of authors, and proper acknowledgment of contributions.

## **Unit II: Ethical Challenges in Research**

- **Fabrication and Falsification of Data:** Distinguishing between ethical and unethical research practices.
- **Conflicts of Interest:** Identifying and managing conflicts in research and publishing.
- **Data Management and Privacy:** Ethical handling of sensitive data, participant confidentiality, and consent.
- **Research Misconduct:** Types of misconduct (plagiarism, data falsification, authorship disputes), and the process of investigation and reporting.
- **Reproducibility and Transparency:** Ensuring research findings can be replicated and are reported transparently.

### **Unit III: Publication Ethics**

- **Principles of Ethical Publishing:** Fairness, transparency, and accountability in publishing.
- **Peer Review Process:** The role of peer review in ensuring quality and integrity in scientific publishing.
- **Publishing Guidelines:** How to select journals, manuscript preparation, and submission processes.
- **Open Access Publishing:** Definition, advantages, disadvantages, and open-access policies.
- **Copyright and Intellectual Property:** Ownership of research, copyright laws, and licensing (Creative Commons, etc.).

### **Unit IV: Emerging Trends in Research**

- **Digital Transformation in Research:** The impact of technology on research methodologies, data collection, and analysis (e.g., big data, AI, machine learning).
- **Interdisciplinary Research:** Growing importance of interdisciplinary approaches and collaborative research.
- **Citizen Science and Crowdsourcing:** Involving the public in research through citizen science platforms and online collaboration.
- **Preprint Repositories:** Role of preprints in accelerating research dissemination and their ethical implications.
- **Research Integrity in the Digital Age:** Addressing issues related to online publication, social media, and open-source tools.

### **Unit V: Ethical Issues in Emerging Research Areas**

- **Ethics of Artificial Intelligence and Machine Learning in Research:** Ethical concerns in AI-driven research, algorithmic bias, and transparency.
- **Ethics of Genetic and Biomedical Research:** Ethical challenges in genomics, biotechnology, and biomedical research, including gene editing (CRISPR).
- **Environmental Sustainability and Research:** Ethical issues related to climate change, environmental studies, and sustainable development.
- **Ethics of Social Media and Networking in Research:** Ethical use of social media platforms for data collection, research dissemination, and networking.

### **Unit VI: Responsible Conduct of Research**

- **Promoting Research Integrity:** Best practices for ensuring ethical conduct in research.
- **Training and Education in Research Ethics:** Importance of ethics training for researchers at all levels.
- **Role of Institutions in Promoting Ethical Research:** Policies, guidelines, and resources provided by academic and research institutions.

- **Research Ethics in Global Context:** Ethical challenges in international collaborations, including differences in cultural, legal, and institutional contexts.
- **Case Studies and Ethical Dilemmas:** Analyzing real-world cases of ethical dilemmas in research and publication.

**Suggested Books:**

1. **"Publication Ethics: A Primer for Researchers"** by Philip M. Davis
2. **"Ethics in Research & Publication"** by R. S. Dhillon and S. G. R. Murthy
3. **"Research Ethics: A Psychological Approach"** by S. R. Behnke
4. **"Responsible Conduct of Research"** by Adil E. Shamoo and David B. Resnik
5. **"Research Ethics in the Digital Age"** by Jeannette Pols and Sophia de Boer
6. **"Ethics in Science and Engineering"** by L. R. Andrew
7. **"Handbook of Research Ethics and Scientific Integrity"** edited by Barbara Koenig, Sandra Soo-Jin Lee, and Philip K. Robb

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## **Interpretation of Statutes**

**Sub. Code: BL408**

**L – 4, C –4.**

### **Course Objectives**

- The Interpretation of Statutes course aims to provide students with a comprehensive understanding of the methods, principles, and tools used to interpret and apply statutes (laws made by a legislative body).
- The course focuses on equipping students with the skills needed to interpret legal texts, identify legislative intent, and resolve ambiguities or conflicts in statutes. Students will study the various canons of statutory interpretation and rules of construction used by courts to ascertain the meaning of statutes. The course will also delve into legislative history, judicial precedents, and the interaction between statutory law and constitutional principles.
- The Students will explore the role of judges in interpreting statutes, the importance of context in legal texts, and the balance between the literal and purposive approaches to interpretation.
- The Students will be able to confidently apply these interpretative techniques to real-world legal issues and understand how judicial interpretation can shape the application of law in various contexts.

### **Unit-I:**

Meaning and Definition of Statutes — Classification of Statues — Meaning and Definition of Interpretation — General Principles of Interpretation

### **Unit-II:**

Grammatical Rule of Interpretation — Golden Rule of Interpretation

### **Unit-III:**

Interpretation of Penal Statutes and Statutes of Taxation — Beneficial Construction — Construction to avoid conflict with other provisions

### **Unit-IV:**

External Aids to Interpretation — Statement of objects of legislation, Legislative debates, identification of purpose sought to be achieved through legislation — Internal Aids to Construction

**Suggested Readings:**

1. Vepa P. Sarathi: Interpretation of Statutes, Eastern Book Co, 4th Edition, 1976.
2. Chatterjee: Interpretation of Statutes.
3. G.P. Singh: Principles of Statutory Interpretation, Wadhwa and Company, 8th Ed., 2001.

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## **PROFESSIONAL ETHICS AND PROFESSIONAL ACCOUNTING SYSTEM**

**Sub.Code:BL410**

**L -4, C-4**

### **Course Objectives**

- Students will be able to critically analyze ethical dilemmas and apply ethical principles real-world situations in various professional settings.
- They will be equipped with the knowledge to make ethically sound decisions, ensure compliance with professional codes of conduct, and contribute to the overall integrity and trustworthiness of their chosen profession.
- The course will prepare students to act responsibly, maintain high moral standards, and uphold the values of fairness, honesty, and social responsibility in their professional lives.
- Learn how to build a career based on ethical principles and professional integrity.

The written examination of this second clinical paper will be for 60 marks and the remaining 40 marks for record and viva voce. There shall be classroom instruction on the following topics:

**Unit-I:** Development of Legal Profession in India — The Advocates Act, 1961 — Right to Practice — a right or privilege? - Constitutional guarantee under Article 19(1) (g) and its scope — Enrolment and Practice — Regulation governing enrolment and practice

**Unit-II:** Seven lamps of advocacy — Advocates duties towards public, clients, court, and other advocates and legal aid ;

**Unit-III:** Disciplinary proceedings — Professional misconduct — Disqualifications — Functions of Bar Council of India/State Bar Councils in dealing with the disciplinary proceedings

**Unit-IV:** Accountancy for Lawyers — Nature and functions of accounting —

**Record (30 marks):** Each student shall write 50 selected opinions of the Disciplinary Committees of Bar Councils and 10 major judgments of the Supreme Court of India in the Record. The Record shall be evaluated for 30marks by the teacher concerned. The Records of the students duly certified by the University Representative appointed by the Controller



of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University before the commencement of the theory examinations.

**Viva- voce (10marks):** There shall be viva-voce examination on the above components. The Viva-voce Board consisting of (i) Principal of the College/the teacher concerned (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law, and (iii) an advocate with 10 years' experience at the Bar shall evaluate the student in the Viva. The proceedings of the viva-voce shall be recorded.

**Note: All the three components of the paper (written examination, submission of record and attendance in viva) shall be compulsory.**

### **Suggested Reading**

- **"Professional Ethics in Accounting"** by Steven M. Mintz
- A comprehensive guide to the ethical principles and standards governing the accounting profession, with case studies and examples.
- **"Ethics in Accounting: A Decision-Making Approach"** by Gordon Klein
- Focuses on decision-making in accounting ethics, discussing real-world dilemmas and ethical frameworks.
- **"Ethical Obligations and Decision Making in Accounting"** by Steven M. Mintz and Roselyn E. Morris
- Explores ethical obligations for accountants, with an emphasis on ethical decision-making processes.
- **"Accounting Ethics"** by Rick B. M. G. (Gerrit) Gouwenberg
- A study of ethical issues in accounting, examining key moral theories and the role of ethics in accounting practices.
- **"The Ethics of Accounting and Finance: A Guide for Managers and Investors"** by J. Edward Ketz
- Discusses the role of ethics in financial decision-making, including the impact of accounting systems on corporate governance.

# Data Analysis-II BL 410A

**Sub. Code: BL 410A**

**L -4, C-4**

## Course Objectives

- Learn advanced data cleaning and preprocessing techniques.
- Perform exploratory and statistical data analysis.
- Apply machine learning methods for data interpretation.
- Develop skills in Python for data manipulation and visualization.
- Analyze real-world data for informed decision-making.

## Unit 1: Data Pre-processing and Cleaning

- Handling Missing Data
- Outliers Detection and Treatment
- Data Transformation: Scaling, Normalization, and Encoding
- Data Integration and Reduction Techniques

## Unit 2: Advanced Data Visualization

- Exploratory Data Analysis (EDA) Techniques
- Visualization Tools: Matplotlib, Seaborn, Plotly
- Multidimensional Data Visualization
- Dashboards and Interactive Visualizations

## Unit 3: Statistical Analysis

- Inferential Statistics: Hypothesis Testing and Confidence Intervals
- Correlation and Regression Analysis
- Analysis of Variance (ANOVA)
- Non-parametric Statistical Methods

## Unit 4: Machine Learning Basics

- Introduction to Supervised and Unsupervised Learning
- Linear and Logistic Regression
- Clustering Techniques: K-Means, Hierarchical Clustering
- Decision Trees and Random Forests

## Unit 5: Data Analysis with Python

- Working with Pandas for Data Manipulation
- NumPy for Numerical Computation
- Introduction to Scikit-Learn for Machine Learning
- Case Studies: Applying Python to Real-World Data

## Suggested Readings

- **"Python for Data Analysis"** by Wes McKinney
- A comprehensive guide to using Python's Pandas library for data analysis.
- **"Practical Statistics for Data Scientists"** by Peter Bruce and Andrew Bruce
- Covers statistical methods and their application in data science.
- **"An Introduction to Statistical Learning"** by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
- A beginner-friendly introduction to statistical and machine learning techniques.
- **"Data Science from Scratch"** by Joel Grus
- Introduces fundamental concepts of data science with Python.
- **"Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow"** by Aurélien Géron
- Focuses on machine learning techniques with practical Python implementation.

## **Computer Programming-II BL410B**

**Sub.Code:BL410B**

**L -4, C-4**

### **Course Objectives**

- Learn advanced programming techniques and concepts.
- Implement and analyse data structures and algorithms.
- Apply object-oriented programming principles.
- Work with file handling and database integration.
- Develop problem-solving skills through practical projects.

### **Unit 1: Advanced Programming Concepts**

- Recursion: Principles, Examples, and Applications
- Pointers and Memory Management (For C/C++)
- Dynamic Memory Allocation
- Error Handling and Debugging Techniques

### **Unit 2: Data Structures**

- Arrays, Linked Lists, Stacks, and Queues
- Trees and Graphs: Basics and Traversals
- Hashing Techniques
- Searching and Sorting Algorithms

### **Unit 3: Object-Oriented Programming (OOP)**

- Principles of OOP: Encapsulation, Inheritance, Polymorphism, and Abstraction
- Class and Object Concepts
- Constructors, Destructors, and Method Overloading
- Advanced Concepts: Interfaces and Abstract Classes

### **Unit 4: File Handling and Data Storage**

- File Operations: Reading, Writing, and Updating Files
- Binary and Text Files
- Random Access File Processing
- Serialization and Deserialization

### **Unit 5: Introduction to Databases and SQL**

- Basics of Database Management Systems (DBMS)
- SQL Syntax: Create, Read, Update, and Delete Operations
- Integrating SQL with Programming Languages
- Practical Case Studies

# Python Programming-II

Sub.Code: BL410C

L -4, C-4

## Course Objectives

- Master advanced Python programming concepts and techniques.
- Work with complex data structures and file handling.
- Apply object-oriented programming for real-world applications.
- Integrate Python with databases and APIs.
- Develop, debug, and test robust Python applications.

## Unit 1: Advanced Python Concepts

- Iterators, Generators, and Decorators
- Context Managers (`with` Statement)
- Working with Dates and Times (`date` `time` module)
- Regular Expressions (`re` module)

## Unit 2: Advanced Data Structures

- Nested Data Structures: Lists of Lists, Dictionaries of Dictionaries
- Collections Module: `namedtuple`, `deque`, `Counter`, and `defaultdict`
- Advanced Operations with Sets and Dictionaries
- Working with JSON and XML Data

## Unit 3: Object-Oriented Programming in Python

- Advanced OOP Features: Method Overloading, Operator Overloading
- Class Methods and Static Methods
- Multiple Inheritance and MRO (Method Resolution Order)
- Abstract Classes and Interfaces (`abc` module)

## Unit 4: Exception Handling and Debugging

- Advanced Exception Handling: Custom Exceptions
- Debugging Techniques and Tools (`pdb` module)
- Logging for Application Debugging (`logging` module)
- Writing Robust Python Code

## Unit 5: Working with Files and Data

- Advanced File Handling: File Modes, Working with Binary Files
- CSV, Excel, and Other File Formats (`csv`, `openpyxl`)
- Data Persistence with SQLite (`sqlite3` module)
- Introduction to Data Analysis with Pandas

## Suggested Readings

- **"Fluent Python"** by Luciano Ramalho
- A comprehensive guide to advanced Python programming techniques and best practices.
- **"Python Cookbook"** by David Beazley and Brian K. Jones
- Provides practical solutions to common Python programming challenges, with a focus on advanced topics.
- **"Python 3 Object-Oriented Programming"** by Dusty Phillips
- Focuses on object-oriented design and advanced OOP concepts in Python.
- **"Effective Python: 59 Specific Ways to Write Better Python"** by Brett Slatkin
- Offers actionable insights and best practices for writing efficient and maintainable Python code.
- **"Automate the Boring Stuff with Python"** by Al Sweigart
- While it's an introductory text, it provides useful real-world examples for automating tasks with Python.
- **"Python for Data Analysis"** by Wes McKinney
- A great resource for learning data analysis with Python, focusing on libraries like Pandas and NumPy.

# **SEMESTERIX**

**Law of Taxation**

**Sub. Code: BL 501**

**L4, C4**

**Course Objectives**

- The Law of Taxation course aims to provide students with a comprehensive understanding of the fundamental principles, concepts, and laws governing taxation. The course explores various types of taxes, the legal framework for tax administration, and the rights and obligations of taxpayers and the state.
- Students will gain the knowledge necessary to analyze, interpret, and apply tax laws, understand tax compliance, and engage in the practical application of tax law in various legal contexts.
- The course is designed to help students develop critical thinking skills regarding the tax system, enhance their understanding of tax policy, and prepare them for careers in taxation law, corporate tax advisory, or public finance.
- Familiarize students with the structure and types of taxes in different jurisdictions, including direct taxes (e.g., income tax, corporate tax) and indirect taxes (e.g., sales tax, VAT).

**Unit – I: Introduction**

a. Definitions

b. Basis of Income

- Charge of Income Tax
- Scope of total Income
- Residential status of an assessee
- Dividend Income

**Unit – II: Incomes which do not form part of total Income**

a. Incomes not included in total income

b. Special provision in respect of newly established industrial undertaking in free trade zones

c. Special provision in respect of newly established hundred per cent export oriented undertaking

d. Income from property held for charitable or religious purpose

e. Income of trusts or institutions from contributions

f. Conditions as to registration of trusts, etc.

**Unit – III: Heads of Income**

a. Salaries

b. Income from house property

c. Profits and gains of business or profession



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### Unit – IV: Tax Authorities

#### Suggested Readings

##### Text books:

1. Dinesh Ahuja and Ravi Gupta, Systematic approach to Income Tax, (Latest Edition)
2. Singhanian, Student Guide to Income Tax, Taxmann (Latest Edition).

##### References:

1. N.A. Palkwllah's Income Tax Act (Two Volume)
2. Iyer's Income Tax Act
3. Chaturvedi's Direct Tax Act (Three Volume)

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**LAW OF PROPERTY**

**Sub. Code: BL 503**

**L – 4, C – 4.**

**Course Objectives**

- I. The students will have a solid understanding of the legal principles surrounding property rights, ownership, transfer, and dispute resolution.
- II. They will be equipped to navigate the legal complexities of property transactions, including real estate deals, leasing arrangements, inheritance issues, and intellectual property.
- III. The students will be able to critically analyze property laws in the context of social justice, economic development, and legal protections for individuals and communities.
- IV. This knowledge will prepare them for careers in property law, real estate law, and related fields, enabling them to address both individual and societal property issues effectively.

**Unit-I:**

**Meaning** and concept of property — Kinds of property — Transfer of property — Transferable and non-transferable property — Who can transfer — Operation of transfer — Mode of transfer — Conditional transfer — Void and unlawful conditions — Condition precedent and condition subsequent

**Unit-II:**

Doctrine of Election — Covenants — Transfer by ostensible owner — Doctrine of Feeding the Grant by Estoppel — Doctrine of Lis Pendens

**Unit-III:**

Sale - Essential features — Mode of Sale — Rights and liabilities of parties. Mortgage - Kinds of Mortgages - Rights and liabilities of mortgagor and mortgagee

**Unit-IV:**

Lease — Essential features — Kinds of leases — Rights and liabilities of lessor and lessee — Termination of lease — forfeiture — Exchange — Gifts

**Suggested Readings:**

1. Mulla: Transfer of Property, Butterworths Publications.
2. Subba Rao GCV: Commentaries on the Transfer of Property Act.
3. KrishnaMenon: Law of Property.
4. Upadhyas Common Matrix of Transfer of Property.

**ENVIRONMENTAL LAWS**

**Sub. Code: BL 505**

**L – 4, C – 4.**

**Course Objectives**

- The Environmental Law course aims to provide students with a thorough understanding of the legal frameworks, principles, and policies designed to protect the environment and regulate human impact on natural resources.
- The course covers both domestic and international environmental law, with a focus on the role of law in promoting sustainable development and addressing key issues such as pollution control, biodiversity conservation, climate change, natural resource management, and environmental justice.
- The objective is to equip students with the legal knowledge and analytical skills needed to navigate the complexities of environmental governance, as well as to promote awareness of the challenges of balancing economic development with environmental protection.
- Students will learn to interpret and apply environmental laws and policies and to critically assess their effectiveness in addressing contemporary environmental issues.

**Unit-I**

The meaning and definition of environment – Ecology - Ecosystems-Biosphere - Biomes - Ozone depletion - Global Warming - Climatic changes - Need for the preservation, conservation and protection of environment

**Unit-II**

Common Law remedies against pollution - trespass, negligence, and theories of Strict Liability & Absolute Liability - Relevant provisions of I.P.C. and Cr.P.C. and C.P.C., for the abatement of public nuisance in pollution cases

**Unit-III**

The law relating to the preservation, conservation and protection of forests, wild life and endangered species, marine life, coastal ecosystems and lakes etc. - Prevention of cruelty towards animals - The law relating to prevention and control of water pollution - Air Pollution - Environment pollution control mechanism - Law relating to environment protection

**Unit-IV:**

Art. 48A and Art. 51A(g) of the Constitution of India - Right to wholesome environment - Right to development - Restriction on freedom of trade, profession, occupation for the protection of environment - Immunity of Environment legislation from judicial scrutiny(Art.31C) - Legislative powers of the Centre and State Government

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### Unit-V

International Environmental Regime - Transactional Pollution - State Liability - Customary International Law - Liability of Multinational Corporations/Companies - Stockholm Declaration on Human Environment, 1972.

### Suggested Readings:

1. Paras Diwan: Studies on Environmental Cases.
  2. S.N. Jain (ed.): Pollution Control and the Law.
  3. Armin Rosencranz and Shyam Divan: Environmental Law and Policy in India.
  4. A. Agarwal (ed.): Legal Control of Environmental Pollution
  5. Chetan Singh Mehta: Environmental Protection and Law
  6. V.K. Krishna Iyer: Environment Pollution and Law
  7. Shah: Environmental Law
  8. Paras Diwan: Environmental Law and Policy in India, 1991
  9. Dr. N. Maheshwara Swamy, Environmental Law, Asia Law House, Hyderabad.
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**Public Relations BL 505A**

**Sub. Code: BL 505A**

**L – 4, C – 4.**

**Course Objectives:**

- To provide students with an understanding of the theory and practice of public relations.
- To develop skills in strategic communication, media relations, and crisis management.
- To introduce students to PR tools and techniques used in crafting messages for different audiences.
- To enable students to understand and apply PR ethics and professional standards.
- To examine how PR integrates with marketing, advertising, and other aspects of communication within organizations.

**Unit 1: Introduction to Public Relations**

**1. Understanding Public Relations:**

- Definition of PR and its importance in organizational communication.
- The evolution and history of public relations.
- Key functions of PR: Media relations, event planning, crisis management, and community outreach.

**2. The Role of PR in Modern Organizations:**

- PR as a tool for brand building and reputation management.
- The relationship between PR and other communication fields like advertising and marketing.
- PR in non-profit, government, and corporate sectors.

**3. Key PR Theories and Models:**

- Press Agency/Publicity Model, Public Information Model, Two-Way Asymmetrical Model, and Two-Way Symmetrical Model.
- Models of communication in PR: Shannon-Weaver, Berlo's SMCR Model, etc.

**Unit 2: Media Relations and Communication Channels**

**1. Working with the Media:**

- The role of media in PR: Print, broadcast, and digital media.
- Building and maintaining relationships with journalists and media outlets.
- Writing press releases, media kits, and pitch letters.
- Conducting interviews and handling media inquiries.

**2. Communication Channels in PR:**

- Owned, earned, and paid media.

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- Digital PR: Social media, blogs, podcasts, and websites.
- Importance of storytelling in PR: Crafting compelling narratives for various audiences.
- 3. Media Ethics and Laws:**
  - Ethical issues in media relations: Transparency, truth, and accuracy.
  - Legal aspects of PR: Copyright, defamation, privacy laws.
  - The role of public relations professionals in upholding ethical media practices.

## **Unit 3: PR Campaigns and Strategic Communication**

- 1. Planning and Implementing PR Campaigns:**
  - The process of developing a PR campaign: Research, planning, execution, and evaluation.
  - Setting objectives and defining target audiences.
  - Creating PR materials: Newsletters, speeches, brochures, and websites.
- 2. Tactics and Tools in PR:**
  - Press conferences, media interviews, and special events.
  - Social media and digital tools: Content creation, blogging, and influencer partnerships.
  - Using measurement and analytics to track campaign success.
- 3. Evaluating PR Campaign Effectiveness:**
  - Techniques for evaluating PR efforts: Media coverage, public perception, surveys.
  - ROI in public relations: Quantifying impact and success.
  - Case studies of successful and failed PR campaigns.

## **Unit 4: Crisis Communication and Reputation Management**

- 1. Understanding Crisis Communication:**
  - Definition and types of crises: Natural disasters, scandals, product failures, etc.
  - The role of PR in crisis management: Anticipation, response, and recovery.
  - The crisis communication process: Message creation, media management, and stakeholder engagement.
- 2. Developing Crisis Communication Plans:**
  - Importance of a crisis communication strategy and a crisis communication team.
  - Key principles in handling crises: Honesty, timeliness, transparency, and consistency.
  - Using media and social media effectively during a crisis.
- 3. Reputation Management and Brand Protection:**
  - The significance of reputation in public relations.
  - Strategies for managing and maintaining a positive public image.
  - Case studies of organizations that effectively managed their reputation.

## Unit 5: PR in the Digital Age

### 1. Digital PR and Social Media:

- The rise of digital PR: The impact of blogs, social media, and podcasts.
- Creating content for digital platforms: Best practices for blogs, Twitter, Instagram, and Facebook.
- Social media engagement: Building online communities and responding to online criticism.

### 2. Online Reputation and Influencer Marketing:

- The role of influencers and bloggers in modern PR.
- Managing online reviews and user-generated content.
- The importance of SEO and content marketing in PR efforts.

### 3. Ethics and Legal Considerations in Digital PR:

- Ethical issues in social media communication: Transparency, privacy, and disclosure.
- Legal aspects: Copyright, defamation, and social media laws.

## Suggested Books:

- *Public Relations: Strategies and Tactics* by Dennis L. Wilcox and Glen T. Cameron.
- *The New Rules of Marketing & PR* by David Meerman Scott.
- *Crisis Communications: A Casebook Approach* by Kathleen Fearn-Banks.
- *Public Relations: Strategies and Tactics* by Dennis L. Wilcox and Glen T. Cameron.
- *Public Relations: Strategies and Tactics* by Dennis L. Wilcox and Glen T. Cameron.
- *The New Rules of Marketing & PR* by David Meerman Scott.
- *Ethics in Public Relations: Responsible Advocacy* by Patricia J. Parsons.
- *Public Relations Ethics: Theory and Practice* by M. J. Bowen.
- *Public Relations Campaigns: An Integrated Approach* by J. K. Grunig.
- *Effective Public Relations* by Scott M. Cutlip and Allen H. Center
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# B.A. – LL.B. (5 YEARS INTEGRATED COURSE) SYLLABUS

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## Global Politics BL 505B

Sub. Code: BL 505B

L – 4, C – 4.

### Course Objectives:

- To introduce students to the fundamental concepts and theories in global politics.
- To examine global political structures, power dynamics, and governance mechanisms.
- To provide an understanding of contemporary issues such as conflict, security, development, and human rights.
- To analyze the role of international institutions, states, and non-state actors in shaping global politics.
- To foster critical thinking about the impact of globalization and international political change.

### Unit 1: Introduction to Global Politics

#### 1. Understanding Global Politics:

- Definition and scope of global politics.
- Theories and approaches in international relations: Realism, Liberalism, Constructivism, Marxism.
- The concept of the state and the role of sovereignty in global politics.

#### 2. Key Actors in Global Politics:

- The state as a central actor in international relations.
- Non-state actors: International organizations, multinational corporations, civil society, NGOs, and individuals.
- Transnational issues and the role of non-state actors in addressing them.

#### 3. Globalization:

- Definition and key features of globalization.
- The impact of globalization on politics, economics, and culture.
- Debates about the benefits and drawbacks of globalization.

### Unit 2: Theories and Approaches in International Relations

#### 1. Realism and Liberalism:

- Key principles of Realism: Power, national interest, and anarchy.
- Key principles of Liberalism: Cooperation, institutions, and interdependence.
- Comparing Realism and Liberalism in understanding state behavior.

#### 2. Constructivism and Marxism:



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- Constructivism: The role of ideas, identities, and norms in shaping global politics.
  - Marxism and Critical Theory: Understanding global politics through economic structures and class struggle.
  - Feminist and postcolonial approaches to global politics.
3. **Post-Colonialism and Global Governance:**
- The legacy of colonialism in shaping global politics.
  - Global governance and the role of institutions in maintaining order.

### Unit 3: Global Governance and International Institutions

1. **The United Nations and Global Governance:**
  - History and structure of the United Nations.
  - The role of the UN in peacekeeping, human rights, and development.
  - The Security Council and its decision-making process.
2. **Regional Organizations and International Law:**
  - The European Union, African Union, ASEAN, and other regional organizations.
  - International law and its role in global politics: Human rights law, international humanitarian law, and the International Criminal Court.
3. **International Financial Institutions:**
  - The International Monetary Fund (IMF), World Bank, and World Trade Organization (WTO).
  - The role of these institutions in global economic governance.
  - Criticisms and challenges facing these institutions.

### Unit 4: Security and Conflict in Global Politics

1. **Theories of Security:**
  - Traditional security vs. human security.
  - The role of military power in global politics.
  - The security dilemma and arms races.
2. **Global Conflict and War:**
  - Causes of conflict: Ideology, resources, territorial disputes, and ethnic tensions.
  - The role of international institutions in conflict resolution.
  - Case studies of recent conflicts (e.g., Syria, Ukraine, Afghanistan).
3. **Terrorism and Non-Traditional Security Threats:**
  - The rise of global terrorism and its impact on international politics.
  - Non-state actors in global conflict.

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- Cybersecurity and environmental threats as emerging security challenges.

## **Unit 5: Global Political Economy**

### **1. Theories of International Political Economy (IPE):**

- Liberalism, Mercantilism, and Structuralism in understanding the global economy.
- The role of multinational corporations in global economic politics.
- The relationship between politics and economics in a globalized world.

### **2. Global Trade and Development:**

- The World Trade Organization (WTO) and global trade agreements.
- Global poverty, inequality, and the role of development aid.
- Sustainable development and the United Nations' SDGs (Sustainable Development Goals).

### **3. Global Financial Crises and the Role of Global Institutions:**

- The 2008 financial crisis and its global impacts.
- The role of international financial institutions (IMF, World Bank) in global economic stability.
- Issues of debt, austerity, and development in the global South.

## **Unit 6: Human Rights and Global Justice**

### **1. The Concept of Human Rights:**

- Universalism vs. relativism in human rights.
- The role of international organizations in human rights protection (e.g., UN, NGOs).
- Case studies: Human rights violations in different regions (e.g., Myanmar, China, Africa).

### **2. Global Justice and Ethics:**

- Theories of global justice: Cosmopolitanism, communitarianism, and global citizenship.
- Ethical challenges in global politics: Intervention, sovereignty, and the "responsibility to protect."
- Debates on global inequality and justice.

### **3. Humanitarian Intervention and Peacekeeping:**

- The ethical and legal dimensions of humanitarian intervention.
- The role of international organizations in peacekeeping and post-conflict reconstruction.
- Case studies: Rwanda, Bosnia, Libya.

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### Suggested Books:

- *The Globalization of World Politics* by John Baylis, Steve Smith, and Patricia Owens.
- *Global Environmental Politics* by Pamela S. Chasek, David L. Downie, and Janet Welsh Brown.
  
- *Global Politics* by Andrew Heywood.
- *The Globalization of World Politics* by John Baylis, Steve Smith, and Patricia Owens.
- *International Relations* by Joshua S. Goldstein.
- *International Human Rights: Law, Policy, and Process* by Rhona K. M. Smith.
- *The Ethics of Global Development* by David Held.
- *Security Studies: An Introduction* by Paul D. Williams.
- *The Globalization of World Politics* by John Baylis, Steve Smith, and Patricia Owens.

**Introduction to Sociology BL 505C**

**Sub. Code: BL 505C**

**L – 4, C – 4.**

**Course Objectives:**

- To provide students with an understanding of the key concepts, theories, and perspectives in sociology.
- To explore the structure and functions of social institutions and their impact on individual behavior.
- To examine how socialization, culture, and identity shape social interactions.
- To develop critical thinking and analytical skills regarding contemporary social issues.
- To familiarize students with basic research methods in sociology.

**Unit 1: Introduction to Sociology and Sociological Imagination**

**1. Sociology**

- Definition and scope of sociology.
- The significance of sociology in understanding human behavior and society.
- Sociology as a discipline: Interdisciplinary connections with anthropology, psychology, economics, and political science.

**2. The Sociological Imagination:**

- C. Wright Mills' concept of the sociological imagination.
- Understanding the relationship between individual experiences and larger social forces.
- The personal troubles vs. public issues framework.

**3. Sociological Perspectives:**

- Structural Functionalism: Key ideas and major theorists (e.g., Emile Durkheim, Talcott Parsons).
- Conflict Theory: Key ideas and major theorists (e.g., Karl Marx, Max Weber).
- Symbolic Interactionism: Key ideas and major theorists (e.g., George Herbert Mead, Erving Goffman).

## Unit 2: Social Structure and Socialization

1. **The Structure of Society:**
  - Social structure: Role, status, norms, and values.
  - Social institutions: Family, education, religion, economy, and government.
  - Social stratification and inequality: Class, caste, race, and gender.
2. **Socialization:**
  - Definition and importance of socialization.
  - The process of socialization: Agents of socialization (family, peers, schools, media).
  - Socialization across the life course: Childhood, adolescence, adulthood, and old age.
  - Theories of socialization: Freud, Piaget, Cooley, Mead.
3. **Culture and Society:**
  - Culture and its components: Material and non-material culture.
  - Cultural norms, values, and symbols.
  - Cultural diversity and multiculturalism.
  - Ethnocentrism and cultural relativism.

## Unit 3: Social Institutions

1. **Family:**
  - Definition and functions of the family as a social institution.
  - Types of family structures: Nuclear, extended, single-parent, etc.
  - Changes in family patterns: Marriage, divorce, parenting.
  - Family and socialization.
2. **Education:**
  - The role of education in society: Socialization, cultural transmission, social control.
  - Education and inequality: Class, gender, race, and educational outcomes.
  - Theories of education: Functionalism, Conflict Theory, and Symbolic Interactionism.
3. **Religion:**
  - The role of religion in society.
  - Different types of religion: Monotheism, polytheism, animism, etc.
  - Theories of religion: Durkheim, Marx, Weber.
  - Secularization and the role of religion in modern society.

## Unit 4: Social Change and Social Movements

### 1. Social Change:

- Definition and types of social change: Evolution, revolution, reform.
- Causes of social change: Technological advancements, social movements, economic and political factors.
- Theories of social change: Evolutionary, cyclical, and conflict theories.

### 2. Social Movements:

- Definition and characteristics of social movements.
- Types of social movements: Reform movements, revolutionary movements, resistance movements, and expressive movements.
- Major social movements in history: Civil rights movement, feminist movement, environmental movement.

### 3. Globalization and Social Change:

- The impact of globalization on society: Economic, political, and cultural changes.
- Social consequences of globalization: Global inequality, migration, cultural homogenization.
- Technology, the internet, and social media as agents of social change.

## Unit 5: Social Problems and Issues

### 1. Defining Social Problems:

- Characteristics of social problems: Social deviance, crime, inequality, poverty.
- The role of sociological perspective in understanding social problems.
- The social construction of social problems.

### 2. Contemporary Social Issues:

- Poverty, unemployment, and economic inequality.
- Crime and deviance: Theories of crime (strain theory, differential association theory, labeling theory).
- Gender inequality: Women's rights, sexual harassment, gender roles.
- Racism, ethnic conflict, and discrimination.
- Environmental degradation and climate change.

### 3. Addressing Social Problems:

- Social policy and the role of the state in addressing social issues.
- The role of non-governmental organizations (NGOs) and civil society in addressing social problems.
- Social reforms and the role of social movements in effecting change.

**Unit 6: Research Methods in Sociology**

**1. Introduction to Sociological Research:**

- The importance of research in sociology.
- Types of research methods: Quantitative and qualitative research.
- Research process: Problem formulation, hypothesis testing, data collection, and analysis.

**2. Quantitative and Qualitative Research:**

- Surveys, experiments, and statistical analysis.
- Participant observation, ethnography, and case studies.
- Strengths and limitations of different research methods.

**3. Ethics in Sociological Research:**

- Ethical considerations in sociological research: Consent, confidentiality, and researcher bias.
- The role of ethics committees and institutional review boards (IRBs).

**Suggested Books:**

- *Sociology: A Global Introduction* by John J. Macionis and Ken Plummer.
- *Introduction to Sociology* by Anthony Giddens.
- *Social Problems* by John J. Macionis.
- *Sociological Research: Methods and Techniques* by Ranjit Kumar.
- *The Practice of Social Research* by Earl Babbie.
- *Social Problems* by John J. Macionis.
- *The Sociology of Social Problems* by Joel Best.
- *Sociology: A Global Introduction* by John J. Macionis and Ken Plummer.
- *The Sociology of Religion* by Max Weber.

**LAW OF BANKING AND NEGOTIABLE INSTRUMENTS**

**Sub. Code: BL 507**

**L -4, C -4**

**Course objectives**

- By the end of the Law of Banking and Negotiable Instruments course, students will have acquired a comprehensive understanding of the legal principles governing banking operations, negotiable instruments, and financial transactions.
- They will be equipped to interpret, apply, and advise on banking laws in areas such as customer-banker relations, negotiable instruments transactions, dispute resolution, and regulatory compliance in the banking sector.
- The course will also prepare students for careers in banking law, corporate law, financial regulation, and legal practice related to financial institutions.
- Study the increasing emphasis on sustainable banking, green finance, and the role of banks in promoting social responsibility and environmental sustainability.

**Unit-I:**

History of the Banking Regulation Act — Salient features — Banking Business and its importance in modern times.

**Unit-II:**

Relationship between Banker and Customer — Debtor and Creditor Relationship — Fiduciary Relationship — Trustee and Beneficiary

**Unit-III:**

Cheques — Crossed Cheques — Account Payee — Banker's Drafts — Dividend Warrants — Postal order and money orders — Travelers cheques and circular notes — Negotiable instruments and deemed negotiable instruments

**Unit-IV:**

The Paying Banker — Statutory protection to Bankers — Forgeries—Collecting Banker -

**Suggested Readings:**

1. Tannan: Banking Law & Practice in India, 18th Edn., Orient Law House, New Delhi.
2. Avtar Singh: Negotiable Instruments, 3rd Edn., Eastern Book Company, Lucknow, 1997.
3. P.N.Varshney: Banking Law & Practice, 17th Edn. Sultan Chand & Sons, New Delhi.
4. Taxman: Law of Banking, India Law House



**DRAFTING, PLEADINGS AND CONVEYANCING**

**Sub. Code: BL 509**

**L -1,P-6, C -4**

**Course Objectives**

- Students will have acquired practical skills in legal writing and drafting essential for effective representation in both litigation and transactional legal work.
- They will be able to draft pleadings, court applications, legal contracts, conveyances, and other important legal documents with precision, clarity, and adherence to legal standards.
- This course will prepare students for careers as legal drafters, litigation lawyers, conveyancing solicitors, and transactional attorneys, equipping them with the skills to address a wide range of legal needs in real-world practice.
- Participate in simulated exercises for drafting real-world legal documents and pleadings, based on case studies and practical scenarios.

**Unit-I**

**Drafting:** General Principles of Drafting and relevant Substantive Rules shall be taught.

**Unit-II**

**Pleadings:** (i) Civil—Plaint, Written Statement, Interlocutory Application, Original Petition, Affidavit, Execution Petition, Memorandum of Appeal and Revision.

(ii) Petition under Article 226 and 32 of the Constitution of India - Drafting of Writ Petition and PIL Petition.

**Unit-III**

**Conveyancing:** Sale Deed, Mortgage Deed, Lease Deed,

**Practical Exercises**

Apart from teaching the relevant law, the course includes not less than 15 (fifteen) practical exercises in drafting of pleadings carrying a total of 45 marks (3 marks for each) and 15 (fifteen) exercises in conveyancing carrying another 45 marks (3 marks for each exercise) and remaining 10 marks for viva-voce.

These 30 exercises shall be recorded. Each student shall be served with different problems for the purpose of exercise. These exercises shall be assessed and marks may be allotted.

These exercises shall be evaluated by a common committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, O.U.; and (iii) an Advocate with 10 years' experience at the Bar. The same committee will also conduct viva-voce on the above concepts. The proceedings of the viva-voce shall be recorded.

**Note:**

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- 1. Attendance of the students for viva-voce shall be compulsory.**
- 2. The above records certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University for Further Verification**

### **Suggested Readings:**

1. R.N. Chaturvedi : Pleadings and Conveyancing, Central Law Publications.
2. De Souza : Conveyancing, Eastern Law House.
3. Tiwari : Drafting, Pleading and Conveyancing, Central Law Agency.
4. Mogha: Indian Conveyancer, Eastern Law House.
5. Mogha: Law of Pleadings in India, Eastern Law House.
6. Shiv Gopal: Conveyancing, Precedents and Forms, Eastern Book Company

**Body Language-I BL 509A**

**Sub. Code: BL 509A**

**L -1, P-6, C -4**

**Course Objectives:**

- To introduce students to the concept and importance of body language.
- To understand the different types of non-verbal communication, including gestures, facial expressions, posture, and eye contact.
- To learn how body language affects interpersonal communication and how to use it effectively in various social and professional situations.
- To develop skills for interpreting body language in diverse settings.
- To enhance personal and professional communication through better understanding of non-verbal cues.

**Unit 1: Introduction to Body Language**

- 1. What is Body Language?**
  - Definition and significance of body language.
  - The role of non-verbal communication in human interactions.
  - Differences between verbal and non-verbal communication.
  - History and development of body language studies.
- 2. Types of Non-Verbal Communication:**
  - Kinesics (gestures, posture, facial expressions).
  - Proxemics (use of space).
  - Haptics (touch).
  - Chronemics (use of time).
  - Paralanguage (tone, pitch, pace of speech).
  - Eye contact and its significance.
- 3. Understanding the Impact of Body Language:**
  - The relationship between body language and emotions.
  - How body language influences perceptions, trust, and relationships.
  - The role of body language in different cultures.
  - Misinterpretations of body language.

## **Unit 2: Understanding Facial Expressions and Gestures**

### **1. Facial Expressions:**

- The six basic facial expressions (happiness, sadness, fear, anger, surprise, and disgust).
- Microexpressions: Understanding fleeting facial expressions.
- The role of facial expressions in emotional communication.
- How to recognize and respond to facial cues.

### **2. Gestures and Posture:**

- Types of gestures: Emblems, illustrators, affect displays, regulators, and adaptors.
- Understanding the meaning of common gestures.
- The significance of posture in body language.
- How posture conveys confidence, openness, or defensiveness.

### **3. Cultural Variations in Facial Expressions and Gestures:**

- Differences in body language across cultures.
- How to avoid cultural misunderstandings in cross-cultural communication.
- The universality and variability of facial expressions and gestures.

## **Unit 3: Eye Contact and Proxemics**

### **1. The Power of Eye Contact:**

- The importance of eye contact in communication.
- Eye contact and its relationship with confidence, interest, and trust.
- How to interpret eye movement and gaze.
- Cross-cultural differences in the use of eye contact.

### **2. Proxemics:**

- Understanding personal space: Intimate, personal, social, and public distances.
- How to use space effectively in social and professional contexts.
- The impact of crowding and proximity in communication.
- Territoriality and how body language signals ownership of space.

### **3. Body Language and Relationship Building:**

- How body language affects relationships and emotional connections.
- Using non-verbal communication to enhance personal relationships.
- The role of body language in conflict resolution and negotiation.

## Unit 4: Interpreting and Using Body Language Effectively

### 1. Reading Body Language:

- Identifying congruence between verbal and non-verbal communication.
- Techniques for interpreting body language in others.
- How to detect lies or deception through body language.
- The role of intuition in reading body language.

### 2. Using Body Language to Enhance Communication:

- How to use body language to convey authority, confidence, and openness.
- Non-verbal techniques for effective public speaking and presentations.
- How to use body language in interviews and professional settings.
- The role of mirroring and matching in building rapport.

### 3. Body Language in Social Situations:

- Understanding body language in social interactions (e.g., dating, friendships, networking).
- Reading body language cues in group dynamics.
- Strategies for adjusting your body language in response to others.

## Unit 5: Body Language in Professional Settings

### 1. Body Language in the Workplace:

- How body language affects professional relationships.
- Using body language in job interviews and meetings.
- Understanding body language cues in leadership and team interactions.
- How to convey professionalism and confidence non-verbally.

### 2. Non-Verbal Communication in Negotiations:

- The role of body language in negotiations and conflict resolution.
- How to recognize power dynamics through body language.
- Understanding gestures, facial expressions, and posture during negotiations.

### 3. Public Speaking and Body Language:

- The importance of non-verbal communication in public speaking.
- Techniques for improving posture, gesture, and facial expression during speeches.
- Handling nervousness and projecting confidence through body language.

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### Suggested Books:

- *The Definitive Book of Body Language* by Allan and Barbara Pease.
- *Body Language: How to Read Others' Thoughts by Their Gestures* by Allan Pease.
- *The Power of Body Language* by Tonya Reiman.
- *What Every BODY is Saying* by Joe Navarro.
- *The Body Language of Leadership* by Carol Kinsey Goman.
- *Body Language at Work* by Peter Clayton.
- *What Every BODY is Saying* by Joe Navarro.
- *The Body Language of Love* by Allan Pease.
- *Emotions Revealed: Recognizing Faces and Feelings to Improve Communication and Emotional Life* by Paul Ekman.
- *Body Language for Dummies* by Elizabeth Kuhnke.

**Presentation Skills-I BL 509B**

**Sub. Code: BL 509B**

**L -1,P-6, C -4**

**Course Objectives:**

- To equip students with the necessary skills to plan and deliver effective presentations.
- To develop students' ability to engage, inform, and persuade audiences.
- To improve public speaking and presentation techniques through practical exercises.
- To teach students how to use visual aids and other presentation tools effectively.
- To enhance students' confidence in delivering presentations in various professional and academic contexts.

**Unit 1: Introduction to Presentation Skills**

**1. What is a Presentation?**

- Definition and importance of presentations in academic, professional, and social settings.
- Types of presentations: Informative, persuasive, and entertaining.
- Characteristics of an effective presentation.

**2. Understanding Your Audience:**

- The importance of audience analysis.
- Identifying audience expectations and tailoring presentations accordingly.
- Adapting your presentation style for different audience types (e.g., formal, informal, mixed).

**3. Planning and Organizing a Presentation:**

- The steps in planning a presentation.
- Setting objectives and outcomes.
- Structuring the presentation: Introduction, body, conclusion.
- Creating a compelling opening and closing.
- Managing time effectively during a presentation.

**Unit 2: Effective Communication Techniques**

**1. Verbal Communication:**

- Voice modulation: Tone, pitch, speed, and clarity.
- Speaking with confidence and authority.
- Avoiding filler words ("um," "ah," "like").
- Using pauses for emphasis and effect.

**2. Non-Verbal Communication:**

- The importance of body language in presentations.

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- Eye contact: Building trust and engagement.
  - Posture and gesture: How to convey confidence.
  - Facial expressions and their role in communication.
3. **Building Confidence and Reducing Anxiety:**
- Techniques for overcoming stage fright and nervousness.
  - Relaxation exercises before and during the presentation.
  - Power poses and breathing techniques to boost confidence.

### Unit 3: Designing Visual Aids and Supporting Materials

1. **Using Visual Aids:**
- Types of visual aids: Slides, charts, videos, and physical props.
  - Principles of effective slide design: Simplicity, readability, and visual appeal.
  - Do's and don'ts of PowerPoint presentations.
2. **Creating Engaging and Informative Slides:**
- Organizing content visually.
  - Choosing the right visuals: Graphics, images, and diagrams.
  - The role of text in slides: Keeping it brief and clear.
  - Avoiding information overload.
3. **Using Technology in Presentations:**
- Introduction to presentation software (e.g., Microsoft PowerPoint, Google Slides).
  - Using multimedia elements (audio, video) effectively.
  - Incorporating interactive elements (polls, questions, audience participation).

### Unit 4: Delivering a Presentation

1. **Effective Delivery Techniques:**
- The importance of storytelling and structure in maintaining audience engagement.
  - How to present with energy and enthusiasm.
  - Maintaining control of the room: Use of voice, pacing, and movement.
2. **Engaging the Audience:**
- Creating audience rapport: Humor, anecdotes, and questions.
  - Techniques for keeping the audience's attention.
  - Encouraging participation and interaction.
3. **Handling Questions and Feedback:**
- Dealing with questions during and after the presentation.
  - Managing difficult or challenging questions.
  - Techniques for staying calm and composed when answering questions.
  - How to incorporate audience feedback into future presentations.



### Unit 5: Practicing and Refining Your Presentation

#### 1. Rehearsal Techniques:

- The importance of practice: Timing, fluency, and confidence.
- How to rehearse effectively: Alone, with peers, or in front of a mirror.
- Practicing with visual aids and technology.
- Recording your presentation and evaluating it.

#### 2. Self-Evaluation and Peer Feedback:

- Using self-assessment to identify strengths and areas for improvement.
- Giving and receiving constructive feedback.
- Continuous improvement and learning from experience.

#### 3. Final Presentation:

- Students will prepare and deliver a final presentation, demonstrating the skills they have learned throughout the course.
- Emphasis on content, delivery, visual aids, and audience engagement.

### Suggested Books:

- *Presentation Skills 201: How to Take It to the Next Level as a Speaker* by William R. Steele.
- *The Art of Public Speaking* by Stephen E. Lucas.
- *Slide:ology: The Art and Science of Creating Great Presentations* by Nancy Duarte.
- *TED Talks: The Official TED Guide to Public Speaking* by Chris Anderson.
- *Confessions of a Public Speaker* by Scott Berkun.
- *The Art of Public Speaking* by Dale Carnegie.
- *TED Talks: The Official TED Guide to Public Speaking* by Chris Anderson.
- *Resonate: Present Visual Stories that Transform Audiences* by Nancy Duarte.

**Effective Writing Skills-I BL 509C**

**Sub. Code: BL 509C**

**L -1,P-6, C -4**

**Course Objectives:**

- To enhance students' writing skills for academic and professional purposes.
- To improve students' ability to organize their thoughts and present them in a structured manner.
- To develop a strong understanding of the rules of grammar, punctuation, and sentence structure.
- To introduce students to various types of writing, such as essays, reports, and reflective writing.
- To help students develop effective writing strategies, including revision and proofreading techniques.

**Unit 1: Introduction to Writing Skills**

**1. The Importance of Writing:**

- Role of writing in academic and professional life.
- Writing as a tool for communication, expression, and persuasion.
- Overview of different types of writing: Informative, persuasive, descriptive, and narrative.

**2. Basic Writing Concepts:**

- The writing process: Prewriting, drafting, revising, editing, and publishing.
- Elements of good writing: Clarity, coherence, consistency, and conciseness.
- Identifying your audience and purpose in writing.

**3. Fundamentals of Grammar and Style:**

- Parts of speech: Nouns, verbs, adjectives, and adverbs.
- Sentence structure: Simple, compound, and complex sentences.
- Common grammar mistakes to avoid: Subject-verb agreement, punctuation, and articles.
- Developing an effective writing style.

**Unit 2: Paragraph Writing and Structure**

**1. The Structure of a Paragraph:**

- Introduction, body, and conclusion in a paragraph.
- Unity and coherence in paragraphs.
- Topic sentences, supporting details, and concluding sentences.

### 2. **Writing Effective Paragraphs:**

- Organizing ideas logically and cohesively.
- Using transitions between sentences and paragraphs.
- Avoiding run-on sentences and fragments.

### 3. **Paragraph Types:**

- Descriptive, narrative, expository, and persuasive paragraphs.
- Writing introductory and concluding paragraphs effectively.

## **Unit 3: Essay Writing Techniques**

### 1. **Essay Structure and Organization:**

- Introduction, thesis statement, body paragraphs, and conclusion.
- Writing effective thesis statements and topic sentences.
- Developing body paragraphs with clear arguments and evidence.

### 2. **Types of Essays:**

- Descriptive Essays: Writing about a person, place, event, or idea.
- Narrative Essays: Telling a story with a clear beginning, middle, and end.
- Expository Essays: Explaining a topic or process clearly.
- Persuasive Essays: Arguing a position with evidence and reasoning.

### 3. **Essay Revision and Editing:**

- Common pitfalls in essay writing.
- Revising for clarity, coherence, and logical flow.
- Proofreading for grammatical and typographical errors.

## **Unit 4: Writing for Different Purposes**

### 1. **Writing Reports:**

- Structure of a report: Title, introduction, methodology, findings, and conclusion.
- Writing clear, concise, and objective reports.
- Using headings, subheadings, and bullet points for clarity.

### 2. **Business and Professional Writing:**

- Writing emails, memos, and letters in a professional tone.
- Formatting and structuring business correspondence.
- Writing resumes and cover letters effectively.

### 3. **Creative Writing:**

- Elements of creative writing: Character, setting, plot, and theme.
- Writing short stories, poems, and descriptive passages.
- Exploring narrative voice and point of view in creative writing.

## Unit 5: Advanced Writing Techniques

### 1. Improving Vocabulary and Sentence Variety:

- Expanding vocabulary for precise and expressive writing.
- Using synonyms and antonyms effectively.
- Writing with sentence variety to maintain interest and flow.

### 2. Writing with Clarity and Conciseness:

- Eliminating redundancy and wordiness.
- Writing clearly and directly without over-explaining.
- Using active voice over passive voice to enhance clarity.

### 3. Critical Thinking and Argumentation:

- Developing arguments and counterarguments.
- Supporting arguments with credible evidence and examples.
- Writing persuasive arguments with logical reasoning and proper structure.

## Suggested Books:

- *The Elements of Style* by William Strunk Jr. and E.B. White.
- *Writing Academic English* by Alice Oshima and Ann Hogue.
- *On Writing Well* by William Zinsser.
- *The Bedford Handbook* by Diana Hacker.
- *The Little, Brown Handbook* by H. Ramsey Fowler and Jane E. Aaron.
- *On Writing Well: The Classic Guide to Writing Nonfiction* by William Zinsser.
- *Business Writing Essentials* by Gregory L. S. Minter.
- *Creative Writing: A Workbook with Readings* by Julia Bell

**SEMESTER X**

**MOOT COURTS, OBSERVATION OF TRIAL, PRE-TRIAL  
PREPARATIONS AND INTERNSHIP**

**Sub. Code: BALLB 502**

**L-2,P-8, C -6**

**Course Objectives**

- The Moot Court course aims to provide law students with practical experience in oral advocacy, legal research, and drafting of pleadings through simulated court proceedings.
- It is designed to help students develop the skills necessary for real-world legal practice by participating in mock trials, arguing cases before a judge or panel, and presenting legal arguments on behalf of hypothetical clients.
- The course helps students bridge the gap between theory and practice by providing a platform to apply their knowledge of substantive law and procedural rules in a courtroom setting.
- Students will be prepared to represent clients in court, effectively communicate legal arguments, and contribute to legal research and writing, making them ready for future careers in litigation, legal practice, and dispute resolution.

This paper has three components of 30 marks each and viva-voce for 10 marks.

**(A) Moot Court (30 marks):** Every student is required to participate in at least three moot courts in the VI Semester with 10 marks for each. The moot court work will be on an assigned problem and it will be evaluated for 5 marks for written submissions and 5 marks for oral advocacy.

Marks will be given on the basis of written submission and oral advocacy. Written submissions shall include brief summary of facts, issues involved, provisions of laws and arguments, citation, prayer, etc. Marks for oral advocacy may be awarded for communication skills, presentations, language, provisions of law; authorities quoted, court manners, etc. Written Memorials submitted by the students shall be kept by the College for Further Verification.

The performance of student in the moot court shall be evaluated by a committee consisting of (i) Principal of the College (ii) an Advocate with 10 years experience at the Bar; and (iii) the teacher concerned.

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### **(B) Observance of Trial in two cases, one Civil and one Criminal (30 marks):**

Students are required to attend courts to observe at least one civil and one criminal case. They shall maintain a record and enter the various steps observed during their attendance on different days in the court assignment. The Court Observation Record submitted by the students should be evaluated by a committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, and (iii) an Advocate with 10 years experience at the Bar and average be taken. Court attendance shall be compulsory and attendance has to be recorded in a register kept therefor. This may be carried under the supervision of a teacher of the college. This scheme will carry 30 marks.

### **(C) Interviewing Techniques and Pre-Trial Preparations and Internship Diary (30 marks):**

Each student should observe two 'interview sessions' of clients either in the Lawyer's Office or in the Legal Aid Office and record the proceedings in a diary, which will carry 15 marks.

Each student has to further observe the preparation of documents and court papers by the Advocate and the procedure for the filing of the suit / petition. This shall be recorded in the diary which will carry 15 marks.

The diary shall clearly indicate the dates on which the above observations are made and they shall be authenticated by the advocate concerned.

Evaluation of the above diary shall be made by the committee consisting of (i) Principal of the College/the concerned teacher (ii) University Representative appointed by the Controller of Examinations in consultation with the Chairman, Board of Studies in Law, O.U.; and (iii) an Advocate with 10 years experience at the Bar and average be taken.

### **Note:**

- 1. Attendance of the students in all the four components of the paper shall be compulsory.**
- 2. The above records, diary certified by the University Representative appointed by the Controller of Examinations in consultation with the Chairman, BOS in Law shall be submitted to the University for Further Verification.**

### **Suggested Readings:**

1. Dr. Kailash Rai: Moot Court Pre-Trial Preparation and Participation in Trial Proceedings, Central Law Publication.
2. Amita Danda: Moot Court for Interactive Legal Education, Gogia Law Agency, Hyderabad.
3. Blackstone's: Books of Moots, Oxford University Press.
4. Mishra: Moot Court Pre-Trial Preparation and Participation in Trial Proceedings, Central Law, Allahabad.

**Body Language-II (BL-502A)**

**Sub. Code: BALLB 502A**

**L-2,P-8, C -4**

**Course Objectives:**

- To introduce students to the phases of trial and pre-trial procedures.
- To enhance understanding of legal terms, courtroom etiquette, and trial strategies.
- To develop skills for preparing cases for trial, including investigation, evidence collection, and witness preparation.
- To expose students to real-world courtroom scenarios through observation of trials.
- To provide opportunities for critical analysis of trial proceedings and the formulation of case strategies.

**Unit 1: Introduction to Trial Procedures**

**1. Overview of the Trial Process:**

- Definition and stages of a trial.
- Key phases: Pre-trial, trial, and post-trial.
- Differences between civil, criminal, and administrative trials.

**2. Participants in a Trial:**

- Roles and responsibilities of judges, attorneys, witnesses, jurors, and court staff.
- Understanding the functions of prosecution and defense counsel.
- Interaction between the judge and counsel during the trial.

**3. Courtroom Etiquette:**

- Formalities and procedures in a courtroom.
- Behavior expectations for lawyers, clients, witnesses, and observers.
- Rules of evidence and courtroom conduct.

**Unit 2: Pre-Trial Preparation and Case Management**

**1. Pre-Trial Motions and Hearings:**

- Understanding pre-trial motions: Motion to dismiss, motion for summary judgment, and motion in limine.
- The role of pre-trial hearings in shaping the trial strategy.
- The discovery process: Gathering evidence and deposing witnesses.
- Developing a pre-trial checklist.

**2. Case Theory Development:**



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- Creating a theory of the case: Crafting a compelling narrative for the court.
  - Identifying key issues in the case and preparing arguments.
  - Legal research and how to use it to develop trial strategy.
  - Preparing exhibits and evidence for presentation in court.
3. **Witness Preparation:**
- Role of witnesses in the trial.
  - Techniques for preparing witnesses for direct and cross-examination.
  - Ethical considerations in witness handling.
  - Mock examination practice for students.

### Unit 3: Observing Trials and Analyzing Courtroom Behavior

1. **The Observation Process:**
- Preparing for trial observation: What to look for in each phase of the trial.
  - Key elements of trial procedure: Opening statements, direct and cross-examination, closing arguments, and jury instructions.
  - Identifying trial tactics: How lawyers build their case and respond to opposing counsel.
2. **Trial Analysis and Case Review:**
- Observing and analyzing the effectiveness of various trial strategies.
  - Understanding the role of the judge and jury during the trial.
  - Ethical considerations for lawyers in trial proceedings.
3. **Courtroom Dynamics:**
- Managing stress and emotion in a courtroom.
  - The role of non-verbal communication (body language, tone) in a trial.
  - The influence of media and public opinion on trial proceedings.

### Unit 4: Trial Strategies and Techniques

1. **Opening Statements and Closing Arguments:**
- Crafting a persuasive opening statement.
  - Closing arguments: Summarizing the case and making a compelling appeal to the jury.
  - Techniques for emphasizing key evidence and witness testimony.
2. **Direct and Cross-Examination:**
- Developing effective questioning strategies.
  - Techniques for managing difficult witnesses.
  - Cross-examination strategies: Impeaching the credibility of witnesses.
  - The role of objections during examination.
3. **Handling Objections and Courtroom Challenges:**

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- Common objections in trial and how to respond.
- Understanding the rules of evidence.
- The importance of timing and courtroom decorum when making objections.

### Unit 5: Post-Trial and Case Reflection

#### 1. Post-Trial Procedures:

- Understanding the judgment phase and what happens after the trial.
- Filing appeals and the appellate process.
- The importance of post-trial motions and the possibility of retrials.

#### 2. Reflection on Trial Observation:

- Discussing observations with instructors and peers.
- Analyzing courtroom strategies used by both parties in observed trials.
- Identifying areas of improvement in trial presentation and strategy.

#### 3. Career Preparation and Legal Practice:

- How trial experience informs legal practice.
- Career paths for lawyers: Litigators, trial consultants, and corporate counsel.
- Professional development through continuous learning and trial experience.

### Suggested Reading:

- *The Anatomy of a Trial* by John M. Conley.
- *Trial Preparation* by William A. Hall.
- *Winning at Trial* by D. Shane Read.
- *The Trial Lawyer's Art* by McElhaney James W.
- *After the Verdict* by Steven M. H. Wallen.
- *The Complete Idiot's Guide to Jury Trials* by David A. Moran.
- *The Anatomy of a Trial* by John M. Conley.
- *The Trial Lawyer: What It Takes to Win* by David Berg.

**Presentation Skills-II BL-502B**

**Sub. Code: BALLB 502B**

**L-2,P-8, C -4**

**Course Objectives:**

- To develop advanced presentation techniques for delivering high-impact presentations.
- To enhance the use of multimedia tools and visual aids in presentations.
- To improve audience engagement strategies and handle diverse audience dynamics.
- To practice dealing with difficult questions and objections during presentations.
- To gain confidence in presenting complex ideas clearly and persuasively.
- To develop personal presentation style and authenticity in delivery.

**Unit 1: Advanced Presentation Structures**

**1. Crafting a Compelling Narrative:**

- Creating a clear and coherent storyline for presentations.
- Using storytelling techniques to engage the audience.
- The structure of persuasive presentations: Introduction, Body, Conclusion.
- Balancing facts with emotional appeal for greater impact.

**2. The 3-Point Rule:**

- Simplifying complex ideas: Focusing on three key takeaways.
- The importance of repetition and emphasis in presenting main ideas.
- Using logical progression to help the audience follow the message.

**3. Developing Powerful Introductions and Conclusions:**

- Crafting powerful openings that grab attention.
- Ending with impact: The importance of strong closing statements.
- Leaving the audience with a memorable call to action.

**Unit 2: Advanced Audience Engagement Techniques**

**1. Understanding Your Audience:**

- Identifying audience needs, interests, and expectations.
- Tailoring your presentation to suit different audience types (e.g., corporate executives, academic audiences, general public).
- Building rapport and establishing credibility with the audience.

**2. Interactive Presentation Techniques:**

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- Using questions, polls, and live feedback to maintain engagement.
  - The art of audience interaction: How to read non-verbal cues from the audience.
  - Techniques for creating a participatory atmosphere in virtual and in-person settings.
- 3. Dealing with Diverse Audiences:**
- Strategies for addressing different types of personalities and communication styles.
  - Techniques for managing difficult or disengaged audiences.
  - Adjusting presentation tone, pace, and language to connect with various groups.

### Unit 3: Mastering the Use of Visual Aids and Multimedia

- 1. Designing Effective Visual Aids:**
- Principles of good design: Simplicity, clarity, and consistency.
  - How to use PowerPoint, Prezi, and other tools to create visually appealing slides.
  - Using infographics, charts, and graphs to enhance understanding.
- 2. Integrating Video, Sound, and Interactive Elements:**
- When and how to incorporate multimedia into your presentation.
  - Using video clips and sound effectively to support your message.
  - Avoiding over-reliance on technology and balancing visual aids with your spoken words.
- 3. Non-Verbal Communication and Body Language:**
- Using gestures, posture, and eye contact to enhance your message.
  - Managing stage presence: How to move with purpose and confidence.
  - The impact of facial expressions and tone of voice on audience perception.

### Unit 4: Handling Questions, Objections, and Difficult Situations

- 1. Managing Q&A Sessions:**
- How to prepare for and anticipate questions.
  - Techniques for handling difficult or hostile questions.
  - Maintaining composure and confidence during Q&A.
  - Answering questions clearly and concisely.
- 2. Dealing with Objections and Pushback:**
- Techniques for addressing objections with respect and persuasion.
  - Turning challenges into opportunities for engagement.
  - Using body language to handle tension during difficult discussions.
- 3. Handling Unexpected Situations:**
- Staying calm when technology fails or when unexpected disruptions occur.

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- Recovering from mistakes or missteps during a presentation.
- How to maintain control over the presentation in high-pressure situations.

### **Unit 5: Virtual and Hybrid Presentations**

#### **1. Delivering Presentations in Virtual Settings:**

- Best practices for presenting through video conferencing tools (Zoom, MS Teams, etc.).
- Managing virtual audience engagement through chat, polls, and Q&A.
- Adjusting presentation style for virtual environments.

#### **2. Hybrid Presentations:**

- Balancing in-person and online audiences.
- Technical considerations for hybrid presentations (audio, video, screen-sharing).
- Keeping both groups engaged and ensuring equal participation.

#### **3. Overcoming Virtual Presentation Challenges:**

- Handling technical glitches and troubleshooting.
- Managing distractions and ensuring smooth communication in virtual settings.
- Building presence and maintaining confidence on camera.

### **Unit 6: Personal Style and Authenticity in Presentations**

#### **1. Finding Your Unique Presentation Style:**

- Understanding the importance of authenticity in presentation delivery.
- How to develop your natural speaking style and avoid "performing."
- Finding balance between professionalism and personality.

#### **2. Building Confidence and Overcoming Stage Fright:**

- Techniques to boost self-confidence before and during a presentation.
- Overcoming fear of public speaking and managing nerves.
- The role of positive body language in building confidence.

#### **3. Feedback and Continuous Improvement:**

- Techniques for soliciting and incorporating feedback after a presentation.
- Using video recordings of your presentations for self-assessment.
- The role of practice in mastering presentation skills.

**Suggested Books:**

- *Talk Like TED* by Carmine Gallo.
- *Made to Stick* by Chip Heath & Dan Heath.
- *Presentation Zen* by Garr Reynolds.
- *The Art of Public Speaking* by Dale Carnegie.
- *Virtual Presentations: Best Practices and Strategies for Successful Online Speaking* by Andy Lopata.
- *The Virtual Presenter's Handbook* by Carole Gaskell.
- *The Quick and Easy Way to Effective Speaking* by Dale Carnegie.
- *Crucial Conversations: Tools for Talking When Stakes Are High* by Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler

**Effective Writing Skills II (BL-502C)**

**Sub. Code: BALLB 502C**

**L-2,P-8, C -4**

**Course Objectives:**

By the end of this course, students will be able to:

1. Analyze and apply the principles of effective writing.
2. Organize ideas clearly and logically in various writing formats.
3. Revise and edit their work to enhance clarity and coherence.
4. Adapt writing styles to different audiences and purposes.
5. Utilize research and evidence to support arguments and claims.

**UNIT 1: Introduction to Effective Writing**

- Overview of the writing process: prewriting, drafting, revising, editing, and publishing
- The importance of audience and purpose in writing

**UNIT 2: Writing Fundamentals**

- Grammar and punctuation essentials
- Sentence structure and variety

**UNIT 3: Organizing Ideas**

- Outlining techniques for clarity and coherence
- The structure of essays: introduction, body, and conclusion

**UNIT 4: Academic Writing**

- Writing thesis statements and arguments

### **Suggested Readings:**

1. "On Writing: A Memoir of the Craft" by Stephen King  
A blend of memoir and writing advice, King shares insights on the writing process and his personal journey.
2. "The Elements of Style" by William Strunk Jr. and E.B. White  
A classic guide that emphasizes clarity, brevity, and the fundamental principles of English style.
3. "Writing Down the Bones: Freeing the Writer Within" by Natalie Goldberg  
Encourages writers to find their voice and express themselves freely, blending writing exercises with personal reflections.
4. "Bird by Bird: Some Instructions on Writing and Life" by Anne Lamott  
Offers practical advice and encouragement, emphasizing the importance of perseverance in the writing process.



# **School of Engineering and Technology**



## **Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

### **School of School of Engineering and Technology**

#### **Ordinances, Regulations & Syllabus**

For

#### **Master of Engineering, Two Year Programme**

#### **Semester System**

(w.e.f. session 2013-14)

Revised and approved in the year 2019 (13<sup>th</sup> Meeting, Board of Studies)

## **Programme Educational Objectives (PEOs)**

**PEO 1** To provide a strong foundation in advanced engineering principles, enabling students to develop innovative and efficient solutions for complex problems in their chosen field of specialization.

**PEO 2** To foster research capabilities, encouraging students to explore emerging technologies, conduct independent research, and contribute to the development of new methodologies in engineering practices.

**PEO 3** To develop critical thinking, analytical abilities, and problem-solving skills, equipping students to effectively apply engineering concepts to real-world challenges and deliver optimized solutions in professional environments.

**PEO 4** To provide in-depth knowledge in specialized areas like Artificial Intelligence, Machine Learning, IoT, Robotics, and renewable energy, preparing students to lead advancements in these cutting-edge technologies.

**PEO 5** To instill a strong sense of professional ethics, responsibility, and social consciousness, ensuring that graduates make informed decisions that positively impact society, the environment, and industry standards.

**PEO 6** To enhance leadership, teamwork, and communication skills, preparing students to work collaboratively in multidisciplinary teams and effectively lead projects in diverse engineering and technology domains.

**PEO 7** To ensure graduates are industry-ready by providing hands-on learning experiences, internships, and exposure to current industry practices, equipping them with practical skills for immediate contributions to engineering projects.

**PEO 8** To promote lifelong learning and adaptability, preparing graduates to stay current with technological advancements and continuously upgrade their knowledge and skills throughout their professional careers in engineering.

## Programme Specific Objectives (PSO's)

**PSO 1** To equip students with advanced knowledge in core engineering subjects, enabling them to design, develop, and optimize systems and solutions for complex engineering challenges.

**PSO 2** To develop expertise in emerging technologies such as Artificial Intelligence, Machine Learning, Internet of Things, and Robotics, preparing students to lead innovations in these high-demand fields.

**PSO 3** To provide in-depth skills in research methodology, enabling students to conduct independent research, contribute to technological advancements, and develop novel solutions in their specialized areas.

**PSO 4** To enhance problem-solving capabilities through practical applications, fostering the ability to analyze, design, and implement engineering systems that meet real-world technical and environmental challenges.

**PSO 5** To instill a strong understanding of industry standards, quality control, and sustainable engineering practices, ensuring that students can contribute to projects with environmental and societal considerations.

**PSO 6** To improve leadership, teamwork, and project management skills, preparing students to lead multidisciplinary teams and manage engineering projects efficiently in dynamic and diverse work environments.

**PSO 7** To ensure mastery of advanced computational tools, simulation techniques, and design software, enabling students to model, analyze, and optimize engineering systems across various industries.

**PSO 8** To promote ethical practices, professional integrity, and social responsibility, ensuring graduates understand the broader impact of engineering decisions and contribute positively to society, technology, and the environment.

## Programme Outcome Objectives (POO's)

**POO 1** Graduates will have a deep understanding of advanced engineering principles, enabling them to apply theoretical and practical knowledge to solve complex engineering problems across various domains.

**POO 2** Graduates will demonstrate strong analytical, critical thinking, and problem-solving abilities, applying appropriate methodologies to design, analyze, and optimize solutions for real-world engineering challenges.

**POO 3** Graduates will possess advanced research skills, enabling them to conduct independent research, contribute to innovation, and stay at the forefront of technological developments in their field.

**POO 4** Graduates will be proficient in the use of modern engineering tools, software, and technologies to model, simulate, and optimize engineering systems and processes across diverse industries.

**POO 5** Graduates will be able to design and develop engineering systems and solutions with an understanding of sustainability, environmental impact, and societal considerations, contributing to ethical engineering practices.

**POO 6** Graduates will demonstrate strong leadership qualities, effective communication skills, and the ability to work collaboratively in multidisciplinary teams, ensuring successful project management and execution.

**POO 7** Graduates will understand and apply industry best practices, standards, and ethical considerations, ensuring their engineering solutions adhere to regulatory requirements and contribute positively to society and the environment.

**POO 8** Graduates will be capable of effectively managing engineering projects, demonstrating proficiency in planning, budgeting, resource management, and risk assessment to achieve project goals within deadlines and constraints.

**POO 9** Graduates will engage in lifelong learning, adapting to evolving technologies and continuously upgrading their knowledge and skills to remain competitive and contribute meaningfully to the engineering profession.

**POO 10** Graduates will demonstrate professional and ethical responsibility, making informed decisions with a focus on the long-term impact of engineering solutions, and positively influencing society and the global engineering community.

**Shobhit University, Gangoh, Saharanpur**  
**Department of Computer Engg.**  
**M.Tech. (Computer Engineering)**  
**(Teaching Scheme)**

**First Semester**

Course No	Subject	L	T	P	Cr
CE- 501	Software Engineering Methodologies	3	1	0	4
CE- 503	Analysis and Design of Algorithms	3	1	0	4
CE- 505	Advanced Database Management Systems	3	1	0	4
CE- 507	Computer Communication and Networks	3	1	0	4
CE- 509	Fundamental of Computer Programming (Audit)	2	1	0	0
CE- 511	Fundamental of Mathematics (Audit)	2	1	0	0
CE- 511 A	Mathematics /				
CE- 511 B	Basic Mathematics /				
CE- 511 C	Mathematics-I				
CE- 551	Algorithms Lab	0	0	4	2
CE- 581	Seminar-I	0	0	3	2
<b>Total: 20</b>					

**Second Semester**

CE- 502	Resource Management of Computer Systems	3	1	0	4
CE- 504	Soft Computing	3	1	0	4
CE- 506	High Performance Computer Architecture	3	1	0	4
	<b>Elective –I (Choose any one)</b>	3	1	0	4
CE-522	Mobile & Wireless Communication				
CE-524	Embedded System				
CE-526	Cloud Computing				
CE-552	Operating systems Lab	0	0	4	2
CE-582	Seminar-II	0	0	3	2
<b>Total: 20</b>					

**Third Semester**

CE- 601	Data Mining and Warehousing	3	1	0	4
CE- 603	Internet and Web Technology	3	1	0	4
CE- 605	Medical Image Processing	3	1	0	4
CE- 607	Software Verification, Validation and Testing	3	1	0	4
	<b>Elective –II (Choose any one)</b>	3	1	0	4
CE-623	Security of Information System				
CE-625	Network Security				
CE-671	Minor Project	0	0	8	2
CE-681	Seminar-III	0	0	3	2
<b>Total: 20</b>					

**Fourth Semester**

CE- 692

Dissertation

**0 – 0 – 28 14**

**Total: 14**

**Grand Total: 74**

## **Software Engineering Methodologies**

**CE- 501**

**L T P Credits**

**3 1 0 4**

### **Unit-I**

The software crisis, principles of software engineering, programming-in-the-small vs. programming-in-the-large, The Software Lifecycle, Software and systems engineering: overview, examples and industrial realities Project Management - Project Planning and Scheduling, Team organization.

### **Unit-II**

SRS (Software requirement specification). Design for reuse, design for change, design notations, design evaluation and validation, coding and testing, software maintenance and reliability.

### **Unit-III**

Software Economics, Software Quality and standards, Software Metrics - Measurement, Estimation and Prediction, Requirements Management, Configuration Management., Risk Management Testing and Inspection Architecture Description Languages, Pattern-Oriented Software Architecture, Component-based Development, Aspect-oriented development

### **Unit-IV**

CASE (Computer Aided Software Engineering): CASE and its Scope, CASE support in software life cycle, documentation, project management, internal interface, Reverse Software Engineering, Architecture of CASE environment.

### **Unit-V**

Issues in project management-team structure, scheduling, software quality assurance. Object



Oriented methodology: object oriented paradigm, OO analysis and design, examples of methodologies

**Suggested Readings:**

1. Shari Lawrence Pfleeger, "Software Engineering, Theory and Practice," Prentice-Hall 1998.
2. Merlin Dorfman and Richard H. Thayer, "Software Engineering, Edited ," IEEE Computer Society Press, 1997.
3. Sommerville: Software Engineering 8th Edition. Addison Wesley. 2006
4. R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001
5. Schulmeyer, Zero Defect Software, McGraw-Hill, 1992.

## Analysis and Design of Algorithms

**CE- 503**

**L T P Credits**

**3 1 0 4**

### **Unit-I: Analyzing Algorithms & Problems**

Introduction to algorithms, Time and Space Complexity, Basic elements of data structures like linked lists, stacks and queues, trees, graphs, recursion. Different types of sorting algorithms and their complexities

### **Unit-II: Dynamic Sets, Searching and Graphs**

Introduction, Array, amortized time analysis, red black trees, hashing, heaps, dynamic equivalence relations and union-find programs, priority queues with decrease key operations, traversing graphs, DFS, strongly connected components, biconnected components, minimum spanning tree algorithm, single source shortest paths, all pair shortest paths

### **Unit - III: Greedy and Dynamic Methods**

Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Dynamic programming with examples such as Knapsack, All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem.

### **Unit - IV: Backtracking and NP – Hard and NP Complete problems**

General backtracking and Branch and Bound Methods, 8 queen, sum of subset, graph coloring, Hamilton cycles, 0/1 knapsack problem, NP – Hard and NP Complete problems: Basic Concepts, Cook's theorem, NP – Hard graph problems, NP hard Scheduling.

## **Unit - V: Parallel Algorithms and Approximation Algorithms**

Introduction, parallelism, PRAM and other models, some simple PRAM algorithms, handling write conflicts, Merging and Sorting, Finding Connected Components, Approximation Algorithms: Introduction, Absolute Approximation,  $\epsilon$ -approximation, polynomial time approximation schemes, fully polynomial time approximation schemes. String matching algorithms.

### **Suggested Readings:**

1. V. Aho , J. E. Hopcroft and J. D. Ullman, “The Design and Analysis of Algorithms”, Addison-Wesley, 1974.
2. T. H. Cormen , C. E. Leiserson and R. L. Rivest, “Introduction to Algorithms 2nd edition”, PHI. 2009.
3. M. R. Garey and D. S. Johnson, “Computers and Intractability: A Guide to the Theory of NPCompleteness”,Freeman, 1979.
4. J. Van Leuween ed, Handbook of Theoretical Computer Science, Vol A., Elsevier, 1990.

## Advanced Database Management Systems

CE- 505

L T P Credits

3 1 0 4

### Unit -I: Introduction

An overview of database management system, database system Vs file system, Architecture, Advantages, Disadvantages, data models, relational algebra, SQL, Normal forms.

### Unit-II: Query Processing

General strategies for query processing, transformations, expected size, statistics in estimation, query improvement, query 'evaluation, view processing, query processor

### Unit-III: Recovery

Reliability, transactions, recovery in centralized DBMS, reflecting updates, Buffer management, logging schemes, disaster recovery.

### Unit - IV: Concurrency

Introduction, serializability, concurrency control,-locking schemes, timestamp based order, optimistic scheduling, multiversion techniques, deadlocks Object Oriented Data base Development: Introduction, Object definition language, creating object instances, Object query language

### Unit - V: Distributed Databases and Data Warehousing

Basic concepts, options for distributing a database, distributed DBMS, Data warehousing: Introduction, basic concepts, data warehouse architecture, data characteristics, reconciled data

layer, data transformation, derived data layer, user interface, Object Relational Databases: Basic concepts enhanced SQL, advantages of object relational approach.

**Suggested Readings:**

1. An Introduction to database systems by Bipin C. Desai, Galgolia Publications,1997.
2. Principles of distributed database systems, by M. Tamer & Valduricz, 2" edition, LPE Pearson Education,2009.
3. Database system concepts by Korth,2008.

## **Computer Communication and Networks**

**CE- 507**

**L T P Credits**

**3 1 0 4**

### **Unit -I**

Review of data communication techniques, Data transmission, line coding, error control coding. Data switching, circuit switching, message and packet switching. Network model ISO-OSI model, primitives and services.

### **Unit -II**

Elements of queuing. Data link control Simplex, pipelined and sliding window protocols, simplex performance analysis. X 25 data link layer. Random access techniques. Pure, slotted and finite population ALOHAs. Stability in ALHOAs.

### **Unit -III**

Routing and congestion control static, adaptive, centralized and distributed routing procedures,

Congestion control, Local Area Networks LAN topologies and protocols, IEEE 802.x protocols, implementation and performance issues, High speed LANs.

### **Unit -IV**

Transport layer. Quality of service transport classes. Design issues, buffer management, synchronization.

## **Unit - V**

Session and presentation layer synchronization issues, formatting data compression data security, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography.

### **Suggested Readings:**

1. Forouzan, "Data Communication and Networking", TMH 2006.
2. A.S. Tanenbaum, "Computer Networks", 3rd Edition, Prentice Hall India, 1997.
3. S. Keshav, "An Engineering Approach on Computer Networking", Addison Wesley, 1997
4. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989.

## **Fundamental of Computer Programming**

**CE-509**

### **Unit 1:**

**Introduction to Programming** Overview of computer programming, history of programming languages, types of programming languages, and the role of algorithms in programming. Basic concepts of software development and the software development life cycle.

### **Unit 2:**

**Basic Concepts of Programming** Understanding data types, variables, constants, and operators. Introduction to expressions and statements. Importance of input and output in programming.

### **Unit 3:**

**Control Structures** Exploration of control flow mechanisms such as conditionals (if, else, switch) and loops (for, while, do-while). Understanding the significance of flowcharts and pseudocode in representing logic.

### **Unit 4:**

**Functions and Modular Programming** Introduction to functions, parameters, return values, and the concept of modular programming. Importance of code reusability and organization. Overview of function overloading and recursion.

### **Unit 5:**

**Data Structures** Basic data structures including arrays, lists, stacks, and queues. Understanding how to store and manipulate data effectively. Introduction to strings and their manipulation.



# **Fundamental of Mathematics**

## **CE-511**

### **Unit 1: Number Systems**

Introduction to various number systems including natural numbers, whole numbers, integers, rational numbers, and irrational numbers. Understanding real numbers and their properties.

### **Unit 2: Algebraic Expressions and Equations**

Exploration of algebraic expressions, like terms, and polynomials. Understanding linear equations and inequalities in one variable, as well as methods for solving them.

### **Unit 3: Functions and Graphs**

Introduction to the concept of functions, types of functions (linear, quadratic, exponential), and their properties. Understanding how to represent functions graphically and analyze their behavior.

### **Unit 4: Trigonometry**

Fundamental concepts of trigonometry, including the study of angles, sine, cosine, and tangent functions. Introduction to trigonometric identities and their applications in solving problems.

### **Unit 5: Geometry**

Basic concepts of geometry, including points, lines, angles, and shapes. Exploration of properties and theorems related to triangles, quadrilaterals, circles, and polygons.

## **Mathematics**

### **CE- 511 A**

#### **Unit 1: Number Systems**

Introduction to natural numbers, whole numbers, integers, rational numbers, and irrational numbers. Exploration of the properties of real numbers and their applications.

#### **Unit 2: Algebra**

Study of algebraic expressions, equations, and inequalities. Understanding polynomials, factoring, and the basics of quadratic equations. Introduction to functions and their graphs.

#### **Unit 3: Geometry**

Basic concepts of points, lines, angles, and geometric shapes. Exploration of properties and theorems related to triangles, quadrilaterals, and circles. Introduction to coordinate geometry.

#### **Unit 4: Trigonometry**

Fundamental concepts of trigonometric ratios, functions, and identities. Applications of trigonometry in solving problems involving angles and triangles.

#### **Unit 5: Calculus**

Introduction to limits, derivatives, and integrals. Understanding the basic principles of differentiation and integration, along with their applications in real-world scenarios.

## Basic Mathematics

### CE-511 B

#### Unit 1: Number Systems

Introduction to different types of numbers including natural numbers, whole numbers, integers, rational numbers, and irrational numbers. Understanding place value and number representation.

#### Unit 2: Arithmetic Operations

Fundamental operations such as addition, subtraction, multiplication, and division. Introduction to order of operations and properties of numbers.

#### Unit 3: Fractions and Decimals

Understanding fractions, types of fractions, and operations with fractions. Introduction to decimals, conversion between fractions and decimals, and operations with decimals.

#### Unit 4: Ratios and Proportions

Concept of ratios and their applications. Understanding proportions, solving problems involving direct and inverse proportions.

#### Unit 5: Percentages

Understanding percentages and their applications. Calculating percentage increases and decreases, and solving problems related to discounts and interest.

## **Mathematics-I**

### **CE-511 C**

#### **Unit 1: Sets and Functions**

Introduction to sets, types of sets, and operations on sets. Understanding functions, domain, range, and types of functions including one-to-one, onto, and inverse functions.

#### **Unit 2: Algebra**

Study of real numbers, algebraic expressions, and polynomials. Operations on polynomials, factorization techniques, and solving quadratic equations.

#### **Unit 3: Trigonometry**

Fundamental trigonometric ratios, identities, and equations. Applications of trigonometry in right triangles and the unit circle. Introduction to inverse trigonometric functions.

#### **Unit 4: Coordinate Geometry**

Basics of the Cartesian coordinate system. Study of lines, slopes, distance formula, and midpoints. Introduction to conic sections such as circles, parabolas, ellipses, and hyperbolas.

#### **Unit 5: Calculus - Limits and Continuity**

Introduction to limits, properties of limits, and techniques for evaluating limits. Understanding the concept of continuity and its implications in calculus.

## Algorithms Lab

### CE-551

1. Write a program to find the factorial of a number using recursion.
2. Create a program to implement binary search on a sorted array.
3. Develop a program to sort an array using the bubble sort algorithm.
4. Write a program to find the nth Fibonacci number using iteration.
5. Implement a program to check if a string is a palindrome.
6. Create a program to perform matrix addition.
7. Write a program to implement the insertion sort algorithm.
8. Develop a program to reverse an array using pointers.
9. Implement a program to calculate the greatest common divisor (GCD) using the Euclidean algorithm.
10. Create a program to perform linear search on an array.
11. Write a program to implement the selection sort algorithm.
12. Develop a program to count the number of vowels in a given string.
13. Implement a program to generate prime numbers within a specified range.
14. Create a program to find the sum of digits of a number.
15. Write a program to merge two sorted arrays into a single sorted array.
16. Develop a program to implement quicksort on an array.
17. Implement a program to check if two strings are anagrams of each other.
18. Create a program to calculate the power of a number using recursion.
19. Write a program to print the Pascal's triangle up to a given number of rows.
20. Develop a program to perform depth-first search (DFS) on a graph represented using an adjacency list.

## Seminar-I

### CE- 581

1. Create a program to implement a simple calculator that performs addition, subtraction, multiplication, and division.
2. Develop a program to convert temperature between Celsius and Fahrenheit.
3. Write a program to generate random numbers within a specified range.
4. Create a program to find the maximum and minimum values in an array.
5. Implement a program to count the number of occurrences of a character in a string.
6. Write a program to check if a number is prime.
7. Develop a program to display the first n prime numbers.
8. Create a program to implement a basic to-do list using an array.
9. Write a program to sort a list of names alphabetically.
10. Implement a program to find the longest word in a sentence.
11. Create a program to convert a decimal number to binary.
12. Write a program to count the number of words in a given sentence.
13. Develop a program to remove duplicates from an array.
14. Create a program to implement a simple text-based game (e.g., guess the number).
15. Write a program to calculate the area of different shapes (circle, rectangle, triangle) based on user input.
16. Implement a program to perform basic file operations (read, write, append).
17. Create a program to validate an email address format.
18. Write a program to simulate a simple banking system with deposit and withdrawal functions.
19. Develop a program to implement a basic Tic-Tac-Toe game.
20. Create a program to find the intersection of two arrays.

## **Resource Management of Computer Systems**

**CE- 502**

**L T P Credits**

**3 1 0 4**

### **Unit -I**

Historical perspectives, interrupt mechanism, Loader, linker, assembler, command interpreter, compiler, operating system, interpreters, Hardware Resources, Resource management, Virtual Computers, The Hardware Interface, The CPU, Memory and Addressing, Interrupts, I/O Devices, The Operating System Interface, Information and Meta-Information

### **Unit -II**

Concurrent processes; mutual exclusion and synchronization, system calls and protection, Context switching and the notion of a process and threads; synchronization and protection issues; scheduling.

### **Unit -III**

Memory management including virtual memory and paging techniques; i/o architecture and device management.

### **Unit -IV**

File systems; distributed file systems, Issues in the design of distributed file systems, Examples of distributed systems, deadlock detection and protection.

### **Unit -V**

Protection and Security. Architecture of the UNIX operating system ,Case Study of Unix,, Windows, and Real-Time OS.

**Suggested Readings:**

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Pearson Education, Inc., 2001.
2. Uresh Vahalia, “UNIX Internals: The New Frontiers”, PEARSON Education, 1996.
3. J. Mauro and R. McDougall, “Solaris Internals: Core Kernel Architecture”, Sun Microsystems Press, 2001.
4. Daniel P. Bovet and Marco Cesati, “Understanding the Linux kernel”, O'Reilly & Associates, Inc., 1998.



## Soft Computing

**CE- 504**

**L T P Credits**

**3 1 0 4**

### **Unit –I : Neural Networks**

History, overview of biological Neuron-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perception Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

### **Unit –II : Fuzzy Logic**

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

### **Unit –III : Fuzzy Arithmetic**

Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

### **Unit -IV : Applications of Fuzzy Logic**

Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Uncertainty based Information: Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets.

### **Unit –V: An Introduction to Genetic Algorithms**

Neural network approaches in engineering analysis, design and diagnostics problems; applications of probabilistic reasoning approaches. Theoretical Foundations of Genetic Algorithms, Genetic Algorithms in Engineering.

**Suggested Readings:**

1. Goldberg, "Genetic Algorithms," Addison Wesley, ISBN 0-201-15767-5,1989,
2. Golden, "Mathematical Methods for Neural Network Analysis and Design," MIT Press, 1996
3. Ahmad Lotfi, Jonathan Garibaldi, "Applications and Science in Soft Computing", Springer,2004.
4. Rajkumar Roy, Mario Koppen "Soft Computing and Industry: Recent Applications", Springer,2002.

## High Performance Computer Architecture

	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>CE- 506</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### Unit –I

Introduction to High Performance Computing: Overview, Pipeline vs. Parallel Processing Parallel Architectures: Classification and Performance. Pipeline Processing: Pipeline Performance, design of arithmetic pipelines, multifunction pipes.

### Unit -II

Concept of reservation table, collision vector and hazards. Instruction Processing Pipes: Instruction and data hazard, hazard detection and resolution, delayed jumps, delayed execution. RISC Philosophy.

### Unit –III

Pipeline scheduling Theory: Greedy pipeline scheduling algorithm, state diagram, modified state diagram, Latency cycles, Optimal cycles, scheduling of static & dynamic Pipelines. Implementation of pipeline schedulers.

### Unit –IV

Interconnection Networks: Interconnection network classification, Single stage/ Multistage Networks, crossbars, Clos Networks, Benes Networks, Routing algorithms. Omega, Cub-connected and other networks.

## **Unit -V**

High performance memory system; Shared memory multiprocessors and cache coherence; Multiprocessor interconnection networks; Performance modeling.

### **Suggested Readings:**

1. M. R. Bhujade, "Parallel Computing", Newage International Pvt. Ltd., 1995.
2. Stallings, William, "Computer organization and architecture, designing for performance",  
Prentice Hall of India, 1997
3. J. L. Hennessy and D. A. Patterson, "Computer architecture: a quantitative approach", Harcourt  
Asia, Singapore 1996.

## Mobile & Wireless Communication

**CE- 522**

**L T P Credits**

**3 1 0 4**

### **Unit –I**

Introduction: Applications, history, market, reference model and overview. Wireless Transmission— Frequencies, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum, cellular system.

### **Unit –II**

MAC and Telecommunication system: Specialized MAC, SDMA, FDMA, TDMA- fixed TDM, classical ALOHA, slotted, ALOHA, CSMA, DAMA, PKMA, reservation TDMA. Collision avoidance, polling inhibit sense multiple access.(CDMA, comparison, GSM- mobile services, architecture radio interlace, protocol, localization, calling, handover, security, new data services, Introduction to W'LL.

### **Unit –III**

Satellite and Broadcast Systems: History, Applications, GEO, LEO, MEO, routing, localization, handover in satellite system. Digital audio and video broadcasting, Wireless LAN: IEEE 802.11- System and protocol architecture, physical layer. MAC layered management. Bluetooth--- User scenarios, physical layer, MAC layer, networking, security and link management.

### **Unit -IV**

Mobile network Layer: Mobile IP- goals, assumption, requirement, entities, terminology, IP packet delivery, Agent advertisement and discovery, registration, tunneling, encapsulation, optimization, reverse tunneling, IPV6. DHCP, Adhoc Networks- routing, destination sequence distance vector, dynamic source routing, hierarchical algorithm, alternative metric Mobile, Transport Layer:

Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP fast retransmission recovery, transmission/timeout freezing, selective retransmission, Transaction oriented TCP.

### **Unit -V**

Support for Mobility: File System, WWW-HIT, HTML, system architecture. WAP architecture, wireless datagram, protocol, wireless transport layer security, wireless transaction protocol, application environment, telephony application.

### **Suggested Readings:**

1. Jochen Schiller, " Mobile Communication" , Pearson Education,2002.
2. Lee, " Mobile Cellular Telecommunications" McGRAW- WILL, 2nd Edition,1990.

## Real Time System

	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>CE- 524</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### Unit -I

Introduction: Issues in Real-Time Computing, Structures of Real-Time System, Task Classes, Performance Measures for Real-Time Systems, Estimating Program Run Times

### Unit -II

Task Assignment and Scheduling : Classical Uni-processor Scheduling algorithm, Uni-processor Scheduling of IRIS Tasks, Task Assignment, Mode Changes, Fault Tolerant Scheduling.

Real-Time Database : Basic Definitions, Real-Time Vs General-Purpose Databases, Main Memory Databases, Transaction Priorities, Transaction Aborts, Concurrency Control Issues, Disk Scheduling algorithm, A Two Phase Approach To Improve Predictability, Maintain Serialization Consistency, Databases for Hard Real Time Systems.

### Unit -III

Programming Languages and Tools : Desired Language characteristics, Data Typing , Control Structures , Facilitating Hierarchical Decomposition, Packages, Runtime Error (Exception) Handling, Overloading and Generics, Multitasking ,Low-Level Programming, Task Scheduling, Timing Specifications, Some experimental Languages, Programming Environments, Run-Time Support.

### Unit -IV

Real-Time Communication : Network Topologies ,Protocols ,Clocks , A Non Fault Tolerant Synchronization

Algorithm, Impact of Faults , Fault Tolerant Synchronization in Hardware, Synchronization in Software

### **Unit -V**

Fault Tolerant Techniques Fault Types , Fault Detection, Fault and error Containment, Redundancy, Data Diversity, Reversal Checks, Malicious or Byzantine Failures, Integrated Failure Handling, Obtaining Parameter Values, Reliability Models for Hardware Redundancy, Software Error models, Taking Time into Account

### **Suggested Readings:**

1. C.M. Krishna, Kang G. Shin, “Real-Time Systems”, Tata McGraw Hill,1997.
2. Hermann Kopetz, “Real-Time Systems” Design Principles for Distributed Embedded Applications Springer-Verlag New York Inc. 2011.



## **Cloud Computing**

	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>CE- 526</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **Unit –I : Understanding Cloud Computing**

Cloud Computing – History of Cloud Computing, Cloud Architecture, Cloud Storage, Why Cloud Computing Matters, Advantages of Cloud Computing, Disadvantages of Cloud Computing, Companies in the Cloud Today, Cloud Services.

### **Unit –II : Developing Cloud Services**

Web-Based Application, Pros and Cons of Cloud Service Development, Types of Cloud Service Development, Software as a Service , Platform as a Service, Web Services, On-Demand Computing, Discovering Cloud Services Development Services and Tools, Amazon Ec2, Google App Engine, IBM Clouds.

### **Unit –III : Cloud Computing For Everyone**

Centralizing Email Communications, Collaborating on Schedules, Collaborating on To-Do Lists, Collaborating Contact Lists, Cloud Computing for the Community, Collaborating on Group Projects and Events, Cloud Computing for the Corporation.

### **Unit –IV : Using Cloud Services**

Collaborating on Calendars, Schedules and Task Management, Exploring Online Scheduling Applications, Exploring Online Planning and Task Management, Collaborating on Event Management, Collaborating on Contact Management, Collaborating on Project Management, Collaborating on Word Processing, Collaborating on Databases, Storing and Sharing Files.

## **Unit –V : Other Ways To Collaborate Online**

Collaborating via Web-Based Communication Tools, Evaluating Web Mail Services, Evaluating Web Conference Tools, Collaborating via Social Networks and Groupware, Collaborating via Blogs and Wikis.

### **Suggested Readings:**

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

## Operating systems Lab

### CE- 552

1. Create a program to simulate the First-Come, First-Served (FCFS) CPU scheduling algorithm.
2. Implement a program to demonstrate the Round Robin (RR) scheduling algorithm.
3. Write a program to simulate the Shortest Job First (SJF) scheduling algorithm.
4. Develop a program to implement process creation and termination using fork and exec in C.
5. Create a program to demonstrate inter-process communication using pipes.
6. Write a program to simulate the Banker's algorithm for deadlock avoidance.
7. Implement a program to demonstrate the production-consumer problem using semaphores.
8. Develop a program to simulate memory management using paging.
9. Create a program to implement the Least Recently Used (LRU) page replacement algorithm.
10. Write a program to demonstrate file handling operations (create, read, write, delete) in a simulated file system.
11. Implement a program to showcase the concept of threads and thread synchronization.
12. Create a program to simulate the allocation of memory using the best-fit and worst-fit strategies.
13. Write a program to demonstrate the use of mutexes in thread synchronization.
14. Develop a program to simulate the elevator algorithm for disk scheduling.
15. Create a program to implement a simple shell that can execute commands.
16. Write a program to demonstrate the use of condition variables in thread synchronization.
17. Implement a program to simulate the FIFO page replacement algorithm.
18. Create a program to perform a basic network socket communication between a client and server.
19. Write a program to demonstrate the concept of file permissions in a UNIX-like environment.
20. Develop a program to implement a simple job scheduling system with priorities.

## Seminar-II

### CE-582

1. Develop a program to scrape data from a website using web scraping techniques.
2. Write a program to create a simple RESTful API using a web framework.
3. Implement a program to analyze text files and count word frequency.
4. Create a program to generate QR codes from user input.
5. Write a program to implement basic user authentication using a database.
6. Develop a program to visualize data using charts and graphs.
7. Create a program to convert audio files from one format to another.
8. Write a program to send automated emails using an email library.
9. Implement a program to parse and manipulate JSON data.
10. Create a program to monitor system resource usage (CPU, memory) in real time.
11. Write a program to perform sentiment analysis on text data.
12. Develop a program to simulate a simple chatbot using predefined responses.
13. Create a program to perform image processing tasks like resizing and filtering.
14. Write a program to implement a task scheduling system with deadlines.
15. Implement a program to manage a simple inventory system with CRUD operations.
16. Create a program to encrypt and decrypt text using a basic algorithm.
17. Write a program to generate random passwords with specific criteria.
18. Develop a program to simulate a simple voting system with user input.
19. Create a program to implement a URL shortener service.

## **Data Mining and Warehousing**

	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>CE- 601</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **Unit -I**

Data Mining: Data Mining Functionalities, Data Preprocessing, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods, Mining Various Kinds of Association Rules, Association Mining to Correlation Analysis, Constraint-Based Association Mining.

### **Unit -II**

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Introduction, Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Ensemble Methods, Model Section.

### **Unit -III**

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

### **Unit -IV**

Data Warehousing and Business Analysis: Data warehousing Components, Building a Data warehouse, Mapping the Data Warehouse to a Multiprocessor Architecture, DBMS Schemas for Decision Support, Data Extraction, Cleanup, and Transformation Tools, Metadata, reporting,

Query tools and Applications, Online Analytical Processing (OLAP), OLAP and Multidimensional Data Analysis.

### **Unit -V**

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

### **Suggested Readings:**

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.  
Prentice Hall of India, 2006.

## Internet and Web Technology

	L	T	P	Credits
CE- 603	3	1	0	4

### Unit –I : Introduction

Internet Protocol model, Internet Addresses, IP routing concepts, Table Driven and next hop routing, other routing related protocols, Internet Access through PPP, SLIP, WWW, Web servers, Browsers.

### Unit –II : Router Technology

Hubs, Bridges, Routers, Routing Protocols, Routing Security, Switch based routing, routing in unicast environment, multicasting, mobile routing.

### Unit –III : Web Server Technology

Web's Robot global access to information, HTML, HTTP, Accessing a web server, publishing on web server, secure HTTP, Secure Sockets Layer, WWW Proxies, IIS, Case study of apache web server.

### Unit –IV : Browsing Systems

Searching and web casting Technique, Popular web servers, basic features, bookmarks, cookies, progress indicators, customization of browsers, browsing tricks, next generation web browsing, search engines, architecture of search engines, search tools, web crawlers, types of crawlers, scalable web crawler, incremental crawler, parallel crawler, focused crawler, agent based crawler, case study of IE.

## **Unit –V : Website Development**

HTML, XHTML, DHTML, XML, Structuring data, namespaces, XML schema Documents, Document Object Model, DOM methods, Simple API for XML, XSL, SOAP, ASP.Net. Security and management issues for creating a web site

### **Suggested Readings:**

1. Chuck Musciano & Bill Kennedy, HTML & XHTML [SPD],2008.
2. D. Hunter, et. Al. Beginning XML [WROX],2000.
3. Douglas E. Comer; Computer Networks and Internets - PE,2012.
4. Mike Thelwall: Web Crawlers And Search Engines - Emerald Group Publishing Limited,2011.



## **Medical Image Processing**

	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>CE- 605</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **Unit –I : Fundamentals of Image Processing**

Introduction, Elements of visual perception, Steps in Image Processing Systems, Image Acquisition, Sampling and Quantization, Pixel Relationships, Colour Fundamentals and Models, File Formats. Introduction to the Mathematical tools.

### **Unit –II : Image Enhancement and Restoration**

Spatial Domain: Gray level Transformations Histogram Processing Spatial Filtering, Smoothing and Sharpening, Frequency Domain: Filtering in Frequency Domain, DFT, FFT, DCT, Smoothing and Sharpening filters – Homomorphic Filtering., Noise models, Constrained and Unconstrained restoration models.

### **Unit –III : Image Segmentation and Feature Analysis**

Detection of Discontinuities, Edge Operators, Edge Linking and Boundary Detection, Thresholding, Region Based Segmentation, Motion Segmentation, Feature Analysis and Extraction.

#### **Unit –IV : Medical Imaging**

Biological Imaging, Magnetic Resonance Imaging, Nuclear medicine, Tactile Imaging, Tomography, Echocardiography, Radiography, Magnetic Resonance Imaging (MRI), Ultrasound, Endoscopy, Elastography, Image, Compression of medical images, Use of Medical Imaging in pharmaceutical clinical trials.

#### **Unit –V : Applications of Image Processing**

Representation and Description, Image Recognition, Image Understanding ,Image Classification, Video Motion Analysis, Image Fusion, Steganography, Colour Image Processing.

#### **Suggested Readings:**

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition, Education, 2008.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Third Edition, Third Edition, Brooks Cole, 2008.
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall India, 2007.
4. Madhuri A. Joshi, ‘Digital Image Processing: An Algorithmic Approach’, Prentice-Hall 33 India, 2006.
5. Rafael C.Gonzalez , Richard E.Woods and Steven L. Eddins, “Digital Image Processing Using MATLAB”, First Edition, Pearson Education, 2004.

## Software Verification, Validation and Testing

	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>CE- 607</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **Unit –I**

Introduction, Definition of testing, goals, psychology, model for testing, effective testing, limitations of testing, Defs. Of Failure, faults or bug, error, incident, test case, test ware, life cycle of bug, bug effects, bug classification, test case design, testing methodology, development of test strategy, verification, validation, testing life cycle model, testing techniques, testing principles.

### **Unit –II**

Verification and validation: Verification activities, verification of requirements, verification of HL design, verification of data design, verification of architectural design, verification of UI design, verification of LL design, intro. to validation activities.

### **Unit –III**

Black Box testing : Boundary value analysis, equivalence class partitioning, state table based testing, decision table based, grappling, error guessing, White Box testing: Logic coverage criteria, basic path testing, graph matrices, loop testing, data flow testing, mutation testing.

### **Unit -IV**

Static Testing: Types of static testing, technical reviews, inspections, inspection process, structured walk through, walk through process, adv. Of static testing, Validation Testing: Unit testing, drivers, stubs, integration testing, methods, effect of module coupling and cohesion, functional testing, system testing, recovery testing, security testing, stress testing, performance testing, usability testing.

## **Unit -V**

Test Automation and debugging: S/w measurement and testing, testing metrics, tools debugging, design of practical test cases, reducing no. of test cases, regression testing and test case mgmt.

### **Suggested Readings:**

1. Daniel Galin, Software quality assurance – from theory to implementation , Pearson education, 2009.
2. Aditya Mathur, Foundations of software testing, Pearson Education, 2008
3. Srinivasan Desikan and Gopaldaswamy Ramesh, Software testing – principles and practices , Pearson education, 2006
4. Ron Patton, Software testing , second edition, Pearson education, 2007
5. Alan C Gillies, “Software Quality Theory and Management”, Cengage Learning, Second edition, 2003

## Security of Information System

	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>CE- 623</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **Unit –I**

Encryption and De-encryption: Terminology and Background: and De-encryption cryptosystems, Plain Text and cipher. Encryption algorithm, crypto analysis. Introduction to ciphers, Monoalphabetic, substitutions, ployalphabetic.

### **Unit -II**

Secure encryption systems: Hard problems: complexity NP-complete problems, characteristics of NP complete, the meaning of NP completeness, NP completeness and cryptography, properties of arithmetic operations, inverse, primes, GCD, modular arithmetic, properties of modular arithmetic, computing the inverse, Fermat's theorem, algorithm for computing inverses, random number generation.

### **Unit -III**

Public key encryption systems: concept and characteristics, introduction to merkle-hellman knapsacks, RSA, Digital signatures, DSS, Hash Algorithms: hash concept, description of hash algorithms, MD4, MD5, SHA1, SHA2, Secure Secret key systems: DES, AES.

### **Unit -IV**

Applied cryptography, protocols, practices, key management protocols Operating system, database, program security.

## **Unit -V**

Electronic Commerce Security: Network Security with IPSec, Web Security using SSL, E-cash and Secure Electronic Transaction (SET), System Security: System Security using Firewalls and VPN's. \* Worms and Viruses Case Studies, Miscellaneous, Smart Cards and security, Digital Watermarking and Steganography.

### **Suggested Readings:**

1. Wenbo Mao, Modern Cryptography: Theory and Practice, Prentice Hall, 2004
2. William Stallings, "Cryptography and Network Security (4th Edition)", PEARSON Education,2006.
3. Behrouz A. Forouzan, "Cryptography and Network Security", McGraw-Hill Education,2007.

## Network Security

	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>CE- 625</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **Unit -I**

Introduction: The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Internetwork Security, Internet Standards the Internet Society, Symmetric Encryption and Message Confidentiality, Symmetric Encryption Principles, Symmetric Encryption Algorithms, Cipher Block Modes of Operation, Location of Encryption Devices, Key Distribution.

### **Unit -II**

Public-Key Cryptography: Public-Key Cryptography and Message Authentication, Approaches to Message Authentication, Secure Hash Functions and HMAC, Public Key Cryptography Principles, Public-Key Cryptography Algorithms , Digital Signatures, Key Management.

### **Unit -III**

Security applications: Authentication Applications, Kerberos, X.509 Directory Authentication Service, Public Key Infrastructure, Electronic Mail Security, Pretty Good Privacy (PGP), S/MIME, IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management Web Security, Web Security Requirements, Secure Sockets Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

### **Unit -IV**

Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility,8.3

SNMPv3.SYSTEM SECURITY, INTRUDERS, Intruders, Intrusion Detection, Password Management.

### **Unit -V**

Malicious Software, Viruses and Related Threats, Virus Countermeasures Distributed Denial of Service Attacks. FIREWALLS, Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

### **Suggested Readings:**

1. Wenbo Mao, Modern Cryptography: Theory and Practice, Prentice Hall, 2004.
2. William Stallings, “Cryptography and Network Security (4th Edition)”, PEARSON Education,2006.
3. Behrouz A. Forouzan, “Cryptography and Network Security”, McGraw-Hill Education,2008.



## **Minor Project**

**CE-671**

### **Unit 1: Project Introduction**

Overview of project objectives, scope, and significance. Discussion of project ideas and selection process. Importance of planning and requirements gathering.

### **Unit 2: Literature Review**

Research and review of existing work related to the project topic. Analysis of methodologies, technologies, and frameworks relevant to the project.

### **Unit 3: Project Planning**

Development of a project plan, including timeline, milestones, and resource allocation. Creation of a detailed project proposal outlining goals and deliverables.

### **Unit 4: System Design**

Design of the system architecture, including user interface, database schema, and overall functionality. Preparation of design documents and diagrams.

### **Unit 5: Implementation**

Coding and development of the project according to the design specifications. Use of appropriate programming languages and tools to build the system.

## Seminar-III

### CE-681

1. Create a program to analyze and visualize climate data over the last decade.
2. Develop a program to implement a basic machine learning model for classification.
3. Write a program to perform data cleaning and preprocessing on a dataset.
4. Create a program to simulate a simple financial calculator for loans and investments.
5. Implement a program to automate the backup of files to a specified location.
6. Write a program to generate a word cloud from a given text input.
7. Develop a program to create a simple budgeting application.
8. Create a program to scrape and analyze product reviews from an e-commerce website.
9. Implement a program to track and visualize personal fitness activities.
10. Write a program to create an interactive quiz application.
11. Develop a program to simulate a simple event management system.
12. Create a program to implement a text-based adventure game.
13. Write a program to perform image classification using a pre-trained model.
14. Implement a program to analyze network traffic and visualize it.
15. Create a program to build a simple content management system (CMS).
16. Write a program to automate data entry tasks using a graphical user interface (GUI).
17. Develop a program to monitor social media sentiment on a specific topic.
18. Create a program to generate personalized reading recommendations based on user preferences.
19. Write a program to implement basic cryptography for secure messaging.
20. Develop a program to create a virtual assistant that can answer simple queries.

## Dissertation

CE- 692

### **Unit 1: Introduction to Dissertation**

Overview of dissertation objectives, significance, and structure. Discussion on the importance of original research and academic integrity.

### **Unit 2: Topic Selection**

Guidance on selecting a relevant and feasible research topic. Methods for narrowing down ideas and defining research questions.

### **Unit 3: Literature Review**

Conducting a comprehensive review of existing literature related to the chosen topic. Techniques for analyzing and synthesizing previous research.

### **Unit 4: Research Methodology**

Overview of different research methodologies (qualitative, quantitative, mixed methods). Selection of appropriate research design, sampling techniques, and data collection methods.

### **Unit 5: Presentation and Defense**

Preparation for presenting the dissertation findings to an academic committee. Strategies for effectively defending the research and addressing questions.



**Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

**School of School of Engineering and Technology**

**Ordinances, Regulations & Syllabus**

**For**

**Master of (MCA), Two Year Programme**

**Semester System**  
**(W.e.f. session 2013-14)**

**Revised and approved in the year 2021 (17<sup>th</sup> Meeting, Board of  
Studies)**

## **Programme Educational Objectives (PEOs)**

**PEO 1** To provide a strong foundation in computer science and software engineering, enabling students to develop, design, and implement advanced IT solutions for complex challenges.

**PEO 2** To enhance critical thinking and problem-solving abilities, allowing graduates to analyze, design, and optimize algorithms and systems for real-world applications in diverse domains.

**PEO 3** To develop leadership skills, effective communication, and teamwork capabilities, preparing students to manage projects and lead multidisciplinary teams in delivering innovative IT solutions.

**PEO 4** To foster research skills and encourage innovation, enabling students to explore emerging technologies and contribute to advancements in software development and computer science.

**PEO 5** To promote ethical behavior, professional integrity, and continuous learning, ensuring graduates stay adaptable and contribute positively to the evolving IT industry throughout their careers.

**PEO 6** To nurture leadership qualities, communication skills, and teamwork, preparing students to manage projects and collaborate effectively within multidisciplinary teams, ensuring success in software development and IT management.

**PEO 7** To instill a sense of ethical responsibility, professionalism, and integrity, ensuring that graduates understand the societal impact of technology and contribute positively to the global IT community.

**PEO 8** To promote lifelong learning and adaptability, preparing graduates to continually update their skills, stay current with emerging technologies, and remain competitive in an ever-evolving IT landscape.

### Programme Specific Objectives (PSO's)

**PSO 1** To develop proficiency in designing, implementing, and testing software applications using modern programming languages, frameworks, and tools to address complex computational problems.

**PSO 2** To equip students with advanced knowledge of computer networks, protocols, and cybersecurity, enabling them to design secure, scalable, and efficient networked systems.

**PSO 3** To provide expertise in database management, data structures, and data analysis, empowering students to design efficient data-driven applications for real-world business and scientific solutions.

**PSO 4** To explore emerging technologies such as Artificial Intelligence, Machine Learning, Cloud Computing, and Big Data, preparing students to innovate and apply these technologies in various domains.

**PSO 5** To cultivate strong analytical and problem-solving skills, enabling students to conduct research and develop innovative solutions to complex problems in software engineering and IT.

**PEO 6** To develop expertise in software testing methodologies, debugging, and quality assurance processes, ensuring that software applications meet industry standards and perform reliably in diverse environments.

**PEO 7** To enhance students' communication and interpersonal skills, preparing them for effective teamwork, leadership, and technical presentations in multidisciplinary, collaborative software development environments.

**PEO 8** To instill a strong sense of professional ethics and a commitment to lifelong learning, ensuring students can adapt to technological advancements and contribute positively to the IT industry

## Programme Outcome Objectives (POO's)

**POO 1** Graduates will demonstrate a solid understanding of computer science fundamentals, software engineering principles, and IT solutions to address complex real-world problems across various domains.

**POO 2** Students will possess advanced problem-solving skills, applying analytical and computational methods to design efficient algorithms and software solutions for technical challenges.

**POO 3** Graduates will be proficient in designing, developing, testing, and deploying software applications using modern programming languages, frameworks, and software engineering methodologies.

**POO 4** Students will gain expertise in database design, management, and optimization, and will be able to create efficient database systems for storing and retrieving data.

**POO 5** Graduates will be adept in utilizing emerging technologies such as AI, Machine Learning, Cloud Computing, and Big Data to innovate and solve modern-day challenges.

**POO 6** Students will understand networking protocols, communication models, and security principles to design and manage secure, efficient computer networks and distributed systems.

**POO 7** Graduates will adhere to ethical standards and demonstrate professional conduct in their practice, ensuring responsibility, accountability, and respect in all computing-related endeavors.

**POO 8** Students will develop strong research skills, contributing to the advancement of technology through innovative solutions and exploration of new computational techniques and methodologies.

**POO 9** Graduates will possess effective communication skills, enabling them to work collaboratively in multidisciplinary teams, share ideas clearly, and present technical information effectively to stakeholders.

**POO 10** Graduates will engage in lifelong learning, continuously updating their knowledge and adapting to new technologies, methodologies, and industry trends to remain competitive in the evolving IT landscape.

## I semester

Code	Course Title	Cr.	L	T	P
MCA-101	Java	4	3	1	0
MCA-102	Advanced DBMS	4	3	1	0
MCA-103	Advanced DAA	4	3	1	0
MCA-104	Network Fundamentals	4	3	1	0
MCA-133 MCA-133 A/ MCA-133 B/ MCA-133 C/ MCA-133 D	Optimization Techniques / Elements of Statistics / Combinatorial Optimization Multi-objective Optimization Biostatistics	4	3	1	0
MCA-151	Lab JAVA	2	0	0	2
MCA-152	Lab Advanced DBMS	2	0	0	2
MCA-153	Lab Design and analysis of Algorithm	24	15	5	4

### PROFESSIONAL ELECTIVE-I

1. MCA-131      Mobile Computing
2. MCA-132      Theory of Computation
3. MCA-133      Optimization techniques
4. MCA-134      Data Warehousing and Data Mining

## II semester

Code	Course Title	Cr.	L	T	P
MCA-201	Software Engineering & Project Management	4	3	1	0
MCA-202	ASP .Net	4	3	1	0
MCA-203	Python	4	3	1	0
MCA-204	Artificial Intelligence	4	3	1	0
MCA-231	Distributed Operating System	4	3	1	0
MCA-251	Lab Software Engineering and Project Management	2	0	0	2
MCA-252	Lab ASP. Net	2	0	0	2
MCA-253	Lab Python	2	0	0	2
	Total	26	15	5	6

### PROFESSIONAL ELECTIVE-II

1. MCA-231      Distributed Operating System
2. MCA-232      Embedded System
3. MCA-233      Linux/ Unix

### OPEN ELECTIVE

1. MCA-241      Cloud Computing
2. MCA-241 A    Digital Electronics
3. MCA-241 B    Business Communication



4. MCA-241 C Research Methodologies
5. MCA-241 D Cognitive Analytics and social skills for Professional Development

### III semester

Code	Course Title	Cr.	L	T	P
MCA-301	PHP	4	3	1	0
MCA-302	Data Science	4	3	1	0
MCA-304	Cryptography and Network Security	4	3	1	0
MCA-332	Compiler Design	4	3	1	0
MCA-351	Lab PHP	2	0	0	2
MCA-352	Lab Data Science	2	0	0	2
MCA-353	Lab Cryptography and Network Security	2	0	0	2
MCA-354	Minor Project	4	0	0	2
MCA-355	Seminar Based on Learning	2	0	0	2
	Total	24	9	3	10

#### PROFESSIONAL ELECTIVE-III

1. MCA-331 Soft Computing
2. MCA-332 Compiler Design

#### OPEN ELECTIVE

1. MCA-303 Android Programming
2. MCA-304 Cryptography and Network Security
3. MCA-304 A Professional Ethics and Social Responsibility for Sustainability
4. MCA-304 B Enterprise Resource Planning
5. MCA-305 C Software Project Planning and Management
6. MCA-306 D Internet of Everything

### IV semester

Code	Course Title	Cr.	L	T	P
MCA-462	MAJOR PROJECT PRESENTATION & VIVA	24	-	-	-

# JAVA

**MCA-101**

**L – 3 T – 1 P-0**

## **Module I: Introduction to Java**

Introduction, Java Virtual Machine and their architecture, JDK & JRE, Environment Variable, Features and differences with C++, Data Types, Identifiers and Variables, Operators and Expressions, Type Conversion, Control flow, arrays, Constants, Methods. Java Class Libraries: java.lang, java.io, java.math, java.text and java.util package.

## **Module II: Java with Object Orientated Features**

**Class & Objects:** Introducing Classes, A Closer look at Methods and Classes, constructor, static members. **Inheritance:** Types and use of super keyword, Final method and classes. **Interfaces and Packages:** Definition and their implementation, defining class path. **Exception Handling:** Errors and Exceptions, Exception Handling Mechanism, caught and uncaught exceptions, Exception class hierarchy, handling exceptions with try, catch, finally block, defining custom exception. **Multithreading:** Thread life cycle, creating and controlling threads.

## **Module III: I/O and Applets**

Run time input/output operations, io classes and their methods implementation, Applets life cycle, Applets program and their execution, Displaying various geometric shapes using 2D Graphics.

## **Module IV: GUI components using AWT and Event Handling**

**AWT:** Making Windows, Frames, Panels, and Forms. Working with command buttons, text fields, labels, list boxes, layout manager, menus etc. **Event Handling:** Event Handling, Delegation Model, Event Classes, Event Listener interfaces, Adapter Classes.

## **Text & References:**

### **Text:**

- Patrick Naughtn and Herbert Schildt The Complete Reference, Java 2, TMH
- Douglas E.Cmer, Computer Networks & Internet, Pearson.

### **References:**

- The Internet :By- Douglas E.Cmer: TMH

# ADVANCED DATABASE MANAGEMENT SYSTEM

**MCA-102**

**L – 3 T –1 P -0**

**Module -I:** Basics of PL/SQL

PL/SQL basics, blocks, architecture, variables, constants, attributes, character set, PL/SQL, data types, control structure, conditional and sequential control statements.

**Module -II:** PL/SQL

PL/SQL precompiler, cursors, type of cursors, exceptions, Indexing, View, triggers, PL/SQL Stored procedures and packages

**Module -III:** Distributed Databases

Introduction, Advantages, Architecture, Homogeneous & Heterogeneous DDBMS, Distributed Data Storage (Fragmentation & Replication), Distributed Transactions, Commit protocol, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing

**Module-IV:** Parallel Databases

Introduction, Architecture, I/O Parallelism and Skew, Inter-query Parallelism, Intra-query Parallelism, Intra-operation Parallelism (Parallel Sort, Parallel Join), Interoperation Parallelism, Design of Parallel Systems.

**Module-V:** Object Oriented Database Management System

Introduction, Object-Oriented Data Model, Object Oriented Languages, Persistent Programming Languages, Object-Relational Databases: Nested Relations, Complex Types, Inheritance, Reference Types, Querying with Complex Types, Functions and Procedures Storage for Object Databases.

**TEXT BOOKS:**

1. H. F. Korth and A. Silberschatz: Database System Concepts, McGraw Hill, New Delhi, 1997.
2. Raghu Ramkrishnan, Johannes Gehrke , “Database Management Systems”, McGraw Hill International, 2007
3. Abraham Silberschatz, Henry Korth, S, Sudarshan,, “Database System Concepts”, McGraw Hill International, 2005
4. C.J.Date, Longman, “An Introduction to Database System”, Pearson Education, 2003

**REFERENCE BOOKS:**

1. R. A. Elmasri and S. B. Navathe: Fundamentals of Database Systems, 3rd ed., Addison-Wesley, 1998.
2. R. Ramakrishnan: Database Management Systems, 2nd ed., McGraw Hill, New York, 1999.
3. Elmasri R and Navathe SB, “Fundamentals of Database Systems”, Addison Wesley, 2000.
4. Thomas Connolly, Carolyan Begg,, “Database Systems,: A Practical Approach to Design, Implementation and Management, Addison Wesley, 2014 10
5. Ceri Pelagatti, “Distributed Database: Principles and System” , Addison Wesley, 1999.

# ADVANCED DESIGN & ANALYSIS OF ALGORITHMS

MCA-103

L -3 T - 1 P - 0

## **Module I:** Algorithm Analysis

Introduction Algorithms Complexity measures, Best, worst and average-case complexity functions, problem complexity, quick review of basic data structures and algorithm design principles.

## **Module II: Sorting and searching Order statistics**

Sorting by selection, insertion and bubble, Divide & Conquer Strategy, Heap Sort, Quick Sort Data Sorting in Linear time. other sorting algorithms— radix sort, merge sort, sternsons Matrix Multiplication.

Searching in static table— binary search, path lengths in binary trees and applications, optimality of binary search in worst cast and average-case Binary search trees, construction of optimal weighted binary search trees; Searching in dynamic table -randomly grown binary search trees, AVL and (a, b) trees. Hashing: Basic ingredients, analysis of hashing with chaining and with open addressing.

## **Module III: Advanced Design and Analysis Techniques**

Dynamic programming- Elements of dynamic programming, Chain-matrix multiplication, All pair shortest path (Flayed -algorithm), Optimal Binary Search Tree.

Greedy algoirhtms- Elements of the greedy strategy, Huffman codes, Single-source shortest path in a directed graph, Knapsack problem.

## **Module IV: Graph Algorithms**

Elementary graphs Algorithms, Minimum spanning Trees minimum spanning trees— Kruskal's and Prim's algorithms— Johnson's implementation of Prim's algorithm using priority queue data structures, Single source Shortest paths, All Pair Shortest Paths. *String processing* : String searching and Pattern matching, Knuth-Morris-Pratt algorithm and its analysis.

## **Module V : NP-completeness**

Informal concepts of deterministic and nondeterministic algorithms, P and NP , NP-completeness, statement of Cook's theorem, some standard NP-complete problems, approximation algorithms.

### **Text Books:**

- T. H. Cormen, C. E. Leiserson and R. L. Rivest: Introduction to Algorithms, Prentice Hall of India, New Delhi, 1998.
- E. Horowitz and S. Sahani: Fundamental of Computer Algorithms, Galgotia Pub. /Pitman, New Delhi/London, 1987/1978.

### **References Books:**

- Aho, J. Hopcroft and J. Ullman; The Design and Analysis of Computer Algorithms, A. W. L, International Student Edition, Singapore, 1998
- S. Baase: Computer Algorithms: Introduction to Design and Analysis, 2nd ed., Addison-Wesley, California, 1988.
- K. Mehlhom: Data Structures and Algorithms, Vol. 1 and Vol. 2, Springer-Verlag, Berlin, 1984.
- Borodin and I. Munro: The Computational Complexity of Algebraic and Numeric Problems, American Elsevier, New York, 1975.
- S. Winograd: The Arithmetic Complexity of Computation, SIAM, New York, 1980.

## NETWORK FUNDAMENTALS

**MCA-104**

**L-3 T-1 P-0**

### **Introduction to Computer Networks**

Need to share resources, Concepts of Layering, Distributed System and Networks, Prerequisites, Definition, Categories and Components, Connections, Layers and Services, Applications of Computer Networks, Data Communication Fundamentals- Introduction, Frequency and Band, Analog and Digital Signals and Transmission, Coding Mechanism, Modulation, Multiplexing and De-multiplexing, TDM, FDM, Switching and Routing, Transmission and Errors

### **Physical Layer**

Introduction, Duties of Physical Layer, Infrared and Millimeter Waves, ISM Bands, Optical Lights and Free Space Optics, Wired Physical Layer, Wireless Physical Layer

**The Data Link Layer** Duties of Data Link Layer, The Error, The Protocols

### **The Medium Access Sub layer**

Introduction, Wired MAC Layer, The LLC Layer, Wireless MAC, The MAC Layer, The Generic Frame Structure, Connecting Device at Data Link Layer, Virtual LAN.

### **The Network Layer**

Introduction, Duties of Network Layer, Connection Oriented Forwarding using Virtual Circuits, Connection Less Forwarding using Datagram, Connection Oriented Vs Connectionless Forwarding, Forwarding Examples, Routing Algorithms, Congestion, Network Layer Switching

### **The Transport Layer**

Introduction, Duties of Transport Layer Connection Management at Transport Layer, Congestion Control, Comparison with Data Link Layer

### **The Application Layer**

Introduction, Domain Name System: Name Space, Registration Process, Name Servers, Resource Records, Types of Resource Records, Dynamic DNS, WWW and HTTP, Bluetooth

### **Text:**

1. Bhushan H Trivedi ,“Computer Networks”, Oxford University Press

### **Reference:**

1. Behrouz A. Forouzan, "Data Communications and Networking", Tata McGraw-Hill, Fourth Edition

2. Andrew S. Tanenbaum, "Computer Networking", Prentice Hall, Fourth Edition

# MOBILE COMPUTING

**MCA-131**

**L -3 T – 1 P - 0**

## **Course Contents:**

### **Module I:**

**Global System for Mobile Communication (GSM) system overview:** GSM Architecture, Mobility management, Network signalling. GSM Additional services: Teletext, Facsimile, Videotext services.

### **Module II: (Wireless) Medium Access Control**

Motivation for a specialized

MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

**Mobile Network Layer:** Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

**Module III: Mobile Transport Layer:** Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

### **Module IV: Mobile Data Communication**

W LANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.

**Third Generation (3G) Mobile Services:** Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

### **Module V: Global Mobile Satellite Systems**

Mobile Satellite Systems (GEO, MEO and LEO), case studies of the IRIDIUM and GLOBALSTAR systems.

## **Text & References:**

### **Text:**

- “Mobile Communications”, 2nd Edition, Jochen Schiller, 2003

### **References:**

- “Wireless and Mobile Networks Architectures”, by Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001.
- “Mobile and Personal Communication systems and services”, by Raj Pandya, Prentice Hall of India, 2001.
- “Third Generation Mobile Telecommunication systems”, by P. Stavronlakis, Springer Publishers, 2001.

# THEORY OF COMPUTATION

MCA-132

L -3 T – 1 P - 0

## UNIT-I

**Theory of Automata:** Definition of an Automaton, Description of a Finite Automaton, Transition Systems, Properties of Transition Functions, Acceptability of a String by a Finite Automaton, Nondeterministic Finite State Machines, The Equivalence of DFA and NDFA, Mealy and Moore Models, Minimization of Finite Automata Exercises

## UNIT-II

**Formal Language:** Basic Definitions and Examples, Chomsky Classification of Languages, Languages and Their Relation, Recursive and Recursively Enumerable Sets, Operations on Languages, Languages and Automata

## UNIT-III

**Regular Sets and Regular Grammars:** Regular Expressions, Finite Automata and Regular Expressions, Pumping Lemma for Regular Sets, Application of Pumping lemma, Closure Properties of Regular Sets, Regular Sets and Regular Grammars

## UNIT-IV

**Context-Free languages and Pushdown Automata:** Context-free languages and Derivation Trees, Ambiguity in Context free Grammars, Simplification of Context-free Grammars, Normal Forms, Pumping Lemma and Decision Algorithms for context free languages, Basic Definitions of Pushdown Automata, Acceptance by pda, Pushdown Automata and Context free Languages, Parsing and Pushdown Automata

## UNIT-IV

**Turing Machines and Linear Bounded Automata:** Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of Turing Machines, Universal Turing Machines and Other modifications, The Model of Linear Bounded Automaton, Turing Machines and Type 0 Grammars, Linear Bounded Automata and languages, Halting Problem of Turing Machines, NP-Completeness.

### **Text Books:**

- Mishra K.L.P. and N. Chandrasekaran : Theory of Computer Science (Automata, Languages and Computation), Prentice Hall of India, New Delhi, 2005.
- John C Martin, “Introduction to Languages and the Theory of Computation”, Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007. (UNIT 4, 5)
- Hopcroft J.E. Motwani R. and Ullman J.D. “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2008. (UNIT 1, 2, 3)

### **References Books:**

- Mishra K L P and Chandrasekaran N, “Theory of computer Science-Automata, Languages and Computation”, Third Edition, Prentice Hall of India, 2004.
- Harry R Lewis and Christos H Papadimitriou, “Elements of the Theory of Computation”, Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.
- Peter Linz, “An introduction to Formal Language and Automata”, Third Edition, Narosa Publications, New Delhi, 2002.
- Kamla Krithivasan and Rama. R, “introduction to Formal languages, Automata Theory and Computation”, Pearson Education 2009.

# OPTIMIZATION TECHNIQUES

MCA-133

L-3 T-1 P-0

## **Module I: Introduction of OR and Linear Programming**

Basic Definition, Nature and Significance of OR, feature of OR Approach Application and Scope of OR, General Methods for Solving Or Models. General Structure of Linear Programming, Advantages and Limitations of Linear Programming, Application Areas of Linear Programming. Linear Programming Solutions: Mathematical formulation of LPP, Standard form of LPP, Multiple Solution, Unbounded Solutions, Infeasible Solution of LPP.

## **Module II: Simplex Method**

Maximization and Minimization Problem, Solution of LPP using Graphical method, Simplex Method, two Phase Method, Big M Method.

## **Module III: Duality in LPP**

Dual Linear Programming Problem, Rules for Constructing the Dual from Primal, Feature of Duality

## **Module IV: Transportation Problem**

Mathematical Model of Transportation Problem, Transportation Method, North West Corner Method, Linear Cost Method, Vogel's Approximation Method, Unbalanced Supply and Demand, Degeneracy Problem, Alternative Optional Solution, Maximization Transportation Problem..

## **Module V: Queueing Models**

Markovian queues – Birth and Death processes – Single and multiple server queueing models (M/M/1 & M/M/S) – Little's formula – Queues with finite waiting rooms – Queues with impatient customers: Balking and renegeing.

## **Module VI: Theory of Games**

Two Person Zero-Sum Games, Pure Strategies, Game with Saddle Point, Games without Saddle Point, Rule of Dominance, Methods for Solving Problems without Saddle Point.

## **Module VII: Project Management**

Basic Idea of PERT & CPM, Difference between PERT & CPM, PERT/CPM Network Components and Precedence Relationship Critical Path Analysis, Project Scheduling, Project Time-Cost, Trade-Off, Resource Allocation.

## **Text & References:**

### ***Text:***

- Operations Research, J K Sharma, Macmillan Publication

### ***References:***

- Operations Research, H. A. Taha
- Operations Research, Kanti Swaroop, Macmillan Publication



## Elements of Statistics

**MCA-133 A**

**Cr L T P 4 3 1 0**

### **Unit 1**

BASIC STATISTICS AND INDEX NUMBERS: Definition - Nature - Scope - Role and Importance of Statistics, Index Numbers: Definition - Uses - Problems in Construction - Methods - Simple and Weighted, Index Numbers in Economics: Laspeyer's and Paache's Index Numbers - Fishers Ideal Index Number - Marshall and Edgeworths Index Numbers.

### **Unit 2**

CENSUS AND SAMPLING: Census and Sampling: Meaning - Features - Population and Sample. Sampling: Meaning - Types of Sampling, Sampling Design: Meaning - Types – Challenges, Design of Questionnaire, Sampling Errors.

### **Unit 3**

COLLECTION AND TABULATION OF DATA: Collection of Data: Meaning - Types of Data: Primary and Secondary - Qualitative and Quantitative, Tabulation of Data: Meaning - Objectives - Classification of Tabulation - Types of Tables - Presentation of Tables.

### **Unit 4**

MEASURES OF CENTRAL TENDENCY, DISPERSION AND DIAGRAMMATICS: Measures of Central Tendency: Characteristics - Median - Mode - Harmonic Mean - Geometric Mean - Simple Problems, Measures of Dispersion-I: Features - Quartile Deviation - Mean Deviation - Standard Deviation - Its usefulness.

### **Unit 5**

Measures of Dispersion-II: Range - Quartiles - Deciles - Percentiles - Characteristics - Simple Problems, Diagrammatic and Graphic Representation - Bar Diagrams - Pie Diagrams - Histograms - Pictograms - Cartograms - Frequency Graphs - Ogives – LorenzCurve.

### **Reference Books:**

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
2. Gupta, S. C. and Kapoor, V.K. (2008): Fundamentals Of Mathematical Statistics, 4 thEdition (Reprint), Sultan Chand & Sons.
3. Miller, Irwin and Miller, Marylees(2006): John E.Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia

## Combinatorial Optimization

MCA-133 B

Cr L T P 4 3 1 0

### Unit 1

Linear and Integer Programs, Formulating real world problems as linear and integer linear programs, formulating combinatorial optimization problems as integer linear programs, recap of important concepts in linear algebra

### Unit 2

Geometry of Polyhedra: Feasible region of LPs and polyhedra, Convexity, Extreme points, Faces and facets. Solving linear programs: Possible outcomes (infeasibility, unboundedness, and optimality) and their certificates, bases and canonical forms, the Simplex method and its geometric interpretation, the ellipsoid method and separation oracles.

### Unit 3

Duality Weak duality, strong duality, complementary slackness, Farkas's Lemma. Combinatorial Optimization Primal-dual method for exact and approximation algorithms, Shortest paths, Minimum cost perfect matchings, Max-Flow Min-Cut Theorem, Totally Unimodular Matrices

### Unit 4

Additional topics (if time permits) Interior-point methods, Randomized/Online algorithms for LPs, Integer Programs, Convex Optimization, Matroids, T-joins, Applications to Game Theory.

### Unit 5

Range of optimization techniques, including divide and conquer, local optimization, dynamic programming, branch and bound, simulated annealing, genetic algorithms, approximation algorithms, integer and linear programming, and greedy algorithms.

### Reference Books:

1. Cook, Cunningham, Pulleyblank and Schrijver. Combinatorial Optimization. Wiley-Interscience, 1998
2. Schrijver. Combinatorial Optimization. Springer, 2003.
3. Grotschel, Lovasz and Schrijver. Geometric Algorithms and Combinatorial Optimization. Springer, 1993

## Multi-Objectives Optimization

**MCA-133 C**

**Cr L T P 4 3 1 0**

### **Unit 1**

Methods for multi-objective optimization and their combination with multi-criteria decision-making techniques, classical methods for treating multi-objective problems will be presented, and their deficiencies will be clarified

### **Unit 2**

Advanced methods, which are based on Pareto-optimality, will be presented. The major part of the course will be based on evolutionary techniques for optimization problems with and without constraints.

### **Unit 3**

Leading algorithms will be presented and compared, such as: NSGA-II, SPEA-2, and MO-CMA-ES. Methods to compare algorithms will be detailed including test functions and measures to analyze the obtained approximated Pareto-optimal set and front. The numerical limitations of the presented algorithms will be clarified.

### **Unit 4**

Methods to cope with such limitations will be described and in particular how to handle the curse of dimensionality of the Pareto-front.

### **Unit 5**

Multi-criteria decision-making approaches will be presented, and their combination with multi-objective optimization

### **Reference Books:**

1. Multi-Objective Optimization in Theory and Practice I: Classical Methods, Andre A. Keller
2. Schrijver. Combinatorial Optimization. Springer, 2003.
3. Extended Multi-Objective Optimization Problems, Andre A. Keller

## Biostatistics

MCA-133 D

Cr L T P 4 3 1 0

### Unit 1

Introduction: Statistics, Biostatistics, Frequency distribution, Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples, Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems, Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation.

### Unit 2

Regression: Curve fitting by the method of least squares, fitting the lines  $y = a + bx$  and  $x = a + by$ , Multiple regression, standard error of regression- Pharmaceutical Examples Probability: Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties – problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference

### Unit 3

Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, KruskalWallis test, Friedman Test, Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

### Unit 4

Blocking and confounding system for Two-level factorials Regression modeling: Hypothesis testing in Simple and Multiple regression models Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach

### Unit 5

Design and Analysis of experiments: Factorial Design: Definition, 2<sup>2</sup>, 2<sup>3</sup> design. Advantage of factorial design Response Surface methodology: Central composite design, Historical design, Optimization Techniques

### Reference Books:

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
3. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C.Montgomery

# DATA WAREHOUSING AND DATA MINING

**MCA-134**

**L -3 T – 1 P - 0**

## **Module I: Data Warehousing**

Introduction to Data Warehouse, its competitive advantage, Data warehouse vs Operational Data, Things to consider while building Data Warehouse

## **Module II: Implementation**

Building Data warehousing team, Defining data warehousing project, data warehousing project management, Project estimation for data warehousing, Data warehousing project implementation

## **Module III: Techniques**

Bitmapped indexes, Star queries, Read only tablespaces, Parallel Processing, Partition views, Optimizing extraction process

## **Module IV: Data Mining**

From Data ware housing to Data Mining, Objectives of Data Mining, the Business context for Data mining, Process improvement, marketing and Customer Relationship Management (CRM), the Technical context for Data Mining, machine learning, decision support and computer technology.

## **Module V: Data Mining Techniques and Algorithms**

Process of data mining, Algorithms, Data base segmentation or clustering, predictive Modeling, Link Analysis, Data Mining Techniques, Automatic Cluster Detection, Decision trees and Neural Networks.

## **Module VI: Data Mining Environment**

Case studies in building business environment, Application of data ware housing and Data mining in Government, National Data ware houses and case studies.

## **Text & References:**

### ***Text:***

- Data Warehousing, Data Mining & OLAP, Alex Berson, Stephen J. Smith, Tata McGraw-Hill Edition 2004.
- Data Mining: Concepts and Techniques, J. Han, M. Kamber, Academic Press, Morgan Kaufman Publishers, 2001
- Data Ware housing: Concepts, Techniques, Products and Applications, C.S.R. Prabhu, Prentice Hall of India, 2001.

### ***References:***

- Mastering Data Mining: The Art and Science of Customer Relationship Management, Berry and Lin off, John Wiley and Sons, 2001.
- Data Mining”, Pieter Adrians, Dolf Zantinge, Addison Wesley, 2000.
- Data Mining with Microsoft SQL Server, Seidman, Prentice Hall of India, 2001.

S.No	List of programs
1.	Print "Hello, World!" to the console.
2.	Take two integers as input and print their sum.
3.	Check if a given number is even or odd.
4.	Compute the factorial of a non-negative integer.
5.	Generate the Fibonacci series up to a specified number.
6.	Determine if a given number is prime.
7.	Reverse and print a given string.
8.	Convert Celsius to Fahrenheit and vice versa.
9.	Perform addition, subtraction, multiplication, and division.
10.	Count the number of vowels and consonants in a string.
11.	Check if a given string is a palindrome.
12.	Calculate simple interest given principal, rate, and time.
13.	Sort an array of integers in ascending order.
14.	Find the maximum and minimum values in an array.
15.	Implement linear search to find an element in an array.

S.No	List of programs
1.	Write a program to create table insert sample records, update a record, delete a record, and retrieve records from the table.
2.	Write a Program that defines two variables and a constant, then calculates the sum and area of a circle.
3.	Write a Program to find the greatest of three numbers using IF-THEN-ELSE
4.	Write a Program to calculate the factorial of a number using a FOR loop.
5.	Write a Program to handle an arithmetic exception for division by zero.
6.	Write a Program using an explicit cursor to fetch and display employee names.
7.	Write a Program to inserts a record and counts the total rows using an implicit cursor.
8.	Write a Program to create a trigger that automatically updates stock when a sale is made,
9.	Write a Program that creates a stored procedure to retrieve employee details by ID.
10.	Write a Program to create a package that includes a function to calculate factorial.
11.	Write a Program that simulates horizontal fragmentation by creating department-specific employee tables.
12.	Write a Program to perform a distributed transaction across two employee tables.
13.	Write a Program to simulate parallel query execution by splitting a large dataset into parts.
14.	Write a Program that simulates a parallel sort operation on a dataset.
15.	Write a Program that demonstrates various types of joins: Inner Join, Left Join, Right Join, and Full Outer Join.

## Lab Design and analysis of Algorithm

### MCA-153

1. Implement Bubble Sort to sort an array of integers.
2. Implement Selection Sort to sort an array of integers.
3. Implement Insertion Sort to sort an array of integers.
4. Implement Merge Sort to sort an array using the divide-and-conquer approach.
5. Implement Quick Sort to sort an array using the partitioning method.
6. Implement Binary Search to find an element in a sorted array.
7. Implement Linear Search to find an element in an unsorted array.
8. Calculate the time complexity of different sorting algorithms.
9. Find the longest common subsequence between two strings.
10. Solve the Knapsack problem using dynamic programming.
11. Implement Dijkstra's algorithm for shortest path in a weighted graph.
12. Implement Breadth-First Search (BFS) for traversing a graph.
13. Implement Depth-First Search (DFS) for traversing a graph.
14. Solve the N-Queens problem using backtracking.
15. Implement Prim's algorithm for minimum spanning tree.
16. Implement Kruskal's algorithm for minimum spanning tree.



# SOFTWARE ENGINEERING & PROJECT MANAGEMENT

**MCA-201**

**L -3 T – 1 P - 0**

## **Module I: Introduction to Software Engineering and Project Management**

Introduction to Software Engineering: Software, Evolving role of software, Three “R”-Reuse, Reengineering and Retooling, An Overview of IT Project Management: Define project, project management framework, the role of project Manager, Systems View of Project Management, Stakeholder management, Project phases and the project life cycle.

## **Module II: Software Development Life Cycle Models**

Overview of Software Development Life Cycle, Process Models: Waterfall Model, Evolutionary Process Model: Prototype and Spiral Model, Incremental Process model: Iterative approach, RAD, JAD model, Concurrent Development Model, Agile Development: Extreme programming, Scrum.

## **Module III: Software Requirement Analysis and Specification**

Types of Requirement, Feasibility Study, Requirement Analysis and Design: DFD, Data Dictionary, Requirement Elicitation: Interviews, Questionnaire, Brainstorming, Facilitated Application Specification Technique (FAST), Use Case Approach. SRS Case study, Software Estimation: Size Estimation: Function Point (Numerical). Cost Estimation: COCOMO (Numerical), COCOMO-II (Numerical), Earned Value Management.

## **Module IV: Software Project Planning**

Business Case, Project selection and Approval, Project charter, Project Scope management: Scope definition and Project Scope management, Creating the Work Breakdown Structures, Scope Verification, Scope Control.

## **Module V: Project Scheduling and Human Resource management**

Relationship between people and Effort: Staffing Level Estimation, Effect of schedule Change on Cost, Degree of Rigor & Task set selector, Project Schedule, Schedule Control, CPM (Numerical), Human Resource Planning, Acquiring the Project Team, Resource Assignment, Loading, Leveling, Developing the Project Team: Team Structures, Managing the Project Team.

## **Module VI: Software Quality and Risk Management**

Software quality, software reliability models, Overview of ISO 9001, SEI Capability Maturity Model, McCalls Quality Model, Six Sigma, Formal Technical Reviews, Tools and Techniques for Quality Control, Quality Control Charts, Modern Quality Management, Risk Management: Identify IT Project Risk, Risk Analysis and Assessment, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation.

## **Module VII: Software Maintenance**

Maintenance Process, Maintenance Model, Estimation of maintenance cost, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management and Documentation.

## **Text & References:**

### ***Text***

- Software Engineering, 5th and 7th edititon, by Roger S Pressman, McGraw Hill publication
- Software Engineering Project Management by Richard H. Thayer Wiley India Publication.

***References:*** <https://www.rgpvnotes.in/2018/01/cs-6003-software-engineering-project.html>

# ASP.NET

MCA-202

L -3 T – 1 P - 0

## **Module I: Introduction to .NET technologies**

Features of .NET, .NET Framework, CLR, MSIL, .NET class library, .NET Languages, CTS, assemblies, manifest, and metadata, What is ASP.NET?, Difference between ASP and ASP.NET.

## **Module II: Controls in ASP.NET**

Overview of Dynamic Web page, Understanding ASP.NET Controls, Applications, Web servers, Installation of IIS.Web forms, web form controls -server controls, client controls. Adding controls to a web form, Buttons, Text Box, Labels, Checkbox, Radio Buttons, List Box. Adding controls at runtime. Running a web Application, creating a multiform web project. Form Validation: Client side validation, server Side validation, validation Controls: Required Field Comparison Range. Calendarcontrol, Ad rotator Control, Internet Explorer Control.

## **Module III: Overview of ADO.NET and XML**

What is ADO.NET, from ADO to ADO.NET. ADO.NET architecture, Accessing Data using Data Adapters and Datasets , using Command & Data Reader, binding data to data bind Controls, displaying data in data grid, XML basics, attributes, fundamental XML classes: Document, text writer, text reader. XML validations, XML in ADO.NET, The XML Data Document.

## **Module IV: ASP.NET Applications**

Creating, tracking, caching, error handling, Securing ASP.NET applications- form based applications, window based application.

## **Module V: Web services**

Introduction, State management- View state, Session state, Application state, Building ASP.NET web services, working with ASP.NET applications, creating custom controls.

## **Text & References:**

### ***Text:***

- ASP.NET Unleashed by Stephen Walther, SAMS publications

### ***References:***

- ASP.NET, Wrox Publications
- ASP.NET and VB.NET, Wrox Publication
- ASP.NET and C#.NET, Wrox publication.

# PYTHON

**MCA-203**

**L -3 T – 1 P - 0**

## **UNIT – I:**

**Introduction:** History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

## **UNIT – II:**

**Operators and Expressions:** Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass

## **UNIT – III:**

**Functions:** Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables, Modules: Creating modules, import statement, from. Import statement, name spacing, Python Packages

## **UNIT – IV:**

**Data Structures:** Lists- Operations, Slicing, Methods, Tuples, Sets, Dictionaries, Sequences, Comprehensions. **Exceptions:** Errors in a Python Program (Compile-Time Errors, Runtime Errors, Logical Errors), Exceptions, Exception Handling, Types of Exceptions, The Except Block, the assert Statement, User- Defined Exceptions, Logging the Exceptions. **Files:** Files, Types of Files in Python, Opening a File, Closing a File, Working with Text Files Containing Strings, Knowing Whether a File Exists or Not, Working with Binary Files, The with Statement, Pickle in Python, The seek() and tell() Methods

## **UNIT – V:**

**Object Oriented Programming OOP in Python:** Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods **Regular Expressions:** Regular Expressions, Sequence Characters in Regular Expressions, Quantifiers in Regular Expressions, Special Characters in Regular Expressions, Using Regular Expressions on Files, Retrieving Information from a HTML File

## **Data Science and Data Visualization using Python**

**Data Science Using Python:** Data Frame (Creating Data Frame from an Excel Spreadsheet, Creating Data Frame from .csv Files, Creating Data Frame from a Python Dictionary, Creating Data from Python List of Tuples, Operations on Data Frames) **Data Visualization:** Bar Graph, Histogram, creating a Pie Chart, Creating Line Graph, **Plotting:** Plotting using PyLab, Plotting mortgages and extended examples

## **Text books**

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly

**Reference Books:**

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson
3. Introduction to Python, Kenneth A. Lambert, Cengage

# ARTIFICIAL INTELLIGENCE

**MCA-204**

**L-3 T-1 P-0**

## **Module I:**

**Fundamental Issues:** Overview of AI problems, Examples of successful recent AI applications, Intelligent behaviour, The Turing test, Rational versus non-rational reasoning, Problem characteristics: Fully versus partially observable, Single versus multi-agent, Deterministic versus stochastic, Static versus dynamic, Discrete versus continuous, Nature of agents: Autonomous versus semi-autonomous, Reflexive, Goal-based, and Utility-based, Importance of perception and environmental interactions, Philosophical and ethical issues.

## **Module II:**

**Basic Search Strategies:** Problem spaces (states, goals and operators), Problem solving by search, Factored representation (factoring state into variables), Uninformed search (breadth-first, depth-first, depth-first with iterative deepening), Heuristics and informed search (hill-climbing, generic best-first, A\*), Space and time efficiency of search, Constraint satisfaction (backtracking and local search methods).

## **Module III:**

**Advanced Search:** Constructing search trees, Dynamic search space, Combinatorial explosion of search space, Stochastic search: Simulated annealing, Genetic algorithms, Monte-Carlo tree search, Implementation of A\* search, Beam search, Minimax Search, Alpha-beta pruning, Expectimax search (MDP-solving) and chance nodes.

**Knowledge Representation:** Propositional and predicate logic, Resolution in predicate logic, Question answering, Theorem proving, Semantic networks, Frames and scripts, conceptual graphs, conceptual dependencies.

## **Module IV:**

**Reasoning under Uncertainty:** Review of basic probability, Random variables and probability distributions: Axioms of probability, Probabilistic inference, Bayes' Rule, Conditional Independence, Knowledge representations using Bayesian Networks, Exact inference and its complexity, Randomized sampling (Monte Carlo) methods (e.g. Gibbs sampling), Markov Networks, Relational probability models, Hidden Markov Models, Decision Theory Preferences and utility functions, Maximizing expected utility.

## **Module V:**

**Agents:** Definitions of agents, Agent architectures (e.g., reactive, layered, cognitive), Agent theory, Rationality, Game Theory Decision-theoretic agents, Markov decision processes (MDP), Software agents, Personal assistants, and Information access Collaborative agents, Information-gathering agents, Believable agents (synthetic characters, modelling emotions in agents), Learning agents, Multi-agent systems Collaborating agents, Agent teams, Competitive agents (e.g., auctions, voting), Swarm systems and Biologically inspired models.

**Expert Systems:** Architecture of an expert system, existing expert systems: MYCIN, RI. Expert system shells.

**Text & References:**

***Text:***

- Artificial Intelligence – II Edition, Elaine Rich, Kevin Knight TMH.

***References:***

- Foundations of Artificial Intelligence and Expert Systems, V S Janakiraman, K Sarukesi, P Gopalakrishan, Macmillan India Ltd.
- Introduction to AI and Expert System, Dan W. Patterson, PHI.

# DISTRIBUTED OPERATING SYSTEM

MCA-231

L-3 T-1 P-0

## Module I

**Fundamentals:** What is Distributed Computing Systems? Evolution of Distributed Computing System; Distributed Computing System Models; What is Distributed Operating System? Issues in Designing a Distributed Operating System; Introduction to Distributed Computing Environment (DCE).

**Message Passing:** Introduction, Desirable features of a Good Message Passing System, Issues in PC by Message Passing, Synchronization, Buffering, Multi-datagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication.

## Module II:

**Remote Procedure Calls:** Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC, Optimization for Better Performance, Case Studies: Sun RPC.

## Module III

**Distributed Shared Memory:** Introduction, General Architecture of DSM systems, Design and Implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM. Synchronization: Introduction, Clock Synchronization, Event Ordering, Mutual Exclusion, Dead Lock, Election Algorithms

## Module IV

**Resource Management:** Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach Process Management: Introduction, Process Migration, Threads.

## Module V

**Distributed File Systems:** Introduction, Desirable Features of a Good Distributed File System, File models, File–Accessing Models, File – Sharing Semantics, File – Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions and Design Principles.

## Text & References:

- Distributed Operating Systems 1st Edition by Andrew S. Tanenbaum
- Distributed Systems: Principles and Paradigms (2nd Edition) 2nd Edition, by Andrew S. Tanenbaum, Maarten Van Steen
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# CLOUD COMPUTING

**MCA-241**

**L -3 T – 1 P - 0**

## **MODULE I: CLOUD ARCHITECTURE AND MODEL**

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

## **MODULE II: VIRTUALIZATION**

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

## **MODULE III: CLOUD INFRASTRUCTURE**

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

## **MODULE IV: PROGRAMMING MODEL**

Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

## **MODULE V: SECURITY IN THE CLOUD**

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

### **Text & References:**

- John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.
- Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
- Kumar Saurabh, “Cloud Computing – insights into New-Era Infrastructure”, Wiley India,2011.
- James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
- Ronald L. Krutz, Russell Dean Vines, “Cloud Security – A comprehensive Guide to Secure Cloud Computing”, Wiley – India, 2010.



## Digital Electronics

### Subject Code- MCA- 241 A

#### UNIT-1:

##### Number System and Data Representation

Number System: Binary, Octal, Decimal and Hexadecimal Number System and Their Interconversion. Binary Codes: Bcd, Excess 3, Parity, Gray, Ascii And Ebcidic Codes, Their Advantages And Disadvantages. Data Representation: (Related To 8 Bit Number), Real Number Representation, Underflow, Overflow, Range and Accuracy of Numbers.

#### UNIT-2:

##### Binary Arithmetic

Binary Addition, Decimal Subtraction Using 9's And 10's Complement, Binary Subtraction Using 1's And 2'nd Compliment, Multiplication And Division .Logic Gates: Truth Table, Properties And Symbolic Representation Of NOT, AND, OR, NOR, NAND, EX-OR, EX – NOR GATES, NOR and NAND GATES As A Universal Gates.

#### UNIT-3

##### Boolean algebra

Laws And Identities Of Boolean Algebra, Demorgan's Theorem, Use Of Boolean Algebra For Simplification Of Logic Expression, Karnaugh Map For 2,3,4 Variable, Simplification Of Sop And Pos Logic Expression Using K-Map.

#### UNIT-4:

##### Combinational / Sequential Circuits

Half Adder, Full Adder, Parallel Adder, Half Subtractor, Full Subtractor, 4 Bit Binary Adder/Subtractor, Multiplexer, demultiplexer, Decoder, Encoder, Parity Detector.

#### UNIT-5:

##### Architecture Of 8086

Block Diagram Of 8086, Pin Diagram Of 8086, Minimum And Maximum Mode, Addressing Modes, Instruction Set: Data Transfer, Arithmetic, Logical, String Manipulation, Control Transfer, Unconditional Branch, Conditional Branch, Flag, Processor Control.

## **Business Communication**

### **Subject Code- MCA- 241 B**

#### Unit 1

Business Vocabulary – Writing: Drafting Notices, Agenda, and Minutes – Reading: Business news, Business articles.

#### Unit 2

Writing: Style and vocabulary – Business Memorandum, letters, Press Releases, reports – proposals – Speaking: Conversational practice, telephonic conversations, addressing a gathering, conducting meetings.

#### Unit 3

Active Listening: Pronunciation – information gathering and reporting – Speaking: Cross-Cultural Issues, Group Dynamics, and negotiation & persuasion techniques.

#### Unit 4

PROFESSIONAL WRITING: Letter writing – Types, Parts and Styles of Formal Letters – Language to be used in Formal Letters – Letters of Enquiry, Complaint, and Apology with Replies – Letter of Application -Resume – E-mail – Active and Passive Voice.

#### Unit 5

REPORT WRITING: Types of Reports – Formats of Reports – Memo Format – Letter Format and Manuscript Format- Parts of Technical Report – Informational, Analytical and Project Reports – Idioms and Phrases.

## **Research Methodologies**

**Subject Code- MCA- 241 C**

Unit 1.

Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method - Understanding the language of Research - Concept, Construct, Definition, Variable. Research Process.

Unit 2.

Problem Identification & Formulation - Research Question - Investigation Question - Measurement Issues - Hypothesis - Qualities of a good Hypothesis Null Hypothesis & Alternative Hypothesis. Hypothesis Testing - Logic & Importance.

Unit 3.

Research Design: Concept and Importance in Research - Features of a good research design - Exploratory Research Design - concept, types and uses, Descriptive Research Designs - concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.

Unit 4.

Qualitative and Quantitative Research: Qualitative research - Quantitative research - Concept of measurement, causality, generalization, and replication. Merging the two approaches.

Unit 5.

Measurement: Concept of measurement- what is measured? Problems in measurement in research- Validity and Reliability. Levels of measurement Nominal, Ordinal, Interval, and Ratio.

## **Cognitive Analytics and Social Skills for Professional Development**

### **Subject Code- MCA- 241 D**

#### Unit I:

Cognitive Analytics and Social Cognition Understanding the self-preliminaries, Models of Understanding Self- T-E-A Model, Johari Window, PE Scale, Meaning and Importance of Self Esteem, Self-Efficacy, Self-Respect, Behavioral Communication- Assertive Skills, Technology adoption, Social Media Etiquettes, Creativity (ICEDIP Model), Visualization, Problem sensitivity, Problem Solving (Six Thinking Hats), Cognitive Flexibility, Cognitive Errors, Introduction to Social Cognition, Attribution Processes (Perceptual Errors), Social Inference, Stereotyping, Prejudice, Accepting Criticism.

#### Unit II:

Attitudes & Emotional Intelligence Understanding Attitudes , Characteristics of Attitude (valence, multiplicity, relation to needs, centrality, pervasiveness, invisible, acquired), Components of Attitudes (Affective, Cognitive, Behavioral), What are Emotions, Healthy and Unhealthy expression of emotions, Relevance of EI at workplace, Emotional Intelligence and Competence, Components of Interpersonal & Intrapersonal Intelligence, Relevance of EI at workplace

#### Unit III:

Leadership and Managing Excellence Team Design Features, Life Cycle of a Teams, Types and Development of Team Building, Issues in Team Performance , Types of leaders, Leadership styles in organizations, Situational Leadership , Strategic Leadership and Change Management- Mentoring, Building Trust, Building a Culture of Inclusion, Sociometry (Sociometry Criteria, Applications of Sociometry, Construction of sociogram), Personal Branding, Time Management, Work Life Integration, Relationship Management (Personal & Professional)

#### Unit IV:

Conflict Resolution and Negotiation Meaning, nature, sources, stages & types of conflicts, Factors affecting conflict, Impact of Conflict, Ethical Dilemmas in Conflict, Conflict Resolution Strategies, Comparison of conflict management styles, Matching conflict management approach with group conditions, Third Party Intervention- Mediation, mediation process, function of the mediator, preconditions for mediation, Intercultural communication and conflict resolution, Negotiation - Types, purpose, stages, Four pillars of negotiation, Strategies, Persuasion, Behavior and conduct during negotiation, closing the negotiation

#### Unit V:

Values & Ethics Meaning & its type, Difference between values and Ethics, Relationship between Values and Ethics, Significance of moral values, Practical Applications of Values & Ethics, Significance of moral values, Moral Icons, Its role in personality development , Character building- “New Self-awareness”, Personal values-Empathy, honesty, courage, commitment, Core Values - Respect, Responsibility, Integrity, Care, & Harmony, Resilience and Agility in Uncertainty, Overview of Resilience , Locus of control, Paradox of choice, Overcoming negative thinking- ABC technique (Adversity, believes and consequences), Personality & cognitive variables that promote resilience, Role of family and social networks, Models, Symptoms and consequences of stress.

# EMBEDDED SYSTEMS

**MCA-232**

**L -3 T – 1 P - 0**

## **Module 1: INTRODUCTION**

Introduction: Evolution of Computers, Technological Trends, Measuring performance Speed up, Computer organization: von Neumann Machine Architecture, Functional units and components, Program development tools. Instruction pipelining and parallel processing: Instruction pipeline, hazards, Data forwarding paths, RISC vs. CISC processors.

## **Module2: EMBEDDED SYSTEM**

Introduction of embedded system, Processor: Embedded Processors in a System, Microprocessor, Microcontroller, Single Purpose Processors and Application specific system processors (ASSPs) in embedded systems. Embedded hardware units and devices

## **Module 3: INTERRUPTS HANDLER, EMBEDDED SOFTWARE**

Interrupts handler, Embedded software, Final Machine Implement-able Software for a System, Coding of Software in Machine Codes, software in Processor Specific Assembly Language, Software in High Level Language, Program Models for Software Designing, Software for Concurrent Processing and Scheduling of Multiple Tasks and ISRs Using an RTOS, Software for the Device Drivers and Device Management using an Operating System, Software tools in designing of an Embedded System, Needed Software Tools in the Exemplary cases. Examples of Embedded System

## **Module 4: The Embedded Computing Platform**

Embedded Computing Platform, CPU Bus, Memory Devices, I/O Devices, Component Interfacing

## **Module 5: Real-Time Operating Systems**

Inter Process Communication & Synchronization of Processes, task and threads, multiple processes in an application, multiple threads in an application, task and states, task and data clear cut distinction between functions, ISRs and Tasks by their Characteristics.

## **Module 6: CONCEPT OF SEMAPHORES**

Concept of semaphores, Use of a Single Semaphore as an event signalling variable or notifying variable (event flag), Use of a Single Semaphore as resource key and in critical Section, Mutex, Use of Multiple Semaphores, Use of Mutex, Counting Semaphores, P and V semaphores shared data: Problem of Sharing Data by Multiple Tasks and Routines, Shared Data, Deadlock Situations ,inter process Communication semaphores, Message Queues, Mailboxes, Pipes, Sockets, Remote Procedure Calls (RPCs).

## LINUX/ UNIX

MCA-233

L-3 T-1 P-0

### **Unit-1 Introduction of UNIX and Shell:**

Introduction, History, Architecture, Experience the Unix environment, Basic command sls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, spell and ispell, Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and||, exit, if, and case conditions, expr, sleep and wait, while, until, for,\$,@, redirection, set and shift, trap.

### **Unit-2 UNIX File System:**

The file, what's in a filename? The parent-child relationship, pwd, the Home directory, absolute path names, using absolute pathnames for a command, cd, mkdir, rmdir, Relative path names, The UNIX file system. Basic File Attributes: Is -l, the -d option, File Permissions, chmod, Security and File Permission, users and groups, security level, changing permission, changing ownership and group, File Attributes, More file attributes: hard link, symbolic link, umask, find.

### **Unit-3 Simple Filters:**

Pr, head, tail, cut, paste, sort, uniq, tr commands, Filters using Regular Expression: grep, Regular Expression, egrep, fgrep, sed instruction, Line Addressing, Inserting and Changing Text, Context addressing, writing selected lines to a file, the-f option, Substitution, Properties of Regular Expressions.

### **Unit-4 Awk and Advanced Shell Programming:**

Awk-Advanced Filters: Simple awk Filtering, Splitting a Line into Fields, printf, the Logical and Relational Operators, Number Processing, Variables, The -f option, BEGIN and END positional Parameters, getline, Built-invariables, Arrays, Functions, Interface with the Shell, Control Flow. The sh command, export, the Command, Conditional Parameter Substitution, Merging Streams, Shell Functions, eval, Exec Statement and Examples

### **Unit-5 Process and System Administration:**

Process basics, PS, internal and external commands, running jobs in background, nice, at and batch, cron, time commands, Essential System Administration root, administrator's privileges, startup & shutdown, managing disk space, cpio, tar, Customizing the Environment : System Variables, profile, sty, Aliases, Command History, On-line Command Editing.

## Software Engineering and Project Management lab

**MCA-251**

**L T P 0 0 2**

<b>S.No</b>	<b>List of programs</b>
1.	Write a program to take task names as input and display them.
2.	Write a program to updates a task's status (Pending/Done) and shows the result.
3.	Write a program to counts how many tasks have been inputted.
4.	Write a program to multiplies the number of hours by a fixed hourly rate to calculate the cost.
5.	Write a program that assigns a priority (High, Medium, Low) to a task and displays it.
6.	Write a program to checks if a task's due date has passed and displays a reminder.
7.	Write a program to marks specific tasks as milestones based on user input.
8.	Write a program to calculates how many tasks are completed out of the total.
9.	Write a program to assigns a person to a task and displays the assignment.
10.	Write a program to log defects with a status (Open/Closed).
11.	Write a program to multiplies the number of tasks by the estimated hours to give a total project effort.
12.	Write a program to input and display project risks.
13.	Write a program to prints task names with start and end dates in a simple list format.
14.	Write a program to simple First-Come-First-Serve (FCFS) scheduler that orders tasks by input time.
15.	Write a program to program that sums up task durations to calculate total project time.

## Lab ASP. Net

### MCA-252

1. Create a simple ASP.NET Web Form that displays "Hello, World!".
2. Build a contact form that captures user input and sends an email.
3. Develop a login page with user authentication using session management.
4. Create a registration form that saves user data to a SQL database.
5. Implement a product catalog page displaying data from a database.
6. Build a shopping cart application with add, remove, and checkout functionalities.
7. Create a CRUD (Create, Read, Update, Delete) application for managing a list of books.
8. Develop an employee management system with role-based access.
9. Implement a search feature for a blog with pagination.
10. Create a dashboard that visualizes data using charts (e.g., using Chart.js).
11. Build a simple API that returns JSON data for a list of users.
12. Implement file upload functionality with size and type validation.
13. Create a multi-language support page using resource files.
14. Develop a URL shortening service using ASP.NET MVC.
15. Implement session state management and demonstrate session tracking.
16. Build a survey application that saves responses to a database.
17. Create a forum page allowing users to post and comment on threads.
18. Develop a booking system for appointments with calendar integration.
19. Implement a real-time chat application using SignalR.
20. Create a blog platform with user roles for authors and admins.



## Lab Python

### MCA-253

1. Print "Hello, World!" to the console.
2. Calculate the sum of two numbers entered by the user.
3. Check if a given number is even or odd.
4. Compute the factorial of a non-negative integer.
5. Generate the Fibonacci series up to a specified number.
6. Determine if a given number is prime.
7. Reverse a string provided by the user.
8. Convert Celsius to Fahrenheit and vice versa.
9. Implement a basic calculator for addition, subtraction, multiplication, and division.
10. Count the number of vowels and consonants in a given string.
11. Check if a given string is a palindrome.
12. Calculate the area of a rectangle given width and height.
13. Sort a list of integers in ascending order.
14. Find the maximum and minimum values in a list.
15. Implement linear search to find an element in a list.
16. Create a program to read and write to a text file.
17. Generate a random number and create a guessing game.
18. Count the number of words in a sentence provided by the user.
19. Create a simple to-do list application using lists.
20. Implement a basic quiz application that asks questions and evaluates answers.

# SOFT COMPUTING

**MCA-331**

**L -3 T – 1 P - 0**

## **Introduction to Soft Computing**

Introduction, Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Applications

## **Fundamentals of Neural Network**

Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Taxonomy of NN Systems, Single-Layer NN System, Applications.

## **Back Propagation Network**

Background, Back-Propagation Learning, Back-Propagation Algorithm.

## **Associative Memory**

Description, Auto-associative Memory, Bi-directional Hetero associative

## **Fundamentals of Genetic Algorithms**

Introduction, Encoding, Operators of Genetic Algorithm, Basic Genetic Algorithm.

## **Swarm Intelligent System**

Introduction to swarm intelligence, Background, ACO, ABC, Cuckoo search algorithms.

## **Text & References:**

- Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S. Rajasekaran, G. A. Vijayalakshami, PHI.
- Chin Teng Lin, C. S. George Lee, Neuro-Fuzzy Systems, PHI
- Tomthy Ross, Fuzzy Logic and Engineering Application, TMH
- Kishan Mehrotra, Elements of Artificial Neural Network, MIT Press
- E. Goldberg, Genetic Algorithms: Search and Optimization, Addison-Wesley
- Recent Articles and Research papers

# PHP

**MCA-301**

**L -3 T – 1 P - 0**

**Module I: Introduction to PHP Servers :** Introducing Apache, PHP, MySql, Installing XAMPP, PHP, MySql, Configuring Apache for PHP, Introduction to PHP, Syntax, Common PHP Script Elements, Variables, String, Operators, If...Else, Switch, Arrays, Looping, Functions, Forms, \$\_GET, \$\_POST, Date, Include, Error, Exception, Filter, PHP ODBC, Working With Forms, Processing Forms, Form Validation, Addressing the Stateless Nature of HTTP, Hidden Form Fields.

**Module II: File Handling :**File and Directory Handling, Including Files, File Access, Displaying directory files, Copying and renaming files, Deleting files, Opening and closing files, Reading files, Writing files, Logging visitor details, Enabling file uploads, Creating and upload form, Creating an upload script, Uploading a file

**Module III: PHP and My SQL:**Introducing databases Connect MySQL, Creating new database MySQL Create, Creating database table MySQL Insert, SQL data types, Inserting table data, Altering an existing table, Updating records, Deleting data, tables and databases, SQL Queries MySQL Select, MySQL Where, MySQL Order By, MySQL Update, MySQL Delete,, Creating Mysql user and password, Connecting a user to Mysql, Listing databases, Listing table names, Creating a database, Deleting a database, Creating a database table, Inserting table data, Altering tables, Retrieving data from a table

**Module IV: Advance PHP :** Declaring a class and Objects, The new keyword and constructor, Destructor, Access method and properties using \$this variable, Public ,private, protected properties and methods, Static properties and method, Class constant, Introducing cookies, Set a cookie, Access limitation, Introducing sessions, Starting session, Session without cookies, Setting session persistence, Cookies or session, Sending plain text E-mail, Sending html E-mail, Creating an attachment form, Sending attachment with E-mail

## **Module – V: Content Management System**

Introduction of Content Management System, Introduction about WordPress, WordPress.org vs. WordPress.com Introduction about drupal, Drupal installation, Maintenance mode, Working with plugins, Working with themes, Updation and deletion plugins, Upgrade the drupal versions, Forum Social media buttons, Slide show, Comments, Audio and video file in drupe, You tube in your drupal site

## **Text & References:**

### **Text:**

Atkinson, Leon. *Core PHP Programming, 2nd Edition*. New York: Prentice Hall

### **References:**

- <http://www.zend.com>
- <http://www.php.net>
- <http://www.mysql.com>
- <http://www.phpbuilder.com>
- <http://www.useit.com>
- <http://www.devshed.com>
- <http://www.webmonkey.com>

# COMPILER DESIGN

MCA-332

L -3 T – 1 P - 0

## **Module I: Introduction**

Introduction to Compilers, Classification of grammars, Context free grammars, Regular grammars, Deterministic finite State Automata (DFA) & Non-DFA.

## **Module II: Syntax Analysis**

Scanners, Top down parsing, LL grammars, Bottom up parsing, Polish expression Operator Precedence grammar, IR grammars, Comparison of parsing methods, Error handling.

## **Module III: Symbol Table**

Symbol table handling techniques, Organization for non-block and block structured languages.

## **Module IV: Code Generation/Intermediate Code Generation**

Run time storage administration, Static and dynamic allocation, Intermediate forms of source program, Polish N-tuple and syntax trees, Semantic analysis and code generation.

## **Module V: Code Optimization**

Code optimization, Folding, redundant sub-expression evaluation, Optimization within iterative loops.

## **Text & References:**

### ***Text:***

- Principles of Compiler Design, Alfred V. Aho, Jeffrey D. Ullman, Narosa Publishing House
- Compilers Principles, Techniques & Tools, Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Pearson Education (Singapore)

### ***References:***

- The Theory and Practice of Compiler Writing, Tremblay, et. al., McGraw Hill, New York, 1985.

# ANDROID PROGRAMMING

**MCA-303**

**L -3 T – 1 P - 0**

## **Module –I: Basics of Android**

What is Android, History and Version, Installing softwares , Setup Eclipse, Hello Android example, Internal Details, Dalvik VM , Software Stack , Android Core Building Blocks , Android Emulator , AndroidManifest.xml , R.java file , Hide Title Bar , Screen Orientation

## **Module –II: UI Widgets**

Working with Button, Toast, Custom Toast, Button, Toggle Button, Switch Button, Image Button, CheckBox, AlertDialog, Spinner, AutoCompleteTextView, RatingBar, DatePicker, TimePicker, ProgressBar, Quick Contact Budge, Analog Clock and Digital Clock, Working with hardware Button, File Download

## **Module –III: Activity, Intent & Fragment**

Activity Lifecycle, Activity Example, Implicit Intent, Explicit Intent, Fragment Lifecycle, Fragment Example, Dynamic Fragment

## **Module –IV: Android Menu & Layout Manager**

Option Menu, Context Menu, Popup Menu , Relative Layout, Linear Layout, Table Layout, Grid Layout

## **Module –V: Adaptor & Views**

Array Adaptor, ArrayList Adaptor, Base Adaptor, GridView , WebView , ScrollView , SearchView , TabHost , DynamicListView , ExpandedListView

## **Text & Reference:**

- Android Programming: The Big Nerd Ranch Guide (Big Nerd Ranch Guides) (By: Bill Philips & Brian Hardy)
- Android Recipes: A Problem-Solution Approach, Dave Smith & Jeff Friesen

# Data Science

**MCA-302**

**L -3 T – 1 P - 0**

## **Module 1: Big Data & Statistics**

Overview of Big Data; Characteristics of Big Data.

- Important statistical concepts used in data science
- Difference between population and sample
- Types of variables
- Measures of central tendency
- Measures of variability
- Coefficient of variance
- Skewness and Kurtosis

## **Module 2: Inferential statistics**

Inferential statistics is used to generalize of populations, from which samples are drawn. This is a new branch of statistics, which helps you learn to analyze representative samples of large data sets. In this module, you will learn –

- Normal distribution
- Test hypotheses
- Central limit theorem
- Confidence interval
- T-test
- Type I and II errors
- Student's T distribution

## **Module 3: Python**

Python is the most important and necessary topic that every data scientist should have knowledge about. In this section, our instructors will take you through the basics of Python and areas where it can be used. You will learn how to use some of the current tools such as Numpy, Pandas, and Matplotlib. Therefore, module 1 includes –

- Environment set-up
- Jupyter overview
- Python Numpy
- Python Pandas
- Python Matplotlib

## **Module 4: Exploratory data analysis**

- Data visualization
- Missing value analysis
- The correction matrix
- R programming language

## **Module 5: Supervised machine learning**

This is a comprehensive module to help you understand how to make machines or computers interpret human language. You will learn –

- Python Scikit tool

- Neural networks
- Support vector machine
- Logistic and linear regression
- Decision tree classifier

# Cryptography and Network Security

## MCA-304

### Unit 1: Introduction to Cryptography

Overview of cryptography, historical background, and applications. Basic terminology such as plaintext, ciphertext, and key. Exploration of types of cryptography including symmetric and asymmetric methods. Introduction to classical ciphers like the Caesar cipher and Vigenère cipher, along with modern cryptographic algorithms.

### Unit 2: Symmetric Key Cryptography

Focus on block ciphers including DES and AES, as well as their modes of operation. Discussion of stream ciphers such as RC4 and their applications. Key management and distribution strategies will be covered, along with cryptographic protocols that utilize symmetric key cryptography. Examination of potential attacks on symmetric key systems.

### Unit 3: Asymmetric Key Cryptography

Principles of asymmetric cryptography, including the RSA algorithm for key generation, encryption, and decryption. Study of the Diffie-Hellman key exchange method and the concepts of digital signatures and certificates. Analysis of applications related to asymmetric cryptography.

### Unit 4: Hash Functions and Message Integrity

Introduction to hash functions and their importance in cryptography. Exploration of the properties of cryptographic hash functions, with a focus on common examples like MD5, SHA-1, and SHA-256. Discussion on message authentication codes (MACs) and the applications and security implications of hash functions.

### Unit 5: Network Security Protocols

Overview of network security concepts and practices. Detailed examination of Secure Sockets Layer (SSL) and Transport Layer Security (TLS), as well as Internet Protocol Security (IPsec). Insights into virtual private networks (VPNs), firewalls, and intrusion detection systems.



# Compiler Design

**MCA-332**

## **Unit 1: Introduction to Compiler Design**

Overview of compiler design and its phases. The role of compilers in programming languages. Lexical analysis, syntax analysis, and semantic analysis. Introduction to different types of translators, including interpreters.

## **Unit 2: Lexical Analysis**

Detailed study of lexical analysis and its importance. Design and implementation of finite automata. Use of regular expressions in token specification. Construction of lexical analyzers and tools like Lex.

## **Unit 3: Syntax Analysis**

Introduction to context-free grammars and parsing techniques. Overview of parsing algorithms, including top-down and bottom-up parsing. Study of predictive parsing, recursive descent parsing, and LR parsing. Construction of parse trees and syntax trees.

## **Unit 4: Semantic Analysis**

Understanding semantic analysis and its role in compiler design. Techniques for type checking and symbol table management. Implementation of semantic actions and the use of attribute grammars. Error detection and handling during semantic analysis.

## **Unit 5: Intermediate Code Generation**

Overview of intermediate representations used in compilers. Techniques for generating intermediate code from syntax trees. Three-address code, quadruples, and other forms of intermediate code. Optimization techniques at the intermediate level.

## **Professional Ethics and Social Responsibility for Sustainability**

**MCA-304 A**

### **Unit 1: Introduction to Professional Ethics**

Overview of professional ethics and its significance in various fields. Examination of ethical theories and frameworks. Discussion on the role of values and morals in professional conduct. Case studies highlighting ethical dilemmas in professional settings.

### **Unit 2: Ethical Decision-Making**

Analysis of decision-making processes in ethical contexts. Models of ethical decision-making and their applications. Factors influencing ethical decisions in professional practice. Strategies for resolving ethical conflicts and dilemmas.

### **Unit 3: Social Responsibility**

Definition and importance of social responsibility in business and professional environments. Examination of corporate social responsibility (CSR) initiatives. The relationship between social responsibility and sustainability. Impact of social responsibility on stakeholder engagement.

### **Unit 4: Sustainability and Ethical Practices**

Understanding sustainability in the context of professional ethics. Exploration of environmental ethics and sustainable practices. Discussion on the role of professionals in promoting sustainable development. Case studies of organizations implementing sustainable practices.

### **Unit 5: Global Perspectives on Ethics and Responsibility**

Examination of ethical standards across different cultures and societies. Challenges of maintaining ethical standards in a globalized world. The impact of globalization on professional ethics and social responsibility. Comparative analysis of ethical practices in various countries.

# **Enterprise Resource Planning**

## **MCA-304 B**

### **Unit 1: Introduction to Enterprise Resource Planning**

Overview of Enterprise Resource Planning (ERP) systems and their significance in organizations. Examination of the evolution of ERP and its integration with business processes. Discussion on the components and architecture of ERP systems.

### **Unit 2: ERP Modules and Functionality**

Detailed exploration of various ERP modules, including finance, human resources, supply chain management, manufacturing, and customer relationship management. Understanding the functionality and interconnectivity of these modules within an ERP system.

### **Unit 3: ERP Implementation Strategies**

Analysis of ERP implementation methodologies and best practices. Overview of project planning, resource allocation, and change management during implementation. Discussion on the challenges and risks associated with ERP implementation.

### **Unit 4: ERP Customization and Integration**

Examination of customization options within ERP systems. Strategies for integrating ERP with existing legacy systems and other software applications. Case studies of successful ERP integration projects.

### **Unit 5: Data Management and Reporting in ERP**

Understanding the importance of data management within ERP systems. Overview of data migration processes and data quality management. Discussion on reporting tools and techniques for data analysis in ERP environments.

MCA-304 C

### **Unit 1: Introduction to Software Project Management**

Overview of software project management principles and practices. Examination of the software development lifecycle and its phases. Discussion on the roles and responsibilities of a project manager in software projects.

### **Unit 2: Project Planning and Estimation**

Introduction to project planning concepts and methodologies. Techniques for project estimation, including expert judgment, analogy-based estimation, and parametric models. Discussion on work breakdown structure (WBS) and project scheduling.

### **Unit 3: Risk Management in Software Projects**

Identification and analysis of risks in software projects. Development of risk management plans and strategies for mitigating risks. Tools and techniques for monitoring and controlling project risks.

### **Unit 4: Resource Management and Team Dynamics**

Overview of resource management in software projects, including human, financial, and material resources. Discussion on team dynamics, communication, and conflict resolution. Strategies for building and leading effective project teams.

### **Unit 5: Quality Assurance and Control**

Introduction to quality management in software projects. Examination of quality assurance and quality control processes. Techniques for measuring and ensuring software quality throughout the project lifecycle.

## **Internet of Everything**

### **MCA-304 D**

#### **Unit 1: Introduction to the Internet of Everything**

Overview of the Internet of Everything (IoE) and its significance. Examination of the components of IoE: people, processes, data, and things. Discussion on the evolution of IoE from the Internet of Things (IoT) and its implications.

#### **Unit 2: Architecture and Technologies of IoE**

Understanding the architectural framework of IoE systems. Overview of enabling technologies such as sensors, connectivity protocols, and cloud computing. Examination of data processing and analytics in IoE environments.

#### **Unit 3: IoE Communication Models**

Analysis of communication models used in IoE. Discussion on device-to-device, device-to-cloud, and cloud-to-cloud communication. Exploration of protocols and standards that facilitate communication in IoE.

#### **Unit 4: Data Management and Analytics**

Introduction to data management challenges in IoE. Techniques for collecting, storing, and processing large volumes of data. Discussion on data analytics and visualization tools to derive insights from IoE data.

#### **Unit 5: Security and Privacy in IoE**

Examination of security challenges and vulnerabilities in IoE systems. Strategies for securing IoE devices and networks. Discussion on privacy concerns and regulations affecting IoE applications.

S.No	List of programs
1.	Write a program to implement the Caesar cipher for encryption and decryption of a given plaintext.
2.	Create a program that implements a substitution cipher by mapping each letter of the alphabet to another letter.
3.	Write a Program to Implement a transposition cipher for rearranging letters.
4.	Write a basic version of the DES encryption and decryption.
5.	Write a Program to Demonstrate Triple DES encryption and decryption.
6.	Write a Program to Implement one block cipher mode (e.g., CBC).
7.	Write a Program to Create a calculator for modular arithmetic operations.
8.	Write a Program to Generate RSA keys using two prime numbers.
9.	Write a Program to Implement Euclid's algorithm for finding GCD.
10.	Write a Program to Compute MD5 hash for a given string.
11.	Write a Program to Implement SHA-256 hash function for messages
12.	Write a Program to Generate a MAC using HMAC.
13.	Write a Program to Simulate a basic Kerberos authentication process.
14.	Write a Program to Demonstrate PGP encryption and decryption.
15.	Write a Program to Simulate a simple firewall rule for access control.

## Lab PHP

### MCA-351

1. Create a simple PHP script that prints "Hello, World!".
2. Build a form that takes user input and displays the submitted data.
3. Implement a user registration system that stores data in a MySQL database.
4. Create a login system with session management to authenticate users.
5. Develop a contact form that sends an email with user details.
6. Build a CRUD application to manage a list of books in a database.
7. Create a simple calculator that performs basic arithmetic operations.
8. Implement a file upload feature with validation for file types.
9. Develop a program that generates a random password.
10. Create a page that displays data from an API using cURL.
11. Implement pagination for displaying a list of products from a database.
12. Build a blog platform with post creation and commenting features.
13. Create a program to read and display contents of a text file.
14. Develop a shopping cart system that tracks selected items.
15. Implement user roles (admin and user) with access control.
16. Create a program that generates and displays a QR code.
17. Build a survey application that collects and displays user responses.
18. Create a simple image gallery that displays images from a folder.

## Lab Data Science

### MCA-352

- 1) Load a CSV file and display basic statistics using pandas.
- 2) Clean a dataset by handling missing values and duplicates.
- 3) Visualize data distributions using histograms and box plots with Matplotlib.
- 4) Implement a linear regression model to predict housing prices.
- 5) Perform exploratory data analysis (EDA) on a dataset with seaborn.
- 6) Create a scatter plot to visualize the relationship between two variables.
- 7) Build a decision tree classifier for a classification problem.
- 8) Implement k-means clustering on a dataset and visualize clusters.
- 9) Generate a word cloud from a text document.
- 10) Use Natural Language Processing (NLP) to tokenize and analyze text data.
- 11) Perform sentiment analysis on tweets using a pre-trained model.
- 12) Create a dashboard using Plotly Dash to visualize key metrics.
- 13) Implement feature scaling (standardization and normalization) on a dataset.
- 14) Build and evaluate a random forest classifier for a binary classification problem.
- 15) Create a time series analysis and forecasting model using ARIMA.
- 16) Use PCA (Principal Component Analysis) to reduce dimensionality of a dataset.
- 17) Implement a recommendation system using collaborative filtering.
- 18) Analyze geographical data and create maps using Folium.



## Minor Project

### MCA-354

1. Build a personal expense tracker application with user authentication.
2. Develop a simple blogging platform that allows users to create and manage posts.
3. Create a task management tool with features for adding, updating, and deleting tasks.
4. Implement a movie recommendation system using a collaborative filtering algorithm.
5. Build a weather dashboard that fetches real-time data from a weather API.
6. Develop a quiz application that scores user responses and provides feedback.
7. Create an online library management system for borrowing and returning books.
8. Implement a chat application using WebSockets for real-time communication.
9. Build a recipe sharing platform with user-generated content and ratings.
10. Develop a fitness tracking app that logs workouts and progress over time.
11. Create a simple e-commerce website with product listings and a shopping cart.
12. Implement a travel itinerary planner that helps users organize trips.
13. Build a note-taking application with features for tagging and searching notes.
14. Create a polling application for gathering opinions on various topics.
15. Develop an online resume builder that allows users to create and download resumes.
16. Implement a simple forum for discussions with user registration and threads.
17. Create a personal blog with customizable themes and comment functionality.
18. Build a language learning app that quizzes users on vocabulary and grammar.
19. Develop a digital art gallery to showcase user-uploaded artworks.
20. Create a simple game (e.g., Tic-Tac-Toe) that can be played against a computer or another user.

## Seminar Based on Learning

### MCA-355

- 1) Create a program that tracks learning progress over time using visualizations.
- 2) Develop a quiz application that adapts questions based on user performance.
- 3) Build a flashcard app for studying vocabulary or concepts with spaced repetition.
- 4) Implement a study group platform that connects learners with similar interests.
- 5) Create a resource-sharing tool for educational materials and links.
- 6) Develop a personalized learning path generator based on user goals.
- 7) Implement a gamified learning experience that rewards users for completing tasks.
- 8) Create a journal application for users to reflect on their learning experiences.
- 9) Build a web scraper to gather educational content from various websites.
- 10) Develop an interactive tutorial platform for teaching coding skills.
- 11) Create a language learning app with pronunciation feedback using speech recognition.
- 12) Implement a project-based learning platform that connects projects with relevant resources.
- 13) Build a mentorship matching system that pairs learners with experienced mentors.
- 14) Create a community forum for discussing learning strategies and sharing tips.
- 15) Develop a visualization tool to map out concepts and their relationships.
- 16) Implement a time management tool specifically designed for students.
- 17) Create a podcast aggregator focused on educational content.
- 18) Build an AI-powered chatbot to answer common learning-related questions.
- 19) Develop a survey tool for gathering feedback on learning experiences.
- 20) Create a platform for hosting and attending webinars on various topics.

## **MAJOR PROJECT PRESENTATION & VIVA**

**MCA-462**

### **Unit 1: Introduction to the Internet of Everything**

Overview of the Internet of Everything (IoE) and its significance. Examination of the components of IoE: people, processes, data, and things. Discussion on the evolution of IoE from the Internet of Things (IoT) and its implications.

### **Unit 2: Architecture and Technologies of IoE**

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### **Unit 3: IoE Communication Models**

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### **Unit 4: Data Management and Analytics**

Introduction to data management challenges in IoE. Techniques for collecting, storing, and processing large volumes of data. Discussion on data analytics and visualization tools to derive insights from IoE data.

### **Unit 5: Security and Privacy in IoE**

Examination of security challenges and vulnerabilities in IoE systems. Strategies for securing IoE devices and networks. Discussion on privacy concerns and regulations affecting IoE applications.



## **Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

### **School of School of Engineering and Technology**

#### **Ordinances, Regulations & Syllabus**

For

#### **Master of (MCA) Lateral Entry, Two Year Programme**

**Semester System**  
(w.e.f. session 2013-14)

**Approved and adopted in the year 2013 (1<sup>th</sup> Meeting, Board of  
Studies)**

## **Programme Educational Objectives (PEOs)**

**PEO 1** To provide a strong foundation in computer science and software engineering, enabling students to develop, design, and implement advanced IT solutions for complex challenges.

**PEO 2** To enhance critical thinking and problem-solving abilities, allowing graduates to analyze, design, and optimize algorithms and systems for real-world applications in diverse domains.

**PEO 3** To develop leadership skills, effective communication, and teamwork capabilities, preparing students to manage projects and lead multidisciplinary teams in delivering innovative IT solutions.

**PEO 4** To foster research skills and encourage innovation, enabling students to explore emerging technologies and contribute to advancements in software development and computer science.

**PEO 5** To promote ethical behavior, professional integrity, and continuous learning, ensuring graduates stay adaptable and contribute positively to the evolving IT industry throughout their careers.

**PEO 6** To nurture leadership qualities, communication skills, and teamwork, preparing students to manage projects and collaborate effectively within multidisciplinary teams, ensuring success in software development and IT management.

**PEO 7** To instill a sense of ethical responsibility, professionalism, and integrity, ensuring that graduates understand the societal impact of technology and contribute positively to the global IT community.

**PEO 8** To promote lifelong learning and adaptability, preparing graduates to continually update their skills, stay current with emerging technologies, and remain competitive in an ever-evolving IT landscape.

## **Programme Specific Objectives (PSO's)**

**PSO 1** To develop proficiency in designing, implementing, and testing software applications using modern programming languages, frameworks, and tools to address complex computational problems.

**PSO 2** To equip students with advanced knowledge of computer networks, protocols, and cybersecurity, enabling them to design secure, scalable, and efficient networked systems.

**PSO 3** To provide expertise in database management, data structures, and data analysis, empowering students to design efficient data-driven applications for real-world business and scientific solutions.

**PSO 4** To explore emerging technologies such as Artificial Intelligence, Machine Learning, Cloud Computing, and Big Data, preparing students to innovate and apply these technologies in various domains.

**PSO 5** To cultivate strong analytical and problem-solving skills, enabling students to conduct research and develop innovative solutions to complex problems in software engineering and IT.

**PEO 6** To develop expertise in software testing methodologies, debugging, and quality assurance processes, ensuring that software applications meet industry standards and perform reliably in diverse environments.

**PEO 7** To enhance students' communication and interpersonal skills, preparing them for effective teamwork, leadership, and technical presentations in multidisciplinary, collaborative software development environments.

**PEO 8** To instill a strong sense of professional ethics and a commitment to lifelong learning, ensuring students can adapt to technological advancements and contribute positively to the IT industry

## **Programme Outcome Objectives (POO's)**

**POO 1** Graduates will demonstrate a solid understanding of computer science fundamentals, software engineering principles, and IT solutions to address complex real-world problems across various domains.

**POO 2** Students will possess advanced problem-solving skills, applying analytical and computational methods to design efficient algorithms and software solutions for technical challenges.

**POO 3** Graduates will be proficient in designing, developing, testing, and deploying software applications using modern programming languages, frameworks, and software engineering methodologies.

**POO 4** Students will gain expertise in database design, management, and optimization, and will be able to create efficient database systems for storing and retrieving data.

**POO 5** Graduates will be adept in utilizing emerging technologies such as AI, Machine Learning, Cloud Computing, and Big Data to innovate and solve modern-day challenges.

**POO 6** Students will understand networking protocols, communication models, and security principles to design and manage secure, efficient computer networks and distributed systems.

**POO 7** Graduates will adhere to ethical standards and demonstrate professional conduct in their practice, ensuring responsibility, accountability, and respect in all computing-related endeavors.

**POO 8** Students will develop strong research skills, contributing to the advancement of technology through innovative solutions and exploration of new computational techniques and methodologies.

**POO 9** Graduates will possess effective communication skills, enabling them to work collaboratively in multidisciplinary teams, share ideas clearly, and present technical information effectively to stakeholders.

**POO 10** Graduates will engage in lifelong learning, continuously updating their knowledge and adapting to new technologies, methodologies, and industry trends to remain competitive in the evolving IT landscape.

Shobhit University, Gangoh (Saharanpur)  
Teaching Scheme  
Effective from 201 (LE)  
MCA  
III semester

Code	Course Title	Cr.	L	T	P
CCA 501	Java Programming	4	3	1	0
CCA 503	C# Programming	4	3	1	0
CCA 505	Data Communication and Networking	4	3	1	0
CCA 507	Advanced Operating System	4	3	1	0
CCA XXX	PROFESSIONAL ELECTIVE-I	4	3	1	0
CCA 551	Java Programming Lab	2	0	0	4
CCA 553	C# Programming Lab	2	0	0	4
	Total	24	15	5	8

**PROFESSIONAL ELECTIVE-I**

1. CCA 509 Theory of Computation
2. CCA 511 Computer Based Numerical & Statistical Techniques
3. CCA 511 A Introduction to Numerical Methods
4. CCA 511 B Statistical Methods for Data Analysis
5. CCA 511 C Linear Algebra and Matrix Computations
6. CCA 511 D Regression Analysis and Modeling
7. CCA 513 Introduction to Programming and Computer Organization

**IV semester**

Code	Course Title	Cr.	L	T	P
CCA 502	Network Security & Cryptography	4	3	1	0
CCA 504	Compiler Design	4	3	1	0
CCA 506 CCA 506 A CCA 506 B CCA 506 C CCA 506 D	Knowledge Management & Expert System Information Systems Management Enterprise Resource Planning Information Security Management Business Process Management	4	3	1	0
CCA XXX	PROFESSIONAL ELECTIVE-II	4	3	1	0
UCA XXX	OPEN ELECTIVE-I	4	3	1	0
CCA 552	Network Security & Cryptography Lab	2	0	0	4
CCA 554	Compiler Design Lab	2	0	0	4
	Total	24	15	5	8

**PROFESSIONAL ELECTIVE-II**



1. CCA 508      System Programming
2. CCA 510      Mobile Computing
3. CCA 512      Computer Graphics

**OPEN ELECTIVE-I**

1. UCA 502      Computing & Its Application
2. UCA 504      Management Information System
3. UCA 506      Software Project Management

# Shobhit University, Gangoh (Saharanpur)

## Teaching Scheme

Effective from 2013

### MCA

#### V semester

Code		Cr.	L	T	P
CCA 601	Advanced DBMS	4	3	1	0
CCA 603	Advanced DAA	4	3	1	0
CCA 605	Expert Intelligence System	4			
CCA 605A	Introduction to Expert Systems				
CCA 605B	Knowledge Representation and Reasoning		3	1	0
CCA 605C	Expert System Design and Development				
CCA 605D	Applications of Expert Systems in Industry				
CCA XXX	PROFESSIONAL ELECTIVE-III	4	3	1	0
UCA XXX	OPEN ELECTIVE-II	4	3	1	0
CCA 651	Advanced DBMS	1	0	0	2
CCA 653	Advanced DAA	1	0	0	2
CCA 655	Minor Project	2	0	0	4
	Total	24	15	5	8

#### PROFESSIONAL ELECTIVE-III

1. CCA 607      Distributed OS
2. CCA 609      Multimedia Computing
3. CCA 611      Pattern Recognition

#### OPEN ELECTIVE-II

1. UCA 601      Neural Network
2. UCA 603      Client-Server Computing
3. UCA 603      Advanced Computer System Architecture

#### VI semester

Code		Cr.	L	T	P
CCA 602	Dissertation	16	0	0	32
CCA 604	Seminar and Progress Reports      -	8	0	0	16
		24	0	0	48

# DATA COMMUNICATIONS AND NETWORKING

CCA-505

Cr. L T P  
4 3 1 0

## Unit - I

**Transmission Technology:** Frequency, Spectrum, Bandwidth, Time Domain Concept, Frequency Domain Concept, Data & Signals i.e. Analog Signal, Digital Signal, Analog Data, Digital Data. Signal Strength, Decibals, Decibal-watt, Decibal-milivolt.

**Relationship between data rate & Bandwidth:** Nyquist Theorem & Shannon's Theorem, Bit Rate & Baud Rate.

## Unit- II

**Transmission Impairments:** Attenuation & Attenuation Distortion, Delay Distortion, Noise, SNR, Thermal Noise, Inter modulation Noise, Cross Talk, Impulse Noise.

**Transmission Media:** Basic idea of electromagnetic spectrum, Guided Transmission Media (UTP, STP, COAX, Optical Fiber), Unguided Transmission Media (Wireless Transmission, Microwave Transmission, Infrared Transmission).

## Unit - III

**Communication System:** Communication System Model, Data Communication Model.

**Amplitude Modulation Theory:** Mathematical Representation of AM, Frequency Spectrum of AM waves, Power relations in AM wave.

**Frequency and Phase Modulation Theory:** Mathematical Representation of FM, Frequency Spectrum of FM waves, Phase Modulation, Effect of Noise in Frequency Modulation.

## Unit - IV

**Signal Encoding Techniques:** Transferring Analog Signals into a Digital form i.e. PCM, Delta Modulation (DM), Digital Signal encoding Techniques: NRZ-L, NRZI, MultiLevel, Binary (Bipolar-AMI, Pseudoternary) Biphasic (Manchester code & Differential Manchester code)

**Encoding or Modulation Technique** for Transforming Digital data into Analog Signals: ASK, FSK, PSK, BPSK and QPSK.

## Unit - V

**Data Communication Technologies:** Asynchronous and Synchronous Transmission, Line Configurations: Point-to-Point, Multipoint, Simplex, Half Duplex and full duplex Transmission.

**Multiplexing:** FDM, TDM, Synchronous TDM, Statistical – TDM.

**Circuit Switching Networks:** Switching Concepts, Space division switching, Time division switching, Control Signaling (Inbound & outbound), Common channel Signaling.

**Packet Switching Networks:** Packet Switching Principles, Datagram packet switching & Virtual circuit packet switching, Frame Relay.

**Interfacing:** RS-232C, X.25, X.21, V.21 & V.28.

**Computer Network:** Goals and uses of Network, LAN, MAN, WAN, Network architecture & layering, OSI model and design Issues of Layers.

**References Books:**

1. William Stallings, "*Data and Computer Communications*", Pearson Education, Eighth Edition, Fourth Impression, 2009.
  2. Behrouz A. Forouzan, "*Data Communications and Networking*", Tata McGraw-Hill Publishing Company Limited, New Delhi, Fourth Edition, Special Indian Edition, Eleventh Reprint, 2008.
  3. George Kennedy, "*Electronic Communication Systems*", Tata McGraw-Hill, Fourth Edition, 35<sup>th</sup> Reprint, 2008.
- G.K. Mithal, "*Radio Engineering*", Khanna Publisher, 4<sup>th</sup> Edition, 2006

# JAVA PROGRAMMING

CCA-503

Cr. L T P  
4 3 1 0

## Unit – I

Introduction to Java: Importance and features of Java, Keywords, constants, variables and Data Types, Operators and Expressions, Decision Making, Branching and Looping: if..else, switch,?: operator, while, do, for statements, labeled loops, jump statements: break, continue, return. Introducing classes, objects and methods: defining a class, adding variables and methods, creating objects, constructors, class inheritance.

Arrays and String: Creating an array, one and two dimensional arrays, string array and methods, Classes: String and String Buffer classes, Wrapper classes: Basics types, using super, Multilevel hierarchy abstract and final classes, Object class, Packages and interfaces, Access protection, Extending Interfaces, packages.

## Unit – II

Exception Handling: Fundamentals exception types, uncaught exceptions, throw, throw, final, built in exception, creating your own exceptions, Multithreaded Programming: Fundamentals, Java thread model: priorities, synchronization, messaging, thread classes, Run able interface, inter thread Communication, suspending, resuming and stopping threads.

## Unit-III

Input/Output Programming: Basics, Streams, Byte and Character Stream, predefined streams, Reading and writing from console and files. . Networking: Basics, networking classes and interfaces, using java.net package, doing TCP/IP and Data-gram Programming

## Unit – IV

The Collection Framework: collection interfaces, collection classes(ArrayList, LinkedList, Hash set), Accessing a Collection via an Iterator, Vector, More utility class: StringTokenizer, Date.

## Unit – V

Event Handling: Different Mechanism, the Delegation Event Model, Event Classes, Listener Interfaces, Adapter and Inner Classes, Working with windows, Graphics and Text, using AWT controls, Layout managers and menus, Java Applet. Beans: Introduction to Java Beans and Swings, Servlets

## Reference Books:

1. Patrick Naughton and Herbertz Schildt, “*Java-2 the Complete Reference*”, TMH, 7<sup>th</sup> Edition, 2006.
2. E. Balaguruswamy, “*Programming with Java: A Primer*”, TMH, First Reprint, 2007.
3. Horstmann, “*Computing Concepts with Java 2 Essentials*”, John Wiley and sons inc, Third Edition, 2003.
4. Kathy Sierra, “*Head First Java*”, O’Rielly, Second Edition, February 2005.

# THEORY OF COMPUTATION

CCA-505

L T P Cr

3 1 0 4

## UNIT I:

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

## UNIT II:

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA, Pumping lemma.

## UNIT III:

Context Free Languages – Leftmost and rightmost derivation, parsing and ambiguity, ambiguity in grammar and languages, normal forms

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF.

## UNIT IV:

Pushdown Automata – NDPDA, DPDA, context free languages and PDA, comparison of deterministic and non-deterministic versions, closure properties, pumping lemma for CFL, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

## UNIT V:

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Decidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory, Chomsky Hierarchy

## Textbooks:

1. An Introduction to Formal Languages and Automata, by Peter Linz, Third Edition, Narosa Publishers (1998)
2. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
3. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
4. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
5. Y.N.Singh "Mathematical Foundation of Computer Science", New Age International.
6. Papadimitriou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI Learning Private Limited, Delhi India.
7. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation, Pearson Education.
8. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd

# C# PROGRAMMING

CCA-507

Cr. L T P  
4 3 1 0

## UNIT - I

**The CLR and .NET Framework:** Understand the motivation behind the .NET platform, Common Language Infrastructure (CLI). Know the role of the Common Type System (CTS), the Common Language Specification (CLS) and the Common Language Runtime (CLR), Understand the assembly, metadata, namespace, type distinction, Contrast single-file and multi-file assemblies, Know the role of the Common Intermediate Language (CIL), Platform independent .NET(Mono / Portable .NET distributions).

## UNIT - II

**Evolution of C# Language:** Language Fundamentals, Reference and value Types, primitive types the Nullable and enum types, Classes and objects, Defining classes Creating objects, Using static members, Garbage Collector, Overloading Methods, Various Constructors. Encapsulating data, access modifiers, properties, indexers arrays and readonly fields. Handling errors and throwing exceptions The Root object class. Inheritance and polymorphism specialization and generalization, Abstract classes, nesting of classes. Structures. String and DateTime classes.

## UNIT - III

**Event handling paradigm** Delegates and events. Anonymous delegates and lambda expression FUNC and Action delegates.

**Generics Collections** Interfaces, overriding interface implementation. Explicit interface implementation. Collection, IEnumerable, IEnumerator, IList, IComparer and their Generic equivalent. Working with generic List, Stack, Dictionary and Queue.

**Programming Window Forms Applications:**The notifies - subscribers paradigm for handling events. .NET framework for handling GUI events. Introduction to WPF and building an WPF application **UNIT - IV Introducing LINQ and XML:** XML A quick introduction. LINQ and C#. Defining and executing a Query. Implicitly typed local variables. Anonymous Types, Extension Methods and Lambda Expressions. Putting LINQ to work. LINQ to SQL Fundamentals of ADO.NET Updating retrieving and deleting data using LINQ to SQL. **TEXT BOOKS:**

1. Jesse Liberty and Donald Xie , “Programming C# 3.0”, O’REILLY.
2. J.G.R. Sathiaselan, N Sasikaladevi, “Programming with C# .net”, PHI, 2009.
3. Paul J. Deitel, Harvey Deitel, “C# 2008 for Programmers”, Pearson, 3<sup>rd</sup> Ed., 2010.
4. Joseph Albahari and Ben Albhari, “C# 3.0/4.0 in NUTSHELL”, O’REILLY.

**REFERENCES:**

1. Stephen C. Perry, AtulKahate, Stephen Walther, Joseph Mayo, “Essential of .net and Related Technologies with a focus on C#, XML, ASP.net and ADO.net”, Pearson, 2<sup>nd</sup> Ed. 2009.
2. Jon Skeet, “C# in Depth ”, O’REILLY



# ADVANCE OPERATING SYSTEM

CCA-509

Cr. L T P  
4 3 1 0

## Unit-I

Introduction: Definition of operating systems, Operating System Design Issues, types of operating systems, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services.

Process Management: Process concept, Process scheduling, Cooperating processes, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.

## Unit-II

Process Synchronization and Deadlocks: The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

## Unit-III

Storage management: Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation.

## Unit-IV

File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.

## Unit-V

Security & Case Study: Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption. Case Study: Linux.

## References Books:

1. Abraham Siberschatz and Peter Baer Galvin, "*Operating System Concepts*", Addison-Wesley, 8<sup>th</sup> edition, 2009.
2. Milan Milenkovic, "*Operating Systems, Concepts and Design*", McGraw-Hill Fifth Edition, 2000.
3. Richard Peterson, "*Linux: The Complete Reference*", McGraw-Hill, sixth edition, 2007.
4. Harvey M Deital, "*Operating Systems*", Addison-Wesley Pub. Co., Second Edition, 2007.

# NETWORK SECURITY & CRYPTOGRAPHY

CCA-502

Cr L-T-P

4 3-1-0

## Unit - I

**Introduction to the Concept of Security:** Introduction to Computer Security, Network Security, Cryptology & Cryptography, Introduction to Security attacks, Services and Mechanism. **Symmetric Key Encipherment:** Conventional encryption Model, Classical encryption techniques substitution ciphers & transposition ciphers, Cryptanalysis, Stereography, Stream & Block Ciphers

## Unit - II

**Block Ciphers:** Block Cipher Principals, Shannon's Theory of Confusion and Diffusion, Fiestal structure, DES, Strength of DES, Differential & Linear Cryptanalysis of DES, Block Cipher Modes of operation, Triple DES, IDEA encryption & Decryption, Strength of IDEA, Confidentiality using Conventional Encryption, Traffic confidentiality, key distribution, random number generation

## Unit - III

**Mathematics of Cryptography:** Introduction to Graph, Ring and Field, Prime and relative prime numbers, Modular Arithmetic, Fermat's & Euler's Theorem, Primality Testing, Euclid's Algorithm, Chinese remainder theorem, Discrete logarithms. **Asymmetric Key Encipherment:** Principals of public key cryptosystems, RSA Algorithms, Security of RSA, key management, Diffie- Hellman key exchange algorithm.

## Unit - IV

**Integrity, Authentication & Hash Function:** Authentication requirements, Authentication functions, Message Authentication Codes. Hash functions, Birthday Attacks, Security of Hash function & MAC, MD5 Message Digest Algorithm, Secure Hash Algorithm. **Digital Signatures:** Digital Signature, Authentication Protocol, DSS, Proof of Digital Signature Algorithms.

## Unit - V

**Network Security Applications: Authentication Applications:** Kerberos & X.509, Directory Authentication Services **E-Mail Security:** PGP, S/MIME. **IP Security:** Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, key management. **Web Security:** Secure Socket Layer & Transport Layer Security , Secure electronic Transaction, **System Security:** Intruder, Intrusion Detection, Password Management. **Malicious Software:** Viruses and related threads. **Firewall:** Firewall design principles, trusted Systems

## Reference Books:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education, 5<sup>th</sup> edition, First impression 2011.
2. Forouzan A. Behrouz, "Cryptography and Network Security", Tata McGraw Hill , 2<sup>nd</sup> Edition, 2008.
3. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill, 2<sup>nd</sup> Edition, 2006

# SYSTEM PROGRAMMING

CCA-504

Cr L-T-P

4 3-1-0

## Unit - I

Introduction To PC Architecture (Intel Pentium, PC Hardware, segments and addressing, Registers, Assembly Language Basics, Machine Addressing, special DEBUG features, Data Definition Directives, Addressing Formats, COM Programs.

## Unit - II

Program Logic And Control Jmp, Loop and conditional jump Instructions, Boolean operations, Shifting, Rotating, Keyboard And Screen Processing, String Operations, Arithmetic Operations and Table Processing, Searching, sorting.

## Unit - III

Macro Working and Linking, Macro Definition, The LOCAL Directive, Reception Directives, Conditional Directives, Intra-segment and Inter-segment calls, passing parameters, Advanced Screen and Keyboard Processing, BIOS Interrupt 16H for Keyboard input, Extended Function Keys.

## Unit - IV

Disk Processing Disk Organization, File allocation Table, File Control Block, Sequential Reading of a Disk File, Random Processing, Miscellaneous disk Processing Features, File Handlers and Extended DOS functions, BIOS Disk Operations, Dos Memory Management, Program Segment Prefix, DOS Memory Control, Program loader, program overlays, Resident programs.

## Unit - V

Assemblers And Macroprocessor, Design of Assembler, Data Structure, format of Databases, Algorithm, Macro instructions, Features of a macro facility, Atwopass algorithm and a single pass algorithm. LOADERS, Compile-and-go Loaders, General Loader Schemes, Absolute Relocating and Direct-Linking loaders.

## Reference Books:

1. Peter Abel, "*IBM PC Assembly Language and Programming*", Pearson Education, 5<sup>th</sup> Edition, 2009.
2. John J. Donovan, "*Systems Programming*", Tata McGraw-Hill, Fourth Edition, 6<sup>th</sup> reprint, 2009.
3. Leland L. Beck, D. Manjula, "*System Software - An Introduction to System Programming*", Pearson Education, 3<sup>rd</sup> Edition, 2009.
4. D. M. Dhamdhare, "*System Programming and Operating Systems*", Tata McGraw-Hill, 2nd Edition, 2008.

# COMPUTING AND ITS APPLICATION

CCA-506

Cr L-T-P  
4 3-1-0

## Unit - I

Introduction to soft computing, Aims of soft computing, Constituents of Soft Computing, Their Strengths and Weaknesses, Synergy of soft computing techniques.

## Unit – II

Artificial Neural Network, Goals of Artificial Neural Network, Theoretical Properties of Artificial Neural Network, Applications of Artificial Neural Network.

## Unit – III

Introduction to Genetic Algorithm, Optimization Problems, Genetic Operators, Crossover, Mutation, Comparison with other Optimization Techniques, Limitations of Genetic Algorithm.

## Unit – IV

Machine Learning: Types of Problem and Tasks, Supervised Learning, Unsupervised Learning, Reinforcement Learning.

## Unit-V

Introduction to fuzzy logic, Applying truth Variables, Linguistic Variables, Hard science with IF-THEN rules.

## Reference Books:

1. "Introduction to the Theory of Neural Computation", Hertz J. Krogh, R.G. Palmer, Addison-Wesley, California.
2. "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey, .
3. "Neural Networks: Algorithms, Applications and Programming Techniques", Freeman J.A. & D.M. Skapura, AddisonWesley, Reading, Mass.

# KNOWLEDGE MANAGEMENT & EXPERT SYSTEM

CCA-508

Cr. L T P

4 3 10

## Unit - I

Introduction to knowledge Management Distinction between data , information & knowledge. Concept of knowledge creation, Intellectual Capital Creation, Human Capital, Customer Capital and Organizational Capital

## Unit-II

Socio-cultural aspects & organizational aspects Tacit & Explicit knowledge & Knowledge Organization . Knowledge Storage and Distribution, KM tools, Data warehouse, Data mining, knowledge management evaluation & Valuation of Knowledge.

## Unit-III

K- Sharing Practices and Barriers. K – culture, KM In Indian organizations and MNC. Learning Organizations & Organizational Learning

## Unit – IV

**Expert System** Existing Expert Systems (DENDRAL, MYCIN), Architecture of expert system, Features of Expert system, Genetic algorithm, Fuzzy logic, Neural Networks, Intelligent Agents, Meta Knowledge, Expertise Transfer, Self Explaining System, User and expert systems.

## Unit-V

K-Initiative, K-Strategic issues in knowledge management, K-Commerce

## Reference Books:

1. SudhirWarrier, “*Knowledge Management*”, Vikas publishing House, New Delhi, First edition, 2007.
2. Thotharti Raman, “*Knowledge Management*”, Excel Books ,New Delhi, First Edition,2004.
3. Stuart Barnes “*Knowledge Management Systems: Theory & Practice*”, Thomson Learning Press, New Delhi, First Edition, 2002.
4. Ronald Maier, “*Knowledge Management System*”, Springer, Germany, Second Edition,2002.
5. AmritTiwana, “*Knowledge Management Tool Kit*”, Pearson Education, New Delhi, First Edition, 2002.

# COMPILER DESIGN

CCA-510

Cr L-T-P

4 3-1-0

## Unit - I

Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler, Lexical Analysis: The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Regular Expressions, Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical Analyzer Generator: LEX, Capabilities of Lexical Analyzer, The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG

## Unit - II

Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Bottom-up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers SLR, Canonical LR, LALR), Syntax Analyzer Generator: YACC, Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition. Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic Expressions, procedure calls, case statements, postfix translation.

## Unit - III

Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation Schemes, Symbol Table management

## Unit - IV

Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

## Unit - V

Code Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Order of evaluation, Register allocation and code selection

## Reference Books:

1. Alfred V. Aho, Jeffrey D. Ullman, "*Principles of Compiler Design*", Narosa Publication, 2002
2. A.V. Aho, R. Sethi and J.D Ullman, "*Compiler: principle, Techniques and Tools*", Addison Wesley, 2<sup>nd</sup> Edition, 2006.
3. H.C. Holub, "*Compiler Design in C*", Prentice Hall Inc, Second Edition, Digitized Edition, 2010.
4. O.G. Kakde, "*Compiler Design*", Laxmi Publication, Seventh Edition, 2007.

## ADVANCED DBMS

CCA-601

Cr. L T P

4 3 10

### Unit 1:

Introduction: Basic Concepts, Records and Files, Abstraction and Data Integration, Three-Level Architecture Proposal for DBMS, Components of a DBMS, Advantages and Disadvantages of a DBMS. Data Associations, Data Models. Classification: Relational Data Model, Network Data Model, Hierarchical Model. Manipulation, Updates, Implementation of data models, ER Diagrams. Relational Model: Relational Database, Relational Algebra, Relational Calculus. Relational Database Design, Relational Scheme and Relational Design.

### Unit 2:

Anomalies in a Database: A Consequence of Bad Design, Universal Relation, Functional Dependency, Relational Database Design. Relational Database Manipulation, SQL, Data Manipulation, Basic Data Retrieval, Condition Specification, Arithmetic and Aggregate Operators. Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, and other higher normal forms.

### Unit 3:

SQL Join: Multiple Tables Queries, Set Manipulation, Categorization, Updates, Views. SQL Programming: Procedures, Cursors, Triggers. Concurrency Management, Serializability, Concurrency Control, Locking Scheme, Timestamp- Based Order, Optimistic Scheduling, Multiversion Techniques, Deadlock and Its Resolution. Database Security, Integrity, and Control, Security and Integrity, Threats, Defense Mechanisms, Integrity.

### Unit 4:

Introduction to DDBMS: Fundamentals of DDBMS (Transparent management of distributed & replicated data, Reliability, Improved performance, System expansion), Types of DDBMS. Overview of three-tier Client server architecture.

### Unit 5:

Data Fragmentation, Replication and allocation techniques for distributed database design. Query processing, concurrency control and recovery in DDBMS.

**Text Books:**

1. Desai, B., —An Introduction To Database Concepts, Galgotia Publications, New Delhi.
2. Elimsari And Navathe, —Fundamentals of Database Systems, Addison Wesley, New York.

**Reference Books:**

1. Date C.J., —An Introduction to Database Systems, Narosa Publishing House, New Delhi.
2. Ullman, J.D, —Principals of Database Systems, Galgotia Publications, New Delhi.
3. M. Tamer Ozsu& Patrick Valduriez, —Principles of Distributed Database Systemsll, Pearson Education Asia.



## ADVANCE DAA

CCA-603

Cr. L T P  
4 3 1 0

### Unit-I

**Introduction to Algorithms** Analysis of algorithm, Design of algorithm, complexity of algorithm, asymptotic notations, Recurrences. Sorting in polynomial time: Insertion sort, Merge sort, Quick sort, heap sort. Sorting in linear time: counting sort, bucket sort, radix sort. Medians and order statistics.

### Unit-II

**Elementary data structure** binary search tree. **Advanced data structure** Red Black tree, Augmenting data structure, binomial heaps, B-tree, Fibonacci heap and data structure for disjoint sets.

### Unit-III

**Advanced design and analysis techniques** Dynamic programming, Greedy algorithm, Backtracking, Amortized analysis.

### Unit-IV

**Graph algorithm** Breadth first search, Depth first search, Minimum spanning tree, Kruskal's algorithms, Prim's algorithms, Single source shortest path, All pair shortest path, Maximum flow and Traveling salesman problem.

### Unit-V

**String matching:** The naïve String Matching algorithm, The Rabin-Karp Algorithm, String Matching with finite automata, The Knuth-Morris Pratt algorithm. Randomized algorithms, string matching, NP-hard and NP-completeness, Approximation algorithms.

### References Books :

- 4 Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, *Introduction to Algorithm*, Tata Mc-Graw Hill, 2<sup>nd</sup> Edition, 2003.
- 5 Horowitz Sahani, *Fundamentals of Computers Algorithm*, Goltotia Publications, 1998.
3. Parag H. Dave, Himanshu B. Dave, *Design and Analysis of Algorithms*, Pearson Education, 2008.

# EXPERT INTELLIGENCE SYSTEM

CCA-605

Cr. L-T-P  
4 3-1-0

## Unit - I

**Introduction:** Introduction to Artificial Intelligence, History, What is AI, Importance of AI, Issues, Simulation of sophisticated & Intelligent Behaviors in different area, problem solving in games, natural language, automated reasoning, visual perception, Search algorithms: Informed search, Uninformed search, Hill Climbing, Depth first search, Best first search, And or graph.

## Unit - II

**Processing and understanding Natural Languages:** Understanding Natural Languages: Applications of Natural Languages, Natural Language processing, Parsing techniques: Rules of parsing, Top down parsing, Bottom up parsing, Transformational grammars, Context free grammar, Transition networks, Fillmore's grammars, Shanks Conceptual Dependency.

## Unit - III

**Knowledge Representation:** Graphs, Frames structures and related structures, Semantic Nets and Partitioned Nets, Scripts, Introduction to PROLOG, Production Rules, Knowledge Based systems, Inference engine, Forward deductions and backward deductions, Matching production rules against working memory.

## Unit - IV

**Expert System** Existing Expert Systems (DENDRAL, MYCIN), Architecture of expert system, Features of Expert system, Genetic algorithm, Fuzzy logic, Neural Networks, Intelligent Agents, Meta Knowledge, Expertise Transfer, Self Explaining System, User and expert systems.

## Unit - V

**Pattern Recognition** Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine perception, Line Finding, Interception, Semantic & Model, Object Identification, Speech Recognition. **Programming Language** Introduction to programming Language, LISP, PROLOG.

## Reference Books :

1. Char Nick, "Introduction to Artificial Intelligence", Addison Wesley, 2007.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach.", Prentice Hall, Third Edition, 2010.
3. Elaine Rich, Kevin Knight and Shivashankar B.Nair, "Artificial Intelligence", Tata McGraw-Hill, Third edition, 2009.
4. Patrick Henry Winston and Berthold Horn, "LISP", Addison Wesley, Third Edition, 2010.
5. Marcellous, "Expert Systems Programming", Prentice Hall Inc., Third Edition, 2009.
6. Elamie, "Artificial Intelligence", Academic Press, Third Edition, 2007.
7. Dan W. Patterson, "Artificial Intelligence and Expert Systems", PHI Learning Private Limited, Third Edition, 2009.

## DISTRIBUTED OS

CCA-607

Cr. L T P

4 3 10

### UNIT I:

Introduction: Distributed Computing Models, Software Concepts, Hardware Concepts, The Client-Server model, Issues in design of a distributed operating system.

### UNIT II:

COMMUNICATION: Introduction to Message Passing, Advantages and features of message passing, Message format, Message Buffering, Remote Procedure Call, Extended RPC Models, Remote Object Invocation, Message Oriented Communication.

### UNIT III:

Processes And Synchronization: Threads, code migration, clock synchronization, logical clocks, global state, Election algorithms, mutual exclusion, Distributed transaction.

### UNIT IV:

Distributed Deadlock Detection: System model, Resources vs. communication deadlocks, deadlock prevention, avoidance, detection and resolution, Centralized deadlock detection, distributed deadlock detection, path pushing and edge chasing algorithm

UNIT V: Distributed Shared Memory: Introduction, General architecture of distributed shared memory, Design and implementation, Issues of DSM, Granularity, structure of shared memory space, consistency models, thrashing, advantages of DSM

UNIT VI: Distributed File System: Introduction, Desirable features of good distributed file system, file models, file accessing, sharing, caching methods, file replication, fault tolerance, Case Study: CORBA (CORBA RMI and Services)

Text Books:

1 Andrew Tanenbaum, Maarten Van Steen, "Distributed System-Principals Paradigm", PHI Publication.

2 Singhal and Shivratri, "Advanced Concept in Operating Systems", McGraw Hill.

# NEURAL NETWORK

UCA 601

Cr. L T P

4 3 10

## UNIT – I INTRODUCTION TO NEURAL NETWORKS

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

## UNIT – II ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

## UNIT – III SINGLE LAYER FEED FORWARD NETWORKS

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

## UNIT – IV MULTI- LAYER FEED FORWARD NETWORKS

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

## UNIT - V ASSOCIATIVE MEMORIES

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis. Neural network applications: Process identification, control, fault diagnosis.

## REFERENCES

1. Laurene Fausett, "Fundamentals of Neural Networks" , Pearson Education, 2004..
2. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003.
3. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TATA Mc Graw Hill, 2006.
4. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004.
4. Timothy J. Ross, " Fuzzy Logic With Engineering Applications", Tata McGraw- Hill Inc. 2000

# Mobile Computing

CCA 51

Cr. L T P

4 3 1 0

## Unit 1: Introduction to Mobile Computing

This unit covers the fundamentals of mobile computing, including its evolution, definitions, and scope. It explores mobile computing applications and the types of mobile computing devices. The unit discusses various architectures, such as client-server and peer-to-peer, and introduces mobile communication protocols.

## Unit 2: Mobile Communications and Networking

This unit delves into wireless communication systems, including cellular networks, satellite communication, and Wi-Fi. Topics include GSM, GPRS, and 3G/4G/LTE standards, as well as mobile IP and TCP. The unit also explores challenges in mobile network design, including handoff, roaming, and network congestion.

## Unit 3: Mobile Application Development

This unit introduces mobile application platforms and development environments. Key topics include the mobile app lifecycle, app architecture, and mobile UI design principles. The unit provides an overview of Android and iOS app development, covering essential concepts like user interaction, activity lifecycle, and data persistence.

## Unit 4: Mobile Operating Systems

This unit focuses on mobile operating systems such as Android, iOS, and Windows Phone. It explores system architecture, file systems, security, and app management. The unit examines the unique requirements of mobile OS design, including power management, multitasking, and security protocols.

## Unit 5: Data Management in Mobile Computing

This unit addresses data storage, retrieval, and synchronization in mobile environments. Topics include cloud storage solutions, mobile database systems, and synchronization mechanisms. The unit explores data consistency, offline access, and techniques for data optimization in mobile applications.

# Computer Graphics

CCA 512

Cr. L T P

4 3 10

## Unit 1: Introduction to Computer Graphics

This unit introduces the fundamentals of computer graphics, including its applications, history, and essential terminology. It covers basic concepts such as graphics hardware, display devices, and coordinate systems, along with an overview of graphics software.

## Unit 2: Graphics Primitives and Drawing Algorithms

This unit explores fundamental graphics primitives, such as points, lines, and circles, and their role in rendering images. It includes algorithms for line drawing (e.g., DDA and Bresenham's algorithms) and circle drawing, as well as polygon filling methods like scanline fill and boundary fill.

## Unit 3: 2D Transformations and Viewing

This unit covers the mathematical foundations of 2D transformations, including translation, rotation, scaling, and shearing. It discusses matrix representations of transformations, homogeneous coordinates, and composite transformations. Topics also include windowing, viewport transformations, and clipping algorithms like Cohen-Sutherland and Liang-Barsky.

## Unit 4: 3D Transformations and Viewing

Building on 2D concepts, this unit introduces 3D transformations, including 3D rotation, translation, scaling, and projection transformations. It covers the 3D viewing pipeline, perspective and parallel projections, and transformations for viewing in three-dimensional space.

## Unit 5: Illumination, Shading, and Color Models

This unit delves into the principles of light, color, and shading in computer graphics. It covers color models like RGB, CMYK, and HSV, as well as illumination models and shading techniques, including flat shading, Gouraud shading, and Phong shading.

# Computer Based Numerical & Statistical Techniques

CCA 511

Cr. L T P

4 3 1 0

## Unit 1: Introduction to Numerical Methods

This unit covers the basics of numerical methods, including error analysis, sources of error, and types of errors such as absolute, relative, and percentage errors. Concepts of numerical stability, convergence, and significant figures are discussed, setting a foundation for solving computational problems accurately.

## Unit 2: Solution of Nonlinear Equations

This unit focuses on methods for finding roots of nonlinear equations, including iterative techniques like the bisection method, Newton-Raphson method, and secant method. Criteria for convergence, applications of root-finding methods, and considerations for choosing appropriate techniques are explored.

## Unit 3: Interpolation and Curve Fitting

This unit delves into interpolation methods for estimating values within a given data set. Polynomial interpolation techniques, such as Newton's and Lagrange's interpolation, are introduced alongside spline interpolation. Curve fitting using least squares regression is also covered, highlighting applications in data analysis.

## Unit 4: Numerical Differentiation and Integration

This unit introduces methods for numerical differentiation and integration, including finite differences, trapezoidal rule, and Simpson's rule. Practical applications of these techniques in engineering and scientific calculations are covered, along with discussions on truncation and round-off errors.

## Unit 5: Statistical Methods and Probability Distributions

This unit provides an overview of statistical methods and probability distributions, covering measures of central tendency and dispersion, basic probability theory, and key distributions such as binomial, Poisson, and normal distributions. Hypothesis testing, correlation, and regression analysis are introduced, applying statistical techniques to computational data analysis.

# Introduction to Numerical Methods

CCA 511A

Cr. L T P

4 3 1 0

## Unit 1: Fundamentals of Numerical Methods

This unit introduces the basic concepts and significance of numerical methods in solving mathematical problems. It covers the types of numerical errors, including truncation and round-off errors, and discusses the importance of accuracy and precision in numerical computations. The unit also includes an overview of numerical algorithms and their applications in various fields.

## Unit 2: Solutions of Linear Equations

This unit focuses on methods for solving systems of linear equations. It covers direct methods such as Gaussian elimination and matrix factorization techniques, including LU decomposition. The unit also discusses iterative methods like Jacobi and Gauss-Seidel methods, addressing convergence criteria and practical applications of these techniques in engineering and computational problems.

## Unit 3: Interpolation and Approximation

This unit explores interpolation techniques used to estimate unknown values from known data points. It covers polynomial interpolation methods such as Lagrange and Newton's interpolation, as well as spline interpolation for piecewise approximation. The unit emphasizes error analysis in interpolation and discusses the importance of approximation in numerical analysis.

## Unit 4: Numerical Differentiation and Integration

This unit introduces techniques for numerical differentiation and integration. It covers finite difference methods for approximating derivatives and various numerical integration methods, including the trapezoidal rule and Simpson's rule. The unit also discusses the concepts of error estimation in numerical integration and the applications of these methods in solving real-world problems.

## Unit 5: Ordinary Differential Equations

This unit focuses on numerical methods for solving ordinary differential equations (ODEs). It covers initial value problems and discusses methods such as Euler's method, Runge-Kutta methods, and multi-step methods. The unit emphasizes stability, convergence, and error analysis.



in the context of ODEs, providing insights into the practical applications of these techniques in modeling dynamic systems.

## **Statistical Methods for Data Analysis**

**CCA 511B**

**Cr. L T P**

4 3 1 0

### **Unit 1: Introduction to Statistics and Data Exploration**

This unit introduces the fundamental concepts of statistics, including types of data, data collection methods, and descriptive statistics. It covers measures of central tendency such as mean, median, and mode, as well as measures of dispersion like range, variance, and standard deviation. The unit emphasizes data visualization techniques, including histograms, box plots, and scatter plots, to aid in exploratory data analysis.

### **Unit 2: Probability Theory and Distributions**

This unit focuses on the foundational principles of probability theory and its role in statistical analysis. It covers concepts such as probability rules, conditional probability, and Bayes' theorem. The unit also introduces discrete and continuous probability distributions, including the binomial, Poisson, normal, and exponential distributions. Applications of these distributions in real-world scenarios are discussed to illustrate their relevance.

### **Unit 3: Inferential Statistics and Hypothesis Testing**

This unit explores the principles of inferential statistics, including estimation, confidence intervals, and hypothesis testing. It covers the formulation of null and alternative hypotheses, types of errors, and significance levels. Various hypothesis tests, such as t-tests, chi-square tests, and ANOVA, are introduced, along with their applications in comparing groups and making inferences from sample data.

### **Unit 4: Regression Analysis**

This unit delves into regression analysis, focusing on simple linear regression and multiple regression techniques. It covers the principles of modeling relationships between variables, estimating parameters, and assessing model fit using R-squared and residual analysis. The unit also discusses assumptions of regression analysis and introduces logistic regression for binary outcomes, highlighting applications in predictive modeling.

### **Unit 5: Advanced Statistical Methods**

This unit covers advanced statistical techniques used for data analysis, including non-parametric tests, time series analysis, and multivariate analysis. It introduces methods such as Kruskal-

Wallis test, Mann-Whitney U test, and principal component analysis (PCA). The unit emphasizes the application of these advanced techniques in complex data scenarios and discusses the interpretation of results to inform decision-making.

## **Linear Algebra and Matrix Computations**

**CCA 511C**

**Cr. L T P**

**4 3 1 0**

### **Unit 1: Introduction to Linear Algebra**

This unit covers the fundamental concepts of linear algebra, including the definition and properties of vectors and matrices. It introduces operations such as addition, scalar multiplication, and matrix multiplication. The unit also discusses special types of matrices, such as square, diagonal, and identity matrices, and emphasizes the importance of linear combinations and span in vector spaces.

### **Unit 2: Systems of Linear Equations**

This unit focuses on methods for solving systems of linear equations, including Gaussian elimination and matrix inversion techniques. It covers the concepts of consistency and uniqueness of solutions and introduces the rank of a matrix and its implications for the solution of linear systems. The unit also discusses applications of linear systems in various fields, such as engineering and computer science.

### **Unit 3: Determinants and Eigenvalues**

This unit explores determinants and their properties, including methods for calculating determinants and applications in solving linear equations. The unit introduces eigenvalues and eigenvectors, discussing their significance in linear transformations and matrix diagonalization. It also covers the characteristic polynomial and the spectral theorem, emphasizing their applications in data analysis and system stability.

### **Unit 4: Vector Spaces and Linear Transformations**

This unit delves into the concepts of vector spaces, subspaces, and bases. It introduces linear transformations, including their properties and representations using matrices. The unit discusses the relationship between linear transformations and matrix multiplication, as well as concepts of the kernel and image of a transformation. Applications of vector spaces in various domains, such as computer graphics and optimization, are also highlighted.

### **Unit 5: Numerical Methods in Linear Algebra**

This unit focuses on numerical techniques for performing matrix computations, including methods for solving linear systems, eigenvalue problems, and matrix factorizations such as LU and QR decompositions. It covers the concepts of numerical stability and conditioning, as well as iterative methods for large systems. The unit emphasizes the practical implementation of these methods using computational tools and libraries.

## **Regression Analysis and Modeling**

**CCA 511C**

**Cr. L T P**

**4 3 10**

### **Unit 1: Introduction to Regression Analysis**

This unit introduces the fundamental concepts of regression analysis, including its purpose and applications in statistical modeling. It covers the basic terminology and principles of simple linear regression, focusing on the relationship between dependent and independent variables. The unit discusses the interpretation of regression coefficients, goodness-of-fit measures, and the assumptions underlying linear regression models.

### **Unit 2: Multiple Regression Analysis**

This unit expands on simple linear regression to explore multiple regression analysis. It covers the formulation of the multiple regression model, including interactions and polynomial terms. The unit discusses techniques for assessing model fit, including adjusted R-squared and F-tests, and examines the implications of multicollinearity. Practical considerations in model selection and evaluation, including variable selection methods, are also addressed.

### **Unit 3: Model Diagnostics and Validation**

This unit focuses on model diagnostics and validation techniques to assess the adequacy of regression models. It covers residual analysis, including checking for homoscedasticity, normality, and independence of errors. The unit discusses outlier detection and influence measures, such as Cook's distance, and emphasizes the importance of cross-validation techniques to ensure the robustness of the regression models.

### **Unit 4: Advanced Regression Techniques**

This unit explores advanced regression techniques, including logistic regression for binary outcomes and other generalized linear models. It discusses the use of regression for categorical data, including multinomial and ordinal logistic regression. The unit also introduces regularization techniques such as Lasso and Ridge regression to address overfitting and enhance model performance.

### **Unit 5: Applications of Regression Modeling**

This unit examines real-world applications of regression modeling across various fields such as economics, healthcare, and social sciences. It covers case studies and practical examples demonstrating the use of regression analysis in predictive modeling and decision-making. The unit emphasizes the interpretation of results and the communication of findings to stakeholders, highlighting the ethical considerations in data analysis and modeling.

## **Introduction to Programming and Computer Organization**

**CCA 513**

**Cr. L T P**

**4 3 10**

### **Unit 1: Introduction to Programming Concepts**

This unit covers the fundamental concepts of programming, including the basic syntax and structure of programming languages. It introduces key programming constructs such as variables, data types, operators, and control structures including conditionals and loops. The unit emphasizes problem-solving techniques and algorithm development, preparing students for writing simple programs.

### **Unit 2: Functions and Modular Programming**

This unit focuses on the concepts of functions and modular programming. It covers the definition and usage of functions, including parameters and return values. The unit discusses the importance of code reusability and organization, exploring topics such as function overloading and recursion. Practical exercises reinforce the development of modular code for solving complex problems.

### **Unit 3: Data Structures and Algorithms**

This unit introduces fundamental data structures such as arrays, linked lists, stacks, and queues. It covers the implementation and application of these data structures in programming. The unit also discusses basic algorithms, including searching and sorting techniques, emphasizing their efficiency and performance. Practical examples are used to illustrate the importance of choosing the right data structure for specific problems.

### **Unit 4: Basics of Computer Organization**

This unit provides an overview of computer organization, covering the architecture of computer systems. It discusses the components of a computer, including the CPU, memory, and input/output devices. The unit introduces concepts such as data representation, binary arithmetic, and assembly language basics. It emphasizes the relationship between hardware and software, preparing students for deeper exploration of computer systems.

### **Unit 5: Introduction to Operating Systems**

This unit introduces the fundamentals of operating systems, covering their role and functions in managing computer resources. It discusses processes, memory management, and file systems. The unit explores various operating system concepts, including multitasking, scheduling, and synchronization. Practical examples highlight the interaction between programming and operating system functionalities, preparing students for further studies in system programming.

## **Information Systems Management**

**CCA 506A**

**Cr. L T P**

**4 3 10**

### **Unit 1: Introduction to Information Systems**

This unit provides an overview of information systems and their role in organizations. It covers the types of information systems, including transaction processing systems, management information systems, and decision support systems. The unit discusses the components of information systems, including hardware, software, data, people, and processes, as well as the strategic importance of information systems in modern business.

### **Unit 2: Information Systems and Organizational Strategy**

This unit examines the role of information systems in shaping organizational strategy. It discusses how information systems support competitive advantage, streamline operations, and enable innovation. Topics include value chain analysis, strategic alignment of IT and business goals, and the role of enterprise systems in integrating business functions. Case studies are used to illustrate the strategic impact of information systems.

### **Unit 3: Managing Information Technology Infrastructure**

This unit covers the planning, development, and management of IT infrastructure within organizations. It includes an overview of hardware, software, networking, and data management. The unit discusses cloud computing, virtualization, and emerging technologies that influence IT infrastructure decisions. Key concepts in IT service management and cost management are introduced, with a focus on optimizing IT resources.

### **Unit 4: Data Management and Business Intelligence**

This unit focuses on the management of data as a critical organizational asset. Topics include database management systems, data warehousing, and data governance. The unit introduces business intelligence and analytics, discussing how data is used to support decision-making and gain insights. Topics such as big data, data mining, and predictive analytics are covered, highlighting their applications in real-world business scenarios.

### **Unit 5: Information Systems Security and Ethical Issues**

This unit addresses the importance of information systems security and ethical considerations in managing information systems. It covers topics such as cybersecurity threats, risk management, and security policies. The unit also explores privacy, data protection regulations, and ethical issues related to information systems. Case studies illustrate best practices for securing information assets and maintaining ethical standards in information systems management.

## **Enterprise Resource Planning**

**CCA 506B**

**Cr. L T P**

**4 3 10**

### **Unit 1: Introduction to ERP Systems**

This unit provides an overview of Enterprise Resource Planning (ERP) systems, their purpose, and their role in modern organizations. It covers the evolution of ERP from legacy systems, the characteristics of ERP systems, and the benefits they offer. The unit also introduces core ERP components, such as finance, human resources, manufacturing, and supply chain management, emphasizing the need for integration across business functions.

### **Unit 2: ERP and Business Process Integration**

This unit examines how ERP systems facilitate business process integration. It discusses key concepts such as business process reengineering (BPR), workflow automation, and data integration. The unit covers how ERP systems streamline processes across departments and enhance information flow, improving efficiency and decision-making. Real-world examples illustrate the transformation of business processes through ERP.

### **Unit 3: ERP Implementation Lifecycle**

This unit focuses on the ERP implementation process, including the stages of ERP lifecycle: planning, design, implementation, testing, and go-live. It discusses key factors for successful implementation, such as change management, user training, and project management. The unit also addresses common challenges in ERP implementations, such as cost overruns, resistance to change, and data migration issues.

### **Unit 4: ERP Systems and Technology**

This unit covers the technical aspects of ERP systems, including system architecture, cloud-based ERP, and ERP software modules. It introduces leading ERP software solutions, such as SAP, Oracle, and Microsoft Dynamics, and discusses criteria for selecting the right ERP system for a business. The unit also explores emerging technologies, such as artificial intelligence (AI), Internet of Things (IoT), and analytics, and their integration with ERP systems.

### **Unit 5: Post-Implementation and ERP Maintenance**

This unit addresses the post-implementation phase of ERP and focuses on system maintenance, upgrades, and performance optimization. It discusses the importance of ongoing support and user training for maintaining ERP effectiveness. The unit also covers ERP performance metrics, continuous improvement, and assessing return on investment (ROI). Case studies highlight the impact of ERP on long-term business success.

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**CCA 506C** **Information Security Management** **Cr. L T P**

**4 3 10**

**Unit 1: Introduction to Information Security**

This unit covers the fundamentals of information security, including the concepts of confidentiality, integrity, and availability (CIA triad). It introduces key terms, types of threats, and the importance of securing information assets. The unit explores the goals of information security and provides an overview of cybersecurity frameworks, such as ISO/IEC 27001 and NIST.

**Unit 2: Risk Management and Assessment**

This unit focuses on risk management principles, including risk identification, assessment, and mitigation strategies. It covers risk assessment methodologies, such as qualitative and quantitative analysis, and discusses the importance of implementing risk management practices. The unit also addresses security policies, asset classification, and strategies for managing security risks in organizations.

**Unit 3: Security Technologies and Controls**

This unit introduces various security technologies and controls used to protect information systems. Topics include firewalls, intrusion detection systems, encryption, access control, and endpoint security. The unit covers technical, administrative, and physical controls, emphasizing how they work together to secure systems. It also explores the role of identity and access management (IAM) in protecting digital resources.

**Unit 4: Security Governance, Compliance, and Legal Issues**

This unit discusses security governance frameworks, regulatory compliance requirements, and legal issues in information security. It covers standards like GDPR, HIPAA, and SOX, as well as industry-specific regulations. The unit emphasizes the importance of security policies, incident

response plans, and audit practices in maintaining compliance and addressing legal challenges in information security.

## **Unit 5: Incident Response and Business Continuity**

This unit focuses on incident response planning, disaster recovery, and business continuity management. It covers the steps involved in detecting, analyzing, and responding to security incidents, including the role of a Computer Security Incident Response Team (CSIRT). The unit also explores business continuity planning, data backup, and recovery strategies, emphasizing their importance in minimizing the impact of security incidents.

## **Business Process Management**

**CCA 506D**

**Cr. L T P**

**4 3 10**

### **Unit 1: Introduction to Business Process Management**

This unit provides an overview of Business Process Management (BPM), its purpose, and its significance in enhancing organizational performance. It covers basic BPM concepts, including process identification, modeling, and improvement. The unit discusses the lifecycle of BPM and explores the benefits of process-oriented management in aligning operations with strategic goals.

### **Unit 2: Process Modeling and Analysis**

This unit focuses on process modeling techniques, such as flowcharts, Business Process Model and Notation (BPMN), and data flow diagrams. It covers the principles of process mapping and introduces tools for visualizing workflows. The unit also discusses methods for analyzing processes to identify inefficiencies, bottlenecks, and areas for improvement, emphasizing the importance of detailed process documentation.

### **Unit 3: Process Design and Improvement**

This unit explores techniques for designing and improving business processes. Topics include process redesign, reengineering, and optimization, with a focus on methodologies like Lean, Six Sigma, and Total Quality Management (TQM). The unit addresses strategies for improving process efficiency, reducing costs, and enhancing quality, as well as the role of innovation in process improvement.

### **Unit 4: Process Automation and Technology Integration**

This unit examines the role of technology in automating and supporting business processes. It covers automation tools such as Robotic Process Automation (RPA) and discusses the integration of Enterprise Resource Planning (ERP) and Customer Relationship Management



(CRM) systems in BPM. The unit explores how digital transformation, artificial intelligence (AI), and data analytics can drive process efficiency and agility.

## **Unit 5: BPM Governance and Performance Management**

This unit addresses BPM governance and the importance of establishing a framework for monitoring and managing process performance. Topics include key performance indicators (KPIs), process metrics, and the use of dashboards for real-time monitoring. The unit also discusses change management, stakeholder engagement, and best practices for sustaining process improvements and ensuring continuous alignment with organizational objectives.

### **Computing & Its Application**

**UCA 502**

**Cr. L T P**

**4 3 10**

## **Unit 1: Introduction to Computing**

This unit provides an overview of computing, including the history and evolution of computers and computing technologies. It introduces the basic components of a computer system, such as hardware, software, and networks, and explores the fundamental concepts of data processing. The unit also discusses types of computer systems, from personal computers to mainframes, and their applications in various fields.

## **Unit 2: Computer Software and Operating Systems**

This unit focuses on the role of software in computing, covering types of software such as system software, application software, and programming languages. It explores the functions and architecture of operating systems, including process management, memory management, and file systems. The unit also introduces popular operating systems like Windows, macOS, and Linux, emphasizing their features and applications.

## **Unit 3: Data Management and Databases**

This unit introduces data management concepts and database systems. It covers the basics of database management systems (DBMS), including relational databases, SQL, and data models. The unit discusses the importance of data storage, retrieval, and management in supporting business applications, as well as the role of data warehouses and cloud storage in modern data management.

## **Unit 4: Networking and the Internet**

This unit provides an overview of networking fundamentals, including network types (LAN, WAN), protocols, and internet technologies. It covers the basics of TCP/IP, DNS, and network security, emphasizing their roles in enabling communication and data exchange. The unit

explores the impact of the internet on business, society, and daily life, with an introduction to emerging concepts like the Internet of Things (IoT).

## **Unit 5: Applications of Computing in Various Fields**

This unit examines the diverse applications of computing across different industries, including healthcare, education, finance, and entertainment. It explores topics such as e-commerce, digital marketing, artificial intelligence, and machine learning, highlighting how these technologies are transforming business operations and enhancing decision-making. The unit also discusses ethical and societal considerations in the application of computing technologies.

### **Management Information System**

**UCA 504**

**Cr. L T P**

**4 3 1 0**

## **Unit 1: Introduction to Management Information Systems**

This unit provides an overview of Management Information Systems (MIS), its components, and its role in organizations. It covers the key concepts of information systems, including data, information, and knowledge, and explores the importance of MIS in decision-making and operational efficiency. The unit also discusses the evolution of MIS and the types of information systems used in business, such as transaction processing systems and executive support systems.

## **Unit 2: Information Systems and Business Strategy**

This unit examines the role of MIS in supporting business strategy and achieving competitive advantage. It discusses strategic models like Porter's Five Forces and the value chain and how information systems can enhance organizational capabilities. The unit explores the alignment of IT strategy with business goals, focusing on enterprise applications like ERP, CRM, and SCM that enable integration and collaboration.

## **Unit 3: System Development and Implementation**

This unit focuses on the processes involved in developing and implementing MIS. It covers the system development life cycle (SDLC), including planning, analysis, design, implementation, and maintenance. The unit also introduces alternative methodologies, such as agile and prototyping. Topics include requirements gathering, feasibility analysis, and the challenges and best practices in MIS implementation.

## **Unit 4: Data Management and Business Intelligence**

This unit covers the importance of data management in MIS, including database management systems (DBMS) and data warehousing. It introduces data mining, business intelligence, and analytics to support informed decision-making. The unit explores data visualization techniques

and reporting tools, focusing on how MIS leverages data for insights into business performance and market trends.

## **Unit 5: Security, Ethical, and Social Issues in MIS**

This unit addresses the security, ethical, and social considerations in MIS. It covers topics like cybersecurity threats, risk management, and data privacy, including regulations such as GDPR. The unit also explores ethical issues related to information systems, such as intellectual property, digital rights, and social responsibility, emphasizing the need for secure and ethical management of information systems.

### **Software Project Management**

**UCA 506**

**Cr. L T P**

**4 3 1 0**

## **Unit 1: Introduction to Software Project Management**

This unit provides an overview of software project management, including its purpose, scope, and key principles. It covers the roles and responsibilities of a project manager and introduces project management frameworks, methodologies, and processes. Topics include project life cycles, the importance of effective project planning, and an introduction to common project management standards like PMBOK and Agile.

## **Unit 2: Project Planning and Scheduling**

This unit focuses on project planning, including defining project scope, objectives, and deliverables. It covers techniques for creating work breakdown structures (WBS), estimating resources, time, and costs, and developing project schedules. The unit introduces tools like Gantt charts and PERT diagrams, as well as techniques for managing project dependencies and critical paths to ensure timely completion.

## **Unit 3: Risk Management in Software Projects**

This unit addresses risk management in software projects, including identifying, analyzing, and mitigating risks. It covers types of project risks, such as technical, operational, and resource risks, and introduces qualitative and quantitative risk assessment techniques. The unit emphasizes the importance of proactive risk management, contingency planning, and tools like risk matrices and impact analysis.

## **Unit 4: Project Monitoring, Control, and Quality Management**

This unit focuses on monitoring and controlling project progress, including tracking project performance, managing changes, and ensuring quality. Topics include key performance indicators (KPIs), earned value management (EVM), and quality management practices such as

software testing and quality assurance. The unit also discusses corrective actions, issue tracking, and maintaining alignment with project goals.

## **Unit 5: Project Closure and Evaluation**

This unit covers the final stages of a software project, including project delivery, documentation, and evaluation. It discusses the importance of conducting post-project reviews, capturing lessons learned, and assessing project success against objectives and metrics. The unit also addresses project handover, client satisfaction, and continuous improvement in project management practices.

## **Introduction to Expert Systems**

**CCA 605A**

**Cr. L T P**

**4 3 10**

### **Unit 1: Fundamentals of Expert Systems**

This unit introduces the basic concepts of expert systems, their history, and their significance in artificial intelligence. It covers the characteristics and components of expert systems, including the knowledge base, inference engine, and user interface. The unit also explores the advantages and limitations of expert systems and provides an overview of various applications in fields such as medicine, engineering, and finance.

### **Unit 2: Knowledge Representation and Acquisition**

This unit focuses on knowledge representation techniques used in expert systems, including rules, frames, semantic networks, and logic-based representations. It discusses the process of knowledge acquisition and elicitation from domain experts, as well as methods for structuring and organizing knowledge. The unit also introduces knowledge engineering and explores tools and techniques for building a robust knowledge base.

### **Unit 3: Inference Mechanisms and Reasoning**

This unit delves into the inference mechanisms that drive expert systems, including forward and backward chaining, rule-based reasoning, and case-based reasoning. It discusses various reasoning approaches, such as deduction, induction, and abduction, and covers uncertainty management techniques like fuzzy logic and probabilistic reasoning. Practical examples illustrate how inference engines draw conclusions based on knowledge.

### **Unit 4: Expert System Development and Tools**

This unit covers the methodologies and tools used in developing expert systems. It introduces development frameworks, including knowledge-based shell systems, and discusses prototyping and iterative development. The unit explores various expert system development environments

and languages, such as CLIPS and Prolog, providing hands-on experience with popular tools used to design and implement expert systems.

## **Unit 5: Applications, Ethics, and Future of Expert Systems**

This unit examines real-world applications of expert systems in areas such as healthcare, finance, and customer service. It discusses the ethical implications of expert systems, including issues of trust, transparency, and accountability. The unit also explores the future of expert systems, the integration with machine learning and AI, and emerging trends in intelligent systems, highlighting the evolving role of expert systems in modern technology.

## **Knowledge Representation and Reasoning**

**CCA 605B**

**Cr. L T P**

**4 3 10**

### **Unit 1: Introduction to Knowledge Representation**

This unit covers the basics of knowledge representation, its significance in artificial intelligence, and the challenges involved in representing real-world knowledge. It explores the key characteristics of an effective knowledge representation system, including expressiveness, efficiency, and inferencing ability. The unit also introduces various forms of knowledge representation, such as declarative, procedural, and structural approaches.

### **Unit 2: Logic-Based Representation**

This unit delves into logic-based representation techniques, covering propositional and predicate logic. It discusses logical connectives, quantifiers, and the syntax and semantics of logical expressions. The unit introduces the concepts of resolution and unification in logic, along with inference rules and theorem proving, to enable reasoning and problem-solving in logical systems.

### **Unit 3: Semantic Networks and Frames**

This unit explores structured knowledge representation techniques, including semantic networks and frames. It covers how entities, relationships, and attributes are represented in semantic networks, along with inheritance and hierarchical relationships. The unit also discusses frames as a way to organize structured data, emphasizing slot-filler structures and their applications in representing real-world objects and scenarios.

### **Unit 4: Rule-Based Systems and Production Rules**

This unit focuses on rule-based systems as a method of knowledge representation. It covers production rules, rule chaining (forward and backward), and the structure of rule-based inference engines. The unit also examines the strengths and limitations of rule-based reasoning, discussing

examples of rule-based expert systems and their applications in problem-solving and decision-making.

### **Unit 5: Reasoning Under Uncertainty**

This unit addresses reasoning methods used when information is incomplete or uncertain. It introduces probabilistic reasoning, Bayesian networks, fuzzy logic, and belief networks, exploring how they are used to handle uncertainty in knowledge representation. The unit covers key concepts in uncertainty management and discusses applications of these techniques in fields like diagnostics, decision support, and robotics.

## **Expert System Design and Development**

**CCA 605C**

**Cr. L T P**

**4 3 10**

### **Unit 1: Fundamentals of Expert Systems**

This unit provides an introduction to expert systems, defining their purpose, components, and applications in artificial intelligence. It covers the architecture of expert systems, including the knowledge base, inference engine, and user interface. The unit also introduces knowledge acquisition methods and the role of expert systems in fields like healthcare, finance, and engineering.

### **Unit 2: Knowledge Representation Techniques**

This unit explores different knowledge representation methods crucial for designing expert systems. It covers rule-based representation, semantic networks, frames, and object-oriented representations. The unit emphasizes the importance of structured knowledge and discusses the pros and cons of each representation method, focusing on their suitability for various expert system applications.

### **Unit 3: Inference Mechanisms and Reasoning Strategies**

This unit delves into inference mechanisms essential for expert systems to perform reasoning. It covers rule-based reasoning (forward and backward chaining), case-based reasoning, and the handling of uncertainty using fuzzy logic and probabilistic reasoning. The unit also introduces hybrid reasoning approaches, illustrating how inference engines draw conclusions from structured knowledge.

### **Unit 4: Expert System Development Process and Tools**

This unit focuses on the process of developing expert systems, from initial knowledge acquisition and analysis to system design and testing. It introduces development environments

and tools, including expert system shells and programming languages like CLIPS and Prolog. The unit discusses prototyping and iterative testing as key steps in refining expert systems to ensure accuracy and usability.

## **Unit 5: Applications, Evaluation, and Ethical Considerations**

This unit examines various real-world applications of expert systems, such as diagnostic systems in medicine, financial advisory systems, and technical support. It also covers evaluation techniques to assess the performance and reliability of expert systems. The unit discusses ethical considerations, including transparency, accountability, and the potential impact of expert systems on decision-making and job roles.

### **Applications of Expert Systems in Industry**

**CCA 605D**

**Cr. L T P**

**4 3 10**

## **Unit 1: Introduction to Expert Systems and Industrial Applications**

This unit provides an overview of expert systems, their architecture, and key components, including the knowledge base and inference engine. It introduces the significance of expert systems in industry and discusses their role in automating complex decision-making tasks, enhancing efficiency, and supporting strategic objectives. The unit also highlights early successes of expert systems across various industrial sectors.

## **Unit 2: Expert Systems in Manufacturing and Production**

This unit explores the use of expert systems in manufacturing, including applications in process control, quality management, and predictive maintenance. It covers the role of expert systems in optimizing production processes, monitoring equipment, and diagnosing machine faults. Case studies illustrate how expert systems reduce downtime, improve product quality, and support just-in-time manufacturing.

## **Unit 3: Expert Systems in Finance and Banking**

This unit examines the applications of expert systems in finance and banking, focusing on credit scoring, fraud detection, and investment analysis. It discusses how expert systems analyze financial data, assess risk, and support decision-making in lending and investment. The unit also covers regulatory compliance and explores the role of expert systems in enhancing operational efficiency and customer service.

## **Unit 4: Expert Systems in Healthcare and Diagnostics**

This unit focuses on the use of expert systems in healthcare, particularly in diagnostics, treatment planning, and patient monitoring. It covers the structure of medical expert systems, including

knowledge bases designed for specific health conditions, and examines examples like MYCIN and DENDRAL. The unit discusses how expert systems assist healthcare professionals in improving diagnostic accuracy and personalizing patient care.

## **Unit 5: Expert Systems in Customer Service and Technical Support**

This unit addresses the role of expert systems in automating customer service and technical support processes. It covers the development of knowledge-based systems for troubleshooting, guiding customers, and answering FAQs. The unit also discusses the use of expert systems in industries like telecommunications and consumer electronics, highlighting their contribution to improved customer satisfaction and reduced service costs.

## **Multimedia Computing**

**CCA 609**

**Cr. L T P**

**4 3 10**

### **Unit 1: Introduction to Multimedia Computing**

This unit introduces the fundamentals of multimedia, including the types of multimedia data (text, audio, images, video, and animation) and their applications in various fields like entertainment, education, and business. It covers basic concepts of multimedia systems, multimedia data representation, digitization, and the importance of compression.

### **Unit 2: Digital Audio and Video Processing**

This unit focuses on digital audio and video technologies, covering sampling, formats, and compression techniques for audio and video data. It discusses codecs like MP3, AAC, MPEG, and H.264, exploring methods for efficient storage and transmission. Topics include audio and video editing basics, synchronization, and streaming media challenges.

### **Unit 3: Image and Graphics Processing**

This unit explores the principles of image representation, color models, and graphics processing techniques. Topics include image transformation, filtering, and basic image processing operations, as well as an introduction to vector and raster graphics. The unit also covers applications of image processing in multimedia, such as image enhancement, compression, and graphics for animation.

### **Unit 4: Multimedia Storage, Databases, and Retrieval**

This unit discusses the management of multimedia data, including multimedia databases, storage formats, and retrieval techniques. Topics cover content-based image and video retrieval, indexing, metadata tagging, and the organization of multimedia data. It also introduces



multimedia content management systems (CMS) and their applications in digital libraries and archives.

## **Unit 5: Multimedia Networking and Applications**

This unit covers the delivery of multimedia content over networks, including streaming protocols, Quality of Service (QoS), and network architectures for multimedia applications. It explores real-time multimedia applications, such as live streaming and video conferencing, along with challenges in bandwidth, latency, and multimedia synchronization. The unit also touches on emerging multimedia applications like virtual reality and augmented reality.

## **Pattern Recognition**

**CCA 611**

**Cr. L T P**

**4 3 10**

### **Unit 1: Introduction to Pattern Recognition**

This unit introduces the basics of pattern recognition, including definitions, scope, and applications across various fields like image analysis, speech recognition, and biometrics. It covers key concepts such as feature extraction, classification, and decision theory. The unit also discusses the difference between supervised and unsupervised learning in pattern recognition.

### **Unit 2: Statistical Pattern Recognition**

This unit covers statistical approaches to pattern recognition, including probability theory, Bayes decision theory, and discriminant functions. It explores topics like parametric and non-parametric techniques, including linear discriminant analysis (LDA) and k-nearest neighbors (k-NN). The unit also introduces Gaussian models and probabilistic frameworks for classification.

### **Unit 3: Feature Selection and Dimensionality Reduction**

This unit focuses on feature selection techniques, emphasizing the importance of identifying relevant features for accurate classification. It covers methods like principal component analysis (PCA), independent component analysis (ICA), and feature selection algorithms. The unit discusses the curse of dimensionality and the role of dimensionality reduction in improving recognition performance.

### **Unit 4: Clustering and Unsupervised Learning**

This unit introduces clustering techniques used in unsupervised learning. Topics include popular clustering algorithms like k-means, hierarchical clustering, and density-based clustering (DBSCAN). The unit discusses clustering evaluation metrics, applications of clustering in pattern recognition, and the role of clustering in grouping and segmenting unlabeled data.

## **Unit 5: Neural Networks and Deep Learning for Pattern Recognition**

This unit covers neural networks and deep learning approaches for pattern recognition. It introduces basic neural network architectures, training algorithms, and common activation functions. The unit explores deep learning models such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), discussing their applications in image, speech, and text recognition tasks.

### **Client-Server Computing**

**UCA 603**

**Cr. L T P**  
**4 3 10**

#### **Unit 1: Introduction to Client-Server Computing**

This unit provides an overview of client-server computing, including its architecture, components, and advantages. It discusses the differences between client-server and peer-to-peer architectures and introduces various types of client-server models. The unit also covers the fundamental concepts of networking and communication protocols that enable client-server interactions.

#### **Unit 2: Client-Server Architecture and Design**

This unit explores different client-server architectures, including two-tier, three-tier, and n-tier models. It discusses the roles of clients and servers, the communication between them, and the responsibilities of each component. The unit also covers design considerations, such as scalability, performance, and security, as well as best practices for developing robust client-server applications.

#### **Unit 3: Communication Protocols and Middleware**

This unit focuses on communication protocols used in client-server computing, such as HTTP, TCP/IP, and WebSocket. It introduces middleware technologies that facilitate communication and data exchange between clients and servers. The unit also discusses remote procedure calls (RPC), message-oriented middleware, and the role of APIs in client-server interactions.

#### **Unit 4: Database Connectivity in Client-Server Applications**

This unit examines database connectivity and management in client-server applications. It covers techniques for accessing databases from client applications, including ODBC, JDBC, and ORM frameworks. The unit discusses the importance of data consistency, transaction management, and security measures in database-driven client-server systems.

#### **Unit 5: Security and Performance in Client-Server Computing**

This unit addresses security challenges and performance optimization techniques in client-server computing. It covers authentication, authorization, encryption, and secure communication methods. The unit also explores performance factors, including load balancing, caching, and resource management, providing strategies for optimizing client-server applications for high availability and responsiveness.

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### References:

- Tanenbaum, A. S., & Austin, T. (2012). *Structured Computer Organization*. Pearson.
- Kurose, J. F., & Ross, K. W. (2017). *Computer Networking: A Top-Down Approach*. Pearson.
- Stallings, W. (2015). *Network Security Essentials: Applications and Standards*. Pearson.
- McGregor, J. D. (2016). *\*Client-Server Programming with Java and C#*. Wiley.

## Advanced Computer System Architecture

**UCA 603**

**Cr. L T P**

**4 3 10**

### Unit 1: Fundamentals of Computer Architecture

This unit provides an overview of computer architecture, covering the basic components of computer systems, including the CPU, memory hierarchy, and input/output systems. It discusses the evolution of computer architecture and introduces fundamental concepts such as instruction sets, data paths, and control units. The unit also covers performance metrics and benchmarking techniques for evaluating computer systems.

### Unit 2: Advanced Processor Architectures

This unit focuses on advanced processor designs, including superscalar, out-of-order execution, and speculative execution architectures. It discusses concepts like pipelining, cache memory organization, and virtual memory. The unit also explores multicore and many-core architectures, examining their impact on performance, energy efficiency, and parallel processing capabilities.

### Unit 3: Memory Systems and Storage Architecture

This unit examines memory systems in-depth, covering cache design, memory hierarchy, and different types of memory technologies (RAM, ROM, SSDs, etc.). It discusses memory management techniques, including paging and segmentation, and explores storage architecture for high-performance systems. The unit also addresses issues related to data consistency, reliability, and fault tolerance in memory systems.

### Unit 4: Parallel and Distributed Architectures

This unit introduces parallel and distributed computing architectures, covering shared memory and distributed memory models. It discusses parallel processing techniques, including SIMD and MIMD architectures, and explores programming models for parallel systems, such as OpenMP and MPI. The unit also addresses challenges in synchronization, communication, and load balancing in distributed systems.

## **Unit 5: Emerging Trends in Computer Architecture**

This unit explores emerging trends and technologies in computer architecture, including quantum computing, neuromorphic computing, and energy-efficient architectures. It discusses the implications of these technologies for future computing systems and the challenges they present. The unit also examines the role of hardware-software co-design and the impact of machine learning on computer architecture.

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### **References:**

- Hennessy, J. L., & Patterson, D. A. (2019). *Computer Architecture: A Quantitative Approach*. Morgan Kaufmann.
- Patterson, D. A., & Hennessy, J. L. (2014). *Computer Organization and Design: The Hardware/Software Interface*. Morgan Kaufmann.
- Flynn, M. J. (2011). *Computer Architecture: Pipelined and Parallel Processor Design*. Jones & Bartlett Learning.
- Baer, J. (2017). *Computer Architecture and Implementation*. Cambridge University Press.

### **Dissertation**

**CCA 602**

**Cr. L T P**

**4 3 10**

## **Unit 1: Introduction to Research Methodology**

This unit introduces the principles of research methodology, including the research process, types of research, and the importance of defining research questions. It covers qualitative and quantitative research methods, literature review techniques, and ethical considerations in research. The unit emphasizes the significance of proper planning and organization in conducting research for a dissertation.

## **Unit 2: Literature Review and Theoretical Framework**

This unit focuses on conducting a comprehensive literature review, identifying relevant sources, and synthesizing findings. It covers the development of a theoretical framework that supports the research question and informs the study. The unit emphasizes critical analysis of existing literature and how it relates to the proposed research, guiding the direction of the dissertation.

### **Unit 3: Research Design and Methodology**

This unit explores the development of a research design, including selecting appropriate research methods, sampling techniques, and data collection strategies. It discusses various data analysis methods, both qualitative and quantitative, and the importance of validating results. The unit also covers the creation of research instruments, such as surveys and interview protocols, ensuring they align with the research objectives.

### **Unit 4: Writing the Dissertation**

This unit covers the structure and organization of a dissertation, including the introduction, methodology, results, discussion, and conclusion chapters. It provides guidelines for academic writing style, citation formats, and referencing standards. The unit emphasizes the importance of clear communication and the presentation of research findings, as well as the revision process and addressing feedback from advisors.

### **Unit 5: Presentation and Defense of the Dissertation**

This unit prepares students for the oral presentation and defense of their dissertation. It covers strategies for effectively communicating research findings to an audience, including presentation skills and visual aids. The unit also discusses the process of defending the dissertation before a committee, addressing questions, and incorporating feedback for future research or publication.

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#### **References:**

- Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage Publications.
- Kothari, C. R. (2004). *Research Methodology: Methods and Techniques*. New Age International Publishers.
- Booth, W. C., Colomb, G. G., & Williams, J. M. (2008). *The Craft of Research*. University of Chicago Press.
- Silverman, D. (2013). *Doing Qualitative Research*. Sage Publications.

### **Seminar and Progress Reports**

**CCA 604**

**Cr. L T P**

**4 3 10**

### **Unit 1: Introduction to Seminars and Reports**

This unit introduces the purpose and significance of seminars and progress reports in academic and professional contexts. It covers the various types of seminars, including formal presentations

and informal discussions, and outlines the essential components of effective progress reports. The unit emphasizes the importance of communication skills and audience engagement in presenting research findings.

## **Unit 2: Research Topics and Literature Review**

This unit focuses on selecting appropriate research topics for seminars and progress reports. It covers techniques for conducting literature reviews, identifying key sources, and synthesizing relevant information. The unit emphasizes the importance of establishing a theoretical framework and developing clear objectives to guide research and presentations.

## **Unit 3: Structuring Presentations and Reports**

This unit explores the structure and organization of seminars and progress reports. It discusses the typical components, including introduction, methodology, results, discussion, and conclusion. The unit provides guidelines for creating clear and coherent presentations, emphasizing the effective use of visual aids and presentation software to enhance communication.

## **Unit 4: Presentation Skills and Techniques**

This unit focuses on developing effective presentation skills for delivering seminars and progress reports. It covers techniques for public speaking, managing anxiety, and engaging the audience. The unit emphasizes the importance of body language, voice modulation, and the use of visual aids to enhance the clarity and impact of presentations.

## **Unit 5: Feedback, Evaluation, and Future Directions**

This unit discusses the process of receiving and incorporating feedback from peers and advisors during seminars and report presentations. It covers evaluation criteria used to assess the quality of presentations and reports. The unit emphasizes the importance of reflecting on feedback to improve future research and presentation skills and discusses the next steps in the research process based on feedback received.

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### **References:**

- McMillan, K., & Weyers, J. (2010). *How to Prepare a Dissertation Proposal: Suggestions for Students in Education and the Social and Behavioral Sciences*. Pearson.
- Harris, M. (2017). *A Guide to Writing Seminar Papers and Reports*. Academic Press.
- McLean, S. (2010). *The Essentials of Business Research Methods*. Wiley.
- McCormick, S. (2015). *Effective Presentations: A Practical Guide to Presenting Your Ideas*. Routledge.

## **Lab Java Programming**

### **CCA-551**

1. Create a simple PHP script that prints "Hello, World!".
2. Build a form that takes user input and displays the submitted data.
3. Implement a user registration system that stores data in a MySQL database.
4. Create a login system with session management to authenticate users.
5. Develop a contact form that sends an email with user details.
6. Build a CRUD application to manage a list of books in a database.
7. Create a simple calculator that performs basic arithmetic operations.
8. Implement a file upload feature with validation for file types.
9. Develop a program that generates a random password.
10. Create a page that displays data from an API using cURL.
11. Implement pagination for displaying a list of products from a database.
12. Build a blog platform with post creation and commenting features.
13. Create a program to read and display contents of a text file.
14. Develop a shopping cart system that tracks selected items.
15. Implement user roles (admin and user) with access control.
16. Create a program that generates and displays a QR code.
17. Build a survey application that collects and displays user responses.
18. Create a simple image gallery that displays images from a folder.

## **Lab C# Programming**

### **CCA-553**

1. Write a C# program to calculate the factorial of a number using recursion.
2. Create a program that finds the greatest common divisor (GCD) of two integers using the Euclidean algorithm.
3. Develop a program that checks if a given string is a palindrome.
4. Write a C# program to sort an array of integers using the bubble sort algorithm.
5. Implement a program that reads a list of integers from the user and finds the maximum and minimum values.
6. Create a program to count the number of vowels and consonants in a given string.
7. Write a C# program to generate the Fibonacci series up to a specified number of terms.
8. Develop a program that reverses an array of integers.
9. Create a program to find the sum of the digits of a given integer.

10. Write a C# program to implement a basic calculator that performs addition, subtraction, multiplication, and division.
11. Implement a program to check if a number is prime.
12. Write a program that displays the multiplication table of a number provided by the user.
13. Create a program to find the second largest number in an array.
14. Write a C# program to convert a binary number (as a string) to its decimal equivalent.
15. Develop a program that counts the occurrences of each character in a string.
16. Implement a program to merge two sorted arrays into a single sorted array.
17. Write a C# program to print the first n prime numbers.
18. Create a program that removes duplicates from an array of integers.

### **Lab Network Security & Cryptography Lab**

#### **CCA-552**

1. Write a program to implement the Caesar cipher encryption and decryption.
2. Create a program that uses the Vigenère cipher for text encryption and decryption.
3. Develop a program to perform a simple hash function (like SHA-256) on a given string.
4. Write a program that demonstrates symmetric key encryption and decryption using AES.
5. Create a program to implement RSA encryption and decryption.
6. Develop a program that generates a pair of RSA keys (public and private).
7. Write a program to demonstrate digital signatures using RSA.
8. Create a program that implements Diffie-Hellman key exchange.
9. Develop a program to encrypt and decrypt files using symmetric encryption.
10. Write a program that verifies the integrity of a file using checksums (MD5 or SHA-1).
11. Create a program that uses SSL/TLS to secure a simple client-server communication.
12. Develop a program to implement HMAC (Hash-based Message Authentication Code).
13. Write a program that simulates a man-in-the-middle attack and its prevention.
14. Create a program that implements a simple password manager with encryption.
15. Develop a program to perform steganography by hiding a message in an image.
16. Write a program to analyze network traffic and detect anomalies using basic heuristics.
17. Create a program that implements a simple firewall rule-checking mechanism.
18. Develop a program to simulate phishing detection by analyzing email content.
19. Write a program to implement two-factor authentication using a time-based one-time password

### **Lab Compiler Design**

#### **CCA-554**

1. Write a program to implement a lexical analyzer (lexer) for a simple programming language.
2. Create a program to construct a syntax tree for arithmetic expressions.
3. Develop a program to implement a parser using recursive descent parsing.



4. Write a program that implements the Shunting Yard algorithm to convert infix expressions to postfix notation.
5. Create a program to evaluate postfix expressions.
6. Develop a program to perform semantic analysis and check for variable declaration and usage.
7. Write a program to generate intermediate code from a given source code.
8. Create a program to implement basic optimization techniques (constant folding, dead code elimination).
9. Develop a program to implement a simple code generator that translates intermediate code to assembly language.
10. Write a program to implement a symbol table with insertion, lookup, and deletion functionalities.
11. Create a program that performs type checking for a simple programming language.
12. Develop a program to implement operator precedence parsing.
13. Write a program to simulate a finite state machine (FSM) for a given regular expression.
14. Create a program to implement lexical analysis with regular expressions.
15. Develop a program that performs syntax-directed translation for arithmetic expressions.
16. Write a program to implement dynamic memory allocation and garbage collection in a simple language.
17. Create a program that generates a control flow graph (CFG) from a given intermediate representation.
18. Develop a program to implement an error recovery mechanism in a parser.
19. Write a program that analyzes and generates reports on the complexity of a given program.
20. Create a program to implement a simple interpreter for a basic programming language.

### **Lab Advanced DBMS**

#### **CCA-651**

1. Write a program to create a database schema using SQL for a simple library management system.
2. Develop a program that connects to a database and performs CRUD operations using JDBC.
3. Create a program to implement a stored procedure that calculates the total sales for a given month.
4. Write a program to demonstrate the use of triggers in a database (e.g., updating inventory on a sale).
5. Develop a program that executes complex SQL queries involving joins, subqueries, and group functions.
6. Create a program to implement database normalization techniques and demonstrate denormalization.
7. Write a program to manage user authentication and authorization in a database application.

8. Develop a program to back up and restore a database using SQL commands.
9. Create a program that performs data mining operations, such as clustering or classification, on a dataset.
10. Write a program to implement transaction management and demonstrate ACID properties.
11. Develop a program that uses indexing to improve query performance in a large database.
12. Create a program that implements full-text search capabilities in a database.
13. Write a program to demonstrate the use of database views and materialized views.
14. Develop a program to perform data replication and synchronization between two databases.
15. Create a program that implements a data warehouse schema using star and snowflake designs.
16. Write a program to perform ETL (Extract, Transform, Load) operations on a dataset.
17. Develop a program that integrates a NoSQL database (like MongoDB) with a relational database.
18. Create a program to analyze query execution plans and optimize queries for performance.
19. Write a program that demonstrates data privacy techniques, such as data masking or encryption.
20. Develop a program to implement a distributed database system and demonstrate data consistency.
- 21.

### **Lab Advanced DAA**

#### **CCA-653**

1. Write a program to implement Dijkstra's algorithm for finding the shortest path in a weighted graph.
2. Create a program that uses dynamic programming to solve the 0/1 Knapsack problem.
3. Develop a program to perform matrix multiplication using Strassen's algorithm.
4. Write a program to implement the Prim's algorithm for minimum spanning tree generation.
5. Create a program that demonstrates the A\* search algorithm for pathfinding.
6. Write a program to solve the Traveling Salesman Problem using a brute force approach.
7. Develop a program that uses the Ford-Fulkerson method to find the maximum flow in a flow network.
8. Create a program that implements the branch and bound technique for solving the N-Queens problem.
9. Write a program to implement the Floyd-Warshall algorithm for all-pairs shortest paths.
10. Develop a program that applies the Bellman-Ford algorithm to find the shortest paths from a single source.
11. Create a program to implement a Huffman coding algorithm for data compression.
12. Write a program that uses backtracking to solve the Sudoku problem.
13. Develop a program to implement the Rabin-Karp algorithm for substring search.
14. Create a program to implement K-means clustering algorithm for data segmentation.

15. Write a program that demonstrates the Quick Sort algorithm with different pivot strategies.

### **LAB Minor Project**

#### **CCA 655**

1. Develop a simple task management application with user authentication and CRUD operations.
2. Create a basic e-commerce website with product listings, shopping cart functionality, and order processing.
3. Write a program to build a personal finance tracker that allows users to manage expenses and budgets.
4. Implement a library management system that handles book borrowing, returns, and member management.
5. Create a weather forecasting application that fetches data from a public API and displays current conditions.
6. Develop a quiz application that allows users to take quizzes, track scores, and view results.
7. Write a program to create a note-taking application with rich text formatting and cloud synchronization.
8. Implement a simple blog platform where users can create, edit, and comment on posts.
9. Create a fitness tracking application that allows users to log workouts, track progress, and set goals.
10. Develop a recipe management system that enables users to search for recipes and save their favorites.
11. Write a program to build a social media dashboard that aggregates posts from multiple platforms.
12. Implement a music player application that allows users to create playlists and play local audio files.
13. Create a voting system for surveys or polls, with user authentication and result visualization.
14. Develop an online ticket booking system for events or movies with seat selection.
15. Write a program to implement a basic chat application using WebSockets for real-time communication.

### **Lab Dissertation**

#### **CCA 602**

1. Develop a comprehensive system for managing academic research papers, including submission, review, and publication processes.
2. Create a program that analyzes large datasets using machine learning algorithms for predictive analytics.
3. Implement a blockchain-based voting system to enhance transparency and security in electoral processes.

4. Design a smart home automation system that integrates various IoT devices for energy efficiency and convenience.
5. Write a program for sentiment analysis on social media data to gauge public opinion on various topics.
6. Create a personalized recommendation system for an e-commerce platform based on user behavior and preferences.
7. Develop a virtual reality application for immersive education experiences in science or history.
8. Implement a comprehensive health monitoring system that collects and analyzes data from wearable devices.
9. Create a program for automated essay scoring using natural language processing techniques.
10. Design a disaster management system that predicts natural disasters and provides real-time alerts and resources.
11. Develop an augmented reality application for interior design, allowing users to visualize furniture in their space.
12. Write a program to facilitate peer-to-peer energy trading using smart contracts on a blockchain.
13. Create a multi-language learning platform that adapts to individual student progress and preferences.
14. Implement a content management system (CMS) for online journalism that allows for multimedia integration and collaboration.
15. Develop a cybersecurity simulation tool that helps organizations train employees on threat detection and response.
16. Create a program that analyzes traffic data to optimize urban transportation systems and reduce congestion.

### **Lab Seminar and Progress Reports**

#### **CCA 604**

1. Develop a web-based application for tracking seminar registrations and managing attendee lists.
2. Create a program that generates automated progress reports for ongoing research projects.
3. Implement a presentation tool that allows users to create and share interactive slideshows.
4. Write a program to analyze feedback from seminar participants and generate summary reports.
5. Create a project management tool that helps teams track milestones and deadlines for seminars and presentations.
6. Develop a database system for organizing and retrieving seminar materials and resources.
7. Implement a video conferencing tool with features for screen sharing and recording seminars.
8. Create a program that schedules seminar sessions and sends reminders to participants.
9. Develop an online platform for submitting and reviewing seminar papers and abstracts.

10. Write a program that visualizes progress over time for individual research projects using graphs and charts.
11. Create a system for peer review of seminar presentations, allowing participants to provide constructive feedback.
12. Develop a mobile app that allows users to access seminar schedules and speaker bios on the go.
13. Implement a notification system for updates on upcoming seminars and related events.
14. Create a program that tracks attendance and engagement metrics during online seminars.
15. Develop a collaborative document editor for preparing seminar papers and reports in real time.
16. Write a program to create customizable templates for seminar presentations and reports.
17. Create a system for archiving and accessing past seminar recordings and materials.
18. Develop a resource-sharing platform where participants can exchange seminar-related documents and links.



**Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

**School of School of Engineering and Technology**

**Ordinances, Regulations & Syllabus**

For

**Bachelor of Engineering, Four Year Programme**

**Semester System**

(w.e.f. session 2013-14)

Revised and approved in the year 2021 (17<sup>th</sup> Meeting, Board of Studies)

## **Programme Educational Objectives (PEOs)**

**PEO 1** Graduates will acquire a strong foundation in engineering principles, enabling them to design, develop, and implement innovative solutions to complex engineering problems across various industries.

**PEO 2** Graduates will develop the ability to apply critical thinking, problem-solving skills, and engineering techniques to analyze, evaluate, and resolve real-world challenges in their chosen engineering discipline.

**PEO 3** Graduates will gain hands-on experience in using modern engineering tools, software, and technologies, enabling them to effectively design, model, and optimize engineering systems and processes.

**PEO 4** Graduates will demonstrate the ability to work collaboratively in multidisciplinary teams, manage engineering projects, and communicate technical information effectively to both technical and non-technical stakeholders.

**PEO 5** Graduates will adhere to professional and ethical standards, ensuring their engineering solutions are socially responsible, environmentally sustainable, and aligned with industry best practices and regulatory requirements.

**PEO 6** Graduates will develop leadership and management skills, preparing them to take on roles of responsibility in both technical and managerial aspects of engineering projects.

**PEO 7** Graduates will engage in lifelong learning and stay current with emerging technologies, ensuring continuous professional growth and adaptability to the evolving engineering landscape.

**PEO 8** Graduates will contribute to the betterment of society by creating innovative solutions that address societal challenges, promote sustainable development, and enhance the quality of life globally.

## Programme Specific Objectives (PSO's)

**PSO 1** To equip students with a solid foundation in core engineering concepts, preparing them to design, analyze, and develop solutions for complex technical challenges in various fields.

**PSO 2** To develop proficiency in modern engineering tools, techniques, and technologies, enabling students to effectively design, model, and optimize engineering systems and processes across diverse applications.

**PSO 3** To enhance problem-solving skills, encouraging students to apply engineering principles and critical thinking to develop innovative and sustainable solutions for real-world challenges in their discipline.

**PSO 4** To foster a strong understanding of professional ethics, environmental sustainability, and social responsibility, ensuring students create engineering solutions that are both technically sound and socially beneficial.

**PSO 5** To provide hands-on experience through laboratory work, internships, and projects, helping students gain practical exposure to the application of engineering concepts in real-world scenarios.

**PSO 6** To nurture teamwork, leadership, and communication skills, preparing students to effectively collaborate in multidisciplinary teams, manage engineering projects, and communicate complex ideas to diverse audiences.

**PSO 7** To ensure students develop a global perspective on engineering practices, preparing them to adapt and innovate in response to technological advancements and the needs of a rapidly changing world.

**PSO 8** To foster lifelong learning habits, ensuring students remain adaptable and stay updated with the latest trends, technologies, and advancements in their engineering field throughout their careers.



## Programme Outcome Objectives (POO's)

**POO 1** Graduates will have a strong foundation in engineering fundamentals, enabling them to apply core principles and methodologies to solve real-world engineering problems across various disciplines.

**POO 2** Graduates will possess the ability to analyze complex engineering systems, design innovative solutions, and optimize processes while considering technical, environmental, and societal constraints.

**POO 3** Graduates will be proficient in using modern engineering tools, software, and technologies to model, simulate, and solve engineering problems, ensuring efficient and effective system designs.

**POO 4** Graduates will develop critical thinking, problem-solving, and decision-making skills to address engineering challenges, ensuring that solutions are feasible, sustainable, and aligned with industry standards.

**POO 5** Graduates will demonstrate the ability to work effectively in multidisciplinary teams, manage projects, and communicate technical information clearly to diverse audiences, both within and outside of engineering fields.

**POO 6** Graduates will adhere to ethical, professional, and legal standards in engineering practice, ensuring their solutions positively impact society, the environment, and the global engineering community.

**POO 7** Graduates will be capable of undertaking independent research, applying engineering principles to explore new solutions, and contributing to advancements in technology and engineering practices.

**POO 8** Graduates will have strong leadership and interpersonal skills, enabling them to manage engineering projects, lead teams, and coordinate with stakeholders to achieve desired outcomes.

**POO 9** Graduates will demonstrate an understanding of sustainability, applying green engineering principles to minimize the environmental impact of their designs and promote socially responsible engineering practices.

**POO 10** Graduates will embrace lifelong learning, continuously updating their knowledge and skills to stay relevant with evolving technologies, methodologies, and trends in engineering, ensuring professional growth throughout their careers.

**Scheme of Teaching**  
**TEACHING SCHEME OF B.TECH. 1<sup>ST</sup> YEAR (1<sup>ST</sup> SEMESTER)**  
**W.E.F. Academic Session 2021-22**  
**(COMMON FOR ALL BRANCHES)**

CODE	SUBJECT	CREDIT	L	T	P
CMAN-101 CMAN-101 A/ CMAN-101 B/ CMAN-101 C/ CMAN-101 D	MATHEMATICS-I MATHEMATICS / BASIC MATHEMATICS / APPLIED MATHEMATICS / ADVANCED APPLIED MATHEMATICS	4	3	1	0
CMEN-101 CMEN-101 A/ CMEN-101 B/ CMEN-101 C/ CMEN-101 D	ENGINEERING MECHANICS STRUCTURAL ANALYSIS/ RIGID BODY MECHANICS/ FLUID MECHANICS/ FREE-BODY DIAGRAMS MECHANICS	4	3	1	0
CECN-101 CECN-101 A/ CECN-101 B/ CECN-101 C/ CECN-101 D	FUNDAMENTALS OF ELECTRONICS / ANALOG ELECTRONICS/ DIGITAL ELECTRONICS/ ELECTRONICS MEASUREMENT AND TESTING/ ELECTROMAGNETICS	4	3	1	0
CESN-101 CESN-101 A/ CESN-101 B/ CESN-101 C CESN-101 D	ENGINEERING CHEMISTRY AND ENVIRONMENTAL SCIENCE CHEMICAL THERMODYNAMICS/ CHEMICAL KINETICS/ ENVIRONMENTAL CHEMISTRY/ NATURAL RESOURCE MANAGEMENT	4	3	1	0
CPCN-101 CPCN-101 A/ CPCN-101 B/ CPCN-101 C/ CPCN-101 D	PRESENTATION AND COMMUNICATION SKILLS ENGLISH COMMUNICATION / ENGLISH / TECHNICAL COMMUNICATION / HUMAN VALUES, DEADDICTION AND TRAFFIC RULES	3	3	0	0
CMEN-151	ENGINEERING WORKSHOP PRACTICE	1	0	0	2
CMEN-153	ENGINEERING GRAPHICS LAB	1	0	0	2
CPCN-151 CPCN-151 A CPCN-151 B CPCN-151 C CPCN-151 D	COMMUNICATION LAB ENGLISH COMMUNICATION LAB / ENGLISH LAB / TECHNICAL COMMUNICATION LAB / HUMAN VALUES, DEADDICTION AND TRAFFIC RULES (LAB)	1	0	0	2
TOTAL		22	15	4	6

**TEACHING SCHEME OF B.TECH. 1<sup>ST</sup> YEAR (2<sup>ND</sup> SEMESTER)**

**W.E.F. Academic Session 2021-22**

<b>CODE</b>	<b>SUBJECT</b>	<b>CREDIT</b>	<b>L</b>	<b>T</b>	<b>P</b>
CMAN-102 CMAN-102 A CMAN-102 B CMAN-102 C CMAN-102 D	MATHEMATICS-II Differential Equations/ Probability and Statistics/ Mathematical Logic/ Differential Geometry	4	3	1	0
CPHN -102 CPHN -102 A CPHN -102 B CPHN -102 C CPHN -102 D	ENGINEERING PHYSICS CLASSICAL MECHANICS/ ELECTROMAGNETIC THEORY/ QUANTUM MECHANICS/ SOLID STATE PHYSICS	4	3	1	0
CCSN-102	COMPUTER FUNDAMENTALS AND PROGRAMMING USING-C	4	3	1	0
CEEN-102 CEEN-102 A CEEN-102 B CEEN-102 C CEEN-102 D	BASICS OF ELECTRICAL ENGINEERING CIRCUIT THEORY/ ELECTROMAGNETISM/ DIGITAL ELECTRONICS/ ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	4	3	1	0
CPCN-102 CPCN-102 A CPCN-102 B CPCN-102 C CPCN-102 D	TECHNICAL COMMUNICATION BUSINESS COMMUNICATION/ PRESENTATION SKILLS/ DIGITAL COMMUNICATION/ AUDIENCE ANALYSIS	3	3	0	0
CPHN-152 CPHN-152A CPHN-152B CPHN-152C CPHN-152D	ENGINEERING PHYSICS LAB CLASSICAL MECHANICS LAB / ELECTROMAGNETIC THEORY LAB / QUANTUM MECHANICS LAB / SOLID STATE PHYSICS LAB	1	0	0	2
CCSN-152	COMPUTER PROGRAMMING USING C LAB	1	0	0	2
CEEN-152 CEEN-152A CEEN-152B CEEN-152C CEEN-152D	BASIC ELECTRICAL ENGINEERING LAB CIRCUIT THEORY LAB / ELECTROMAGNETISM LAB / DIGITAL ELECTRONICS LAB / ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB	1	0	0	2
<b>TOTAL</b>		22	15	4	6

# SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)

## TEACHING SCHEME

W.E.F. Academic Session 2021-22

### B. TECH. (COMPUTER SCIENCE & ENGINEERING)

#### III semester

Code	Course Title	Cr.	L	T	P
CCSN-201	DATA STRUCTURE USING 'C'	4	3	1	0
CCSN-203	DBMS	4	3	1	0
CCSN-205	OPERATING SYSTEMS (UNIX PROGRAMMING)	4	3	1	0
CCSN-207	JAVA PROGRAMMING	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-I	4	3	1	0
CBSN-201	VALUE EDUCATION, HUMAN RIGHTS AND LEGISLATIVE PROCEDURES	2	2	0	0
CBSN-201 A	HUMANITIES AND SCIENCE				
CBSN-201 B	PUBLIC POLICY				
CBSN-201 C	LEADERS FOR GLOBAL OPERATIONS				
CCSN-251	DATA STRUCTURE USING 'C' LAB	1	0	0	2
CCSN-253	DBMS LAB	1	0	0	2
CCSN-255	JAVA PROGRAMMING LAB	1	0	0	2
	Total	25	17	5	6

#### PROFESSIONAL ELECTIVE-I

1. CCSN 209 DISCRETE MATHEMATICS  
CCSN 209 A MATHEMATICS  
CCSN 209 B BASIC MATHEMATICS  
CCSN 209 C MATHEMATICS-I  
CCSN 209 D Advanced Applied Mathematics
1. CCSN 211 PERL PROGRAMMING
2. CCSN 213 INTRODUCTION TO SOFT COMPUTING (Neural Networks, Fuzzy Logic and Genetic Algorithm)
3. CCSN 215 MATLAB PROGRAMMING FOR ENGINEERS

**SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)**  
**TEACHING SCHEME**  
**W.E.F. Academic Session 2021-22**  
**B. TECH. (COMPUTER SCIENCE & ENGINEERING)**  
**IV semester**

Code	Course Title	Cr.	L	T	P
CCSN-202	OBJECT ORIENTED PROGRAMMING USING C++	4	3	1	0
CCSN-204	DESIGN AND ANALYSIS OF ALGORITHMS	4	3	1	0
CCSN-206	INTERNET AND WEB TECHNOLOGY	4	3	1	0
CCSN-208	COMPUTER NETWORKS	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-II	4	3	1	0
CBSN-202	TECHNICAL ENGLISH	2	2	0	0
CBSN-202A	BUSINESS COMMUNICATION				
CBSN-202B	TECHNICAL WRITING				
CBSN-202C	INTERCULTURAL COMMUNICATION				
CCSN-252	OBJECT ORIENTED PROGRAMMING USING C++ LAB	1	0	0	2
CCSN-254	DESIGN AND ANALYSIS OF ALGORITHMS LAB	1	0	0	2
CCSN-256	INTERNET AND WEB TECHNOLOGY LAB	1	0	0	2
	Total	25	17	5	6

**PROFESSIONAL ELECTIVE-II**

1. CCSN 210 FORMAL LANGUAGES & AUTOMATION THEORY
2. CCSN 212 NANO SCIENCES

**INDUSTRIAL ENHANCEMENT ELECTIVE-I**

1. CBSN-202 TECHNICAL ENGLISH
2. CBSN-202 A BUSINESS COMMUNICATION
3. CBSN-202 B TECHNICAL WRITING
4. CBSN-202 C INTERCULTURAL COMMUNICATION
5. CBSN-204 OPERATIONS RESEARCH

# SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)

## TEACHING SCHEME

W.E.F. Academic Session 2021-22

### B. TECH. (COMPUTER SCIENCE & ENGINEERING)

#### V semester

Code	Course Title	Cr.	L	T	P
CCSN-301	SOFTWARE ENGINEERING	4	3	1	0
CCSN-303	COMPILER DESIGN	4	3	1	0
CCSN-305	OBJECT ORIENTED ANALYSIS AND DESIGN	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-III	4	3	1	0
CUCS-XXX	OPEN ELECTIVE-I	4	3	1	0
CBSN-301	ENERGY STUDIES	2	2	0	0
CBSN-301A	SUPPLY CHAIN MANAGEMENT				
CBSN-301B	TRANSPORTATION				
CBSN-301C	ENVIRONMENT AND SUSTAINABILITY				
CCSN-351	SOFTWARE ENGINEERING LAB	1	0	0	2
CCSN-353	COMPILER DESIGN LAB	1	0	0	2
CCSN-355	OBJECT ORIENTED ANALYSIS AND DESIGN LAB	1	0	0	2
	Total	25	17	5	6

#### PROFESSIONAL ELECTIVE-III

1. CCSN 307 CRYPTOGRAPHY & INFORMATION SECURITY
2. CCSN 309 INTERNET WEB PROGRAMMING
3. CCSN 311 GRAPH THEORY

#### OPEN ELECTIVE-I

1. CUCS 341 COMPUTER VISION
2. CUCS 343 ROBOTICS AND AUTOMATION
3. CUCS 345 CLOUD COMPUTING
4. CUCS 347 HUMAN COMPUTER INTERFACE

**SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)**  
**TEACHING SCHEME**

**W.E.F. Academic Session 2021-22**

**B. TECH. (COMPUTER SCIENCE & ENGINEERING)**  
**VI Semester**

<b>Code</b>	<b>Course Title</b>	<b>Cr.</b>	<b>L</b>	<b>T</b>	<b>P</b>
CCSN-302	COMPUTER GRAPHICS	4	3	1	0
CCSN-304	DATA WAREHOUSING & DATA MINING	4	3	1	0
CCSN-306	MOBILE COMPUTING	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-IV	4	3	1	0
CUCS-XXX	OPEN ELECTIVE-II	4	3	1	0
CBSN-302 CBSN-302A CBSN-302B CBSN-302C	ENVIRONMENTAL STUDIES ENVIRONMENTAL SCIENCE NATURAL RESOURCE MANAGEMENT POLLUTION CONTROL	2	2	0	0
CCSN-352	COMPUTER GRAPHICS LAB	1	0	0	2
CCSN-354	DATA WAREHOUSING & DATA MINING LAB	1	0	0	2
CCSN-356	MINI PROJECT	1	0	0	2
	Total	25	17	5	6

**PROFESSIONAL ELECTIVE-IV**

1. CCSN 308 KNOWLEDGE MANAGEMENT & EXPERT SYSTEM
2. CCSN 310 EMBEDDED COMPUTING SYSTEMS
3. CCSN 312 SIMULATION AND MODELING
4. CCSN 314 APPROXIMATION OF ALGORITHMS

**OPEN ELECTIVE-II**

1. CUCS 342 SOFTWARE PROJECT MANAGEMENT
2. CUCS 344 MICROWAVE ENGINEERING
3. CUCS 346 SUPPLY CHAIN MANAGEMENT-PLANNING
4. CUCS 348 SOFTWARE TESTING

**SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)**  
**TEACHING SCHEME**  
**W.E.F. Academic Session 2021-22**  
**B. TECH. (COMPUTER SCIENCE & ENGINEERING)**  
**VII Semester**

Code	Course Title	Cr.	L	T	P
CCSN-401	ARTIFICIAL INTELLIGENCE	4	3	1	0
CCSN-403	DISTRIBUTED COMPUTING SYSTEMS	4	3	1	0
CCSN-405	ADVANCED COMPUTER SYSTEM ARCHITECTURE	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-V	4	3	1	0
CUCS-XXX	OPEN ELECTIVE-V	4	3	1	0
CBSN-401	LAW FOR ENGINEERS				
CBSN-401 A	INTELLECTUAL PROPERTY RIGHTS				
CBSN-401 B	EMPLOYMENT LAW	2	2	0	0
CBSN-401 C	DISPUTE RESOLUTION AND LITIGATION				
CBSN-401 D	ENVIRONMENTAL LAW				
CCSN-451	ARTIFICIAL INTELLIGENCE LAB	1	0	0	2
CCSN-453	DISTRIBUTED COMPUTING SYSTEMS LAB	1	0	0	2
CCSN-481	SEMINAR & GROUP DISCUSSION	1	0	0	2
	Total	25	17	5	6

**PROFESSIONAL ELECTIVE-V**

1. CCSN 407 DIGITAL IMAGE PROCESSING
2. CCSN 409 MULTIMEDIA COMPUTING
3. CCSN 411 PATTERN RECOGNITION
4. CCSN 413 C# Programming

**OPEN ELECTIVE-III**

1. CUCS 441 CLIENT-SERVER COMPUTING
2. CUCS 443 NEURAL NETWORK
3. CUCS 445 ENGINEERING SYSTEM MODELING AND SIMULATION
4. CUCS 447 COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES



## VIII Semester

<b>Code</b>	<b>Course Title</b>	<b>Cr.</b>	<b>L</b>	<b>T</b>	<b>P</b>
CCSN-462	INTERNSHIP AND Report Presentation	20	0	0	40

# ***SYLLABUS***

# Mathematics-I

## CMAN-101

Cr. L T P  
4 3 1 0

### COURSE OBJECTIVES:

The objectives of this course are to

1. Develop a strong foundation in matrix algebra, including matrix operations, eigenvalues, eigenvectors, and matrix diagonalization.
2. Understand and solve higher-order ordinary differential equations using various methods, including Euler-Cauchy and variation of parameters.
3. Learn numerical methods for solving ordinary differential equations, such as Picard's method and Euler methods.
4. Explore functions of several variables, including limits, differentiability, Jacobians, and Taylor's theorem.
5. Study series solutions of second-order linear differential equations and properties of Bessel functions and Legendre polynomials.

### Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Apply matrix algebra techniques to solve linear equations, calculate eigenvalues and eigenvectors, and understand matrix diagonalization.
2. Solve linear and simultaneous differential equations using various analytical methods like Euler-Cauchy and variation of parameters.
3. Implement numerical methods to solve ordinary differential equations and analyze the convergence of infinite series.
4. Evaluate functions of several variables, apply the chain rule, and find extrema using Taylor's theorem and Jacobians.
5. Solve second-order differential equations using series methods and understand the properties of Bessel functions and Legendre polynomials.

### Unit-I

**Matrix Algebra:** Rank of a matrix, Inverse of a matrix by elementary operations; Solution of linear simultaneous equations and their numerical solutions by Gauss elimination, Eigenvalues and Eigenvectors of matrices by Cayley-Hamilton theorem; Diagonalisation of matrices; Orthogonal, Hermetian, Skew-Hermetian, Normal and Unitary matrices and their elementary properties.

### Unit-II

**Ordinary Differential Equations:** Linear differential equation of nth order with constant coefficients, Simultaneous Linear differential equations, Euler-Cauchy equations, Solution of second order differential equations by change of dependent and independent variables; Method of variation of parameters for second order differential equations.

### Unit-III

**Numerical Solution of ODE:** Picard's method, Taylor's series, Euler method & Modified Euler method. Definition of Sequence and series with example, Convergence of infinite series; Comparison test, Ratio test, Root test, Logarithmic test, De Morgan's test, Cauchy integral test.

#### **Unit-IV**

**Functions of Several Variables:** Limit continuity and differentiability of functions of two variables; Euler's theorem, Tangent plane and normal, Change of variables, Chain rule; Jacobians, Taylor's Theorem for two variables; Extrema of functions of two or more variables.

#### **Unit-V**

**Solution in Series:** Solution in series of second order linear differential equations with polynomial coefficients; Bessel and Legendre equations and their series solutions; Properties of Bessel functions and Legendre polynomials.

#### **Reference Books :**

1. Kreyszig, E. *Advanced Engineering Mathematics*. 8<sup>th</sup> Edition. Wiley Eastern, 2004.
2. Grewal, B.S. *Engineering Mathematics*. 39<sup>th</sup> Edition. Khanna Publishers, 2005.

**Course Description:**

This course introduces essential mathematical concepts and techniques for engineering students, covering calculus, linear algebra, differential equations, vector calculus, and probability theory. The aim is to provide students with the analytical tools needed to model and solve real-world engineering problems.

**Unit 1: Calculus**

Functions, Limits, and Continuity: Definitions, limit laws, and continuity.

Differentiation: Differentiation of functions, product and quotient rules, chain rule, higher-order derivatives.

Applications of Differentiation: Tangents and normals, maxima and minima, optimization problems, curve sketching.

Integration: Definite and indefinite integrals, techniques of integration (substitution, integration by parts), improper integrals.

Applications of Integration: Area under curves, volumes of solids of revolution.

**Unit 2: Linear Algebra**

Matrices and Determinants: Basic operations, types of matrices, determinants, properties.

System of Linear Equations: Gaussian elimination, inverse of a matrix, rank of a matrix, consistency of linear systems.

Eigenvalues and Eigenvectors: Definitions, properties, diagonalization, Cayley-Hamilton theorem, applications to systems of differential equations.

Vector Spaces: Subspaces, linear independence, basis, and dimension.

**Unit 3: Ordinary Differential Equations**

First-order Differential Equations: Separable equations, exact equations, integrating factors, applications (growth models, electrical circuits).

Second and Higher-order Differential Equations: Solutions of linear differential equations, homogeneous and non-homogeneous equations, method of undetermined coefficients, variation of parameters.

Applications: Mechanical vibrations, electrical networks, and other physical applications.

**Unit 4: Vector Calculus**

Vector Functions: Differentiation and integration of vector functions, gradient, divergence, and curl.

Line, Surface, and Volume Integrals: Green's theorem, Stokes' theorem, and Gauss's divergence theorem.

Applications: Fluid flow, electromagnetism, and potential fields.

### **Unit 5: Probability and Statistics**

Probability Theory: Basics of probability, conditional probability, independent events, Bayes' theorem.

Random Variables: Discrete and continuous random variables, probability density function (PDF), cumulative distribution function (CDF), and expectation.

Probability Distributions: Binomial, Poisson, and Normal distributions, applications to engineering problems.

Statistics: Measures of central tendency (mean, median, mode), measures of dispersion (variance, standard deviation), hypothesis testing, confidence intervals.

### **Recommended Textbooks:**

1. Advanced Engineering Mathematics by Erwin Kreyszig, 11th Edition, Wiley, 2020.
2. Higher Engineering Mathematics by B.S. Grewal, 44th Edition, Khanna Publishers, 2022.
3. Linear Algebra and Its Applications by David C. Lay, 6th Edition, Pearson, 2021.
4. Introduction to Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, 6th Edition, Academic Press, 2020.
5. Differential Equations and Boundary Value Problems: Computing and Modeling by C.H. Edwards and David E. Penney, 6th Edition, Pearson, 2018

**Course Description:**

This course aims to provide students with the basic mathematical tools and concepts essential for understanding more advanced topics in engineering. The focus is on algebra, trigonometry, coordinate geometry, basic calculus, and introductory probability and statistics, which form the foundation for problem-solving in engineering fields.

**Unit 1: Algebra**

Polynomials: Degree, factorization, roots of polynomials, quadratic equations, and their applications.

Arithmetic and Geometric Progressions: Definitions, nth term, sum of series, applications in engineering.

Binomial Theorem: Expansion, general term, and applications.

Logarithms: Properties of logarithms, solving logarithmic equations, applications.

**Unit 2: Trigonometry**

Trigonometric Functions: Definitions, identities, and equations.

Inverse Trigonometric Functions: Domains, ranges, and basic properties.

Trigonometric Equations: General solutions, applications to physical problems.

Applications of Trigonometry: Heights and distances, simple harmonic motion, and waves.

**Unit 3: Coordinate Geometry**

Straight Lines: Equation of a line in different forms, slope, angle between two lines, distance formula, applications.

Circles: Standard equation, tangents and normals, intersection of a circle with a line.

Conic Sections: Parabola, ellipse, and hyperbola - standard equations and simple properties.

Applications in Engineering: Modelling of trajectories and orbits, structural designs.

**Unit 4: Calculus**

Limits and Continuity: Concept of a limit, properties of limits, continuity of a function.

Differentiation: Basic rules, derivatives of standard functions, product rule, quotient rule, chain rule.

Applications of Differentiation: Rate of change, maxima and minima, curve sketching.

Integration: Basic rules of integration, integration of standard functions, definite and indefinite integrals.

Applications of Integration: Area under curves, volumes of revolution, and simple applications in physics.

### **Unit 5: Probability and Statistics**

Probability Basics: Definitions, sample space, events, conditional probability, independence, and Bayes' theorem.

Random Variables: Discrete and continuous, probability mass function (PMF), probability density function (PDF), cumulative distribution function (CDF).

Descriptive Statistics: Measures of central tendency (mean, median, mode), measures of dispersion (variance, standard deviation).

Basic Probability Distributions: Binomial, Poisson, and normal distributions.

Introduction to Hypothesis Testing: Null and alternative hypotheses, significance levels, z-tests and t-tests.

### **Recommended Textbooks:**

1. Basic Engineering Mathematics by John Bird, 8th Edition, Routledge, 2021.
2. Engineering Mathematics by K.A. Stroud and Dexter Booth, 8th Edition, Palgrave Macmillan, 2020.
3. College Algebra and Trigonometry by Margaret Lial, John Hornsby, David Schneider, 7th Edition, Pearson, 2021.
4. Introduction to Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, 6th Edition, Academic Press, 2020.
5. Calculus: Early Transcendentals by James Stewart, 9th Edition, Cengage Learning, 2020.



**Course Description:**

This course covers advanced mathematical techniques and applications necessary for solving engineering problems. It includes advanced calculus, differential equations, numerical methods, and complex variables, providing tools to model, analyze, and solve practical problems in engineering disciplines.

**Unit 1: Advanced Calculus**

Partial Differentiation: Functions of several variables, total derivatives, chain rule, Jacobians.

Taylor's Theorem for Multivariable Functions: Expansion of functions in two variables.

Maxima and Minima of Functions of Several Variables: Lagrange multipliers method and applications.

Multiple Integrals: Double and triple integrals, applications to area, volume, and center of mass.

Applications of Calculus: Engineering problems involving optimization, mass distribution, and fluid mechanics.

**Unit 2: Ordinary and Partial Differential Equations**

First-Order Differential Equations: Separable, exact, and linear equations, applications in mechanics and electrical circuits.

Higher-Order Differential Equations: Solutions of linear differential equations with constant coefficients, method of undetermined coefficients, and variation of parameters.

Partial Differential Equations (PDEs): Classification, method of separation of variables, wave equation, heat equation, and Laplace equation.

Applications: Mechanical vibrations, heat conduction, and fluid flow analysis.

**Unit 3: Numerical Methods**

Roots of Equations: Bisection method, Newton-Raphson method, and secant method.

Numerical Integration: Trapezoidal rule, Simpson's rule, and Gaussian quadrature.

Numerical Solutions to ODEs: Euler's method, Runge-Kutta methods (2nd and 4th order).

Finite Difference Methods for PDEs: Forward and backward difference methods, Crank-Nicolson method.

Applications: Numerical simulations in engineering problems such as heat transfer and structural analysis.

**Unit 4: Complex Variables and Complex Analysis**

**Complex Numbers and Functions:** Basic properties of complex numbers, polar form, complex functions, and their derivatives.

**Analytic Functions:** Cauchy-Riemann equations, harmonic functions, conformal mapping.

**Complex Integration:** Cauchy's theorem, Cauchy's integral formula, Taylor and Laurent series, residue theorem, and its applications.

**Applications in Engineering:** Fluid dynamics, electromagnetic fields, and signal processing.

### **Unit 5: Fourier Series and Laplace Transforms**

**Fourier Series:** Periodic functions, Fourier series expansions, half-range expansions, and applications in engineering (signal processing, vibrations).

**Laplace Transforms:** Definition and properties, inverse Laplace transforms, solving ordinary differential equations using Laplace transforms.

**Applications of Fourier Series and Laplace Transforms:** Solution of heat, wave, and Laplace equations, control systems, and circuit analysis.

### **Recommended Textbooks:**

1. Advanced Engineering Mathematics by Erwin Kreyszig, 11th Edition, Wiley, 2020.
2. Applied Mathematics for Engineers and Physicists by L.A. Pipes and L.R. Harvill, 4th Edition, Dover Publications, 2014.
3. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale, 8th Edition, McGraw-Hill, 2020.
4. Complex Variables and Applications by James Ward Brown and Ruel V. Churchill, 9th Edition, McGraw-Hill, 2021.
5. Fourier Analysis and Its Applications by Gerald B. Folland, 2nd Edition, American Mathematical Society, 2020.

**Course Description:**

This course provides an in-depth study of advanced mathematical concepts and methods used in engineering and applied sciences. It covers advanced topics such as optimization techniques, advanced numerical methods, transform techniques, special functions, and integral equations. These topics are essential for solving complex engineering problems.

**Unit 1: Optimization Techniques**

**Linear Programming:** Formulation, graphical method, simplex method, duality, sensitivity analysis.

**Non-Linear Programming:** Introduction to non-linear optimization, Lagrange multipliers, Kuhn-Tucker conditions.

**Dynamic Programming:** Bellman's principle of optimality, recursive equations, applications to inventory control, resource allocation.

**Applications:** Optimization problems in engineering, project management, and operations research.

**Unit 2: Advanced Numerical Methods**

**Interpolation and Extrapolation:** Newton's forward and backward interpolation, Lagrange interpolation, spline interpolation.

**Numerical Solutions to Nonlinear Systems:** Fixed-point iteration, Newton's method for systems of equations.

**Numerical Methods for ODEs and PDEs:** Higher-order Runge-Kutta methods, finite element method (FEM), finite volume method (FVM).

**Error Analysis and Stability:** Concepts of error, stability, and convergence in numerical methods.

**Applications:** Numerical simulation of fluid dynamics, structural analysis, and heat transfer.

**Unit 3: Integral Transforms**

**Fourier Transform:** Fourier integrals, Fourier cosine and sine transforms, properties and applications to PDEs.

**Laplace Transform:** Review of Laplace transforms, inverse Laplace transforms, convolution theorem, application to ODEs and PDEs.

**Z-Transform:** Introduction, properties, inverse Z-transform, application in discrete-time systems and digital signal processing.

**Applications:** Signal processing, control systems, electrical circuits, and mechanical vibrations.

#### **Unit 4: Special Functions**

Gamma and Beta Functions: Definitions, properties, and applications in engineering problems.

Bessel Functions: Bessel's equation, Bessel functions of the first and second kinds, applications in vibration and heat conduction problems.

Legendre Polynomials: Legendre's equation, generating functions, orthogonality, applications in potential theory and electrostatics.

Applications: Solutions to boundary value problems in cylindrical and spherical coordinates.

#### **Unit 5: Integral Equations and Calculus of Variations**

Integral Equations: Volterra and Fredholm integral equations, kernel functions, methods of solving integral equations, applications.

Green's Function: Application of Green's function to solve boundary value problems.

Calculus of Variations: Euler-Lagrange equation, isoperimetric problems, Hamilton's principle, applications to mechanics and engineering.

Applications: Structural mechanics, fluid dynamics, and electrostatics.

#### **Recommended Textbooks:**

1. Advanced Engineering Mathematics by Erwin Kreyszig, 11th Edition, Wiley, 2020.
2. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale, 8th Edition, McGraw-Hill, 2020.
3. Applied Mathematical Methods by J. David Logan, 4th Edition, Wiley, 2018.
4. Introduction to Optimization by Pablo Pedregal, 3rd Edition, Springer, 2021.
5. Special Functions for Scientists and Engineers by W.W. Bell, 2nd Edition, Dover Publications, 2014.

**UNIT-I**

**Two Dimensional Force Systems:** Basic concepts, Laws of motion, Principle of Transmissibility of forces, Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Lami's Theorem, Distributed force system, Free body diagrams, Types of supports- Support reactions for beams with different types of loading-Concentrated, uniformly distributed and uniformly varying loading.

**UNIT-II**

Beam: Introduction, Shear force and Bending Moment, Shear force and Bending Moment Diagrams for Statically Determinate Beams

Trusses: Introduction, Simple Truss and Solution of Simple truss, Method of Joints and Method of Sections.

**UNIT-III**

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy. Bending of Beams: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections. Theory of Torsion, Torque and twist, Shear stress due to torsion circular sections.

**UNIT-IV**

Centroid and Moment of Inertia: Centroid of plane, curve, area and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Mass Moment of Inertia

**Unit-V**

Engineering Thermodynamics: Thermodynamic system, Surrounding and the Universe, Control volume phase, Macroscopic & microscopic point of view, Thermodynamic equilibrium, Thermodynamic properties, State path process, Cyclic process, Laws of thermodynamics, Carnot cycle, Clausius inequality, Enthalpy and entropy, Principle of entropy increase.

**References:**

1. "Engineering Mechanics: Statics", J.L Meriam, Wiley
2. "Engineering Mechanics: Dynamics", J.L Meriam, Wiley
3. "Engineering Mechanics", F L Singer
4. "Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
5. "Engineering Mechanics", Timoshenko & Young, 4ed, Tata McGraw Hill
6. "Engineering Mechanics: Statics and Dynamics", A. Nelason, McGraw-Hill
7. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
8. "Engineering Mechanics : Statics and Dynamics", S. Rajasekaran and G. Sankarasubramanian, Vikas
9. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI
10. "Engineering Mechanics", D. P. Sharma, PHI
11. "Engineering Mechanics", M. V. Sheshagiri Rao, and D. Rama Durgaiyah, University Press.
12. "Engineering Mechanics", K L Kumar and V. Kumar, McGraw Hill

13. "Engineering Mechanics" , Bhattacharya , Oxford Press
14. "Engineering Mechanics " , Dr Sadhu Singh , Umesh Publications
15. "Engineering Mechanics " , Bhavikatti , New Age

**UNIT I****Fundamentals of Statically Determinate Structures**

Types of statically determinate & indeterminate structures, static and kinematic indeterminacy, stability of structures, principle of superposition, Maxwell's reciprocal theorems. Framed structure : Computation of internal forces in statically determinate framed structures such as plane truss, plane frame, grids.

**UNIT II****Strain energy & Displacement of Statically Determinate structures**

Strain Energy : Resilience, strain energy due to axial loads & flexure, proof resilience, modulus of resilience, impact loads, and sudden loads Displacement : Differential equation of elastic curve, relation between moment, slope and deflection, Displacement of beam by Macaulay's method

**UNIT III****Direct and Bending stresses + Column & Struts**

Direct and Bending stresses Members subjected to eccentric loads, middle third rule, kernel of Section, stress distribution. Applications of Direct & Bending stresses. Columns and Struts ,Buckling of columns, different end conditions, effective length, Least radius of gyration Applications: Euler's and Rankine's formulae,

**UNIT IV****Statically Indeterminate beam**

Types of statically indeterminate beams, Consistent Deformation Method, Basic principles for fixed beam, basics of moment distribution Method. Propped Cantilever beam : Analysis of propped cantilever beams. Fixed beam : Computation of fixed-end actions for various types of loads And secondary effects using basic principles, beams of varying moment of Inertia. Continuous beams

**UNIT V****Computer Applications in Structural Engg. (for Laboratory Only)**

Use of professional software such as STAAD-Pro, SAP, ETABS etc. for Determining response of frames structure of the topics related to this course

**Reference Books:**

1. Junarkar S.B. & Shah H.J.; Mechanics of Structures Vol-I; Charter publishing house, Anand
2. Wang. C.K., Intermediate Structural analysis. Tata McGraw Hill book Company. Delhi

**UNIT I**

**Introduction to Rigid Body Mechanics**

Definition and importance of rigid body mechanics. Basic concepts (position, displacement, velocity, acceleration). Reference frames (inertial, non-inertial). Rigid body idealization and modeling

**UNIT II**

**Kinematics of Rigid Bodies**

Translation, rotation, and general motion. Angular displacement, velocity, and acceleration. Euler's angles and rotation matrices. Relative motion and velocity analysis

**UNIT III**

**Kinetics of Rigid Bodies**

Newton-Euler equations. Angular momentum and moment of inertia. Work-energy principle and conservation of energy. Impulse-momentum principle

**UNIT IV**

**Planar Motion of Rigid Bodies**

. Planar kinematics and kinetics. Equations of motion (translation, rotation). Force and moment analysis. Application to linkages, gears, and cams

**UNIT V**

**Three-Dimensional Motion of Rigid Bodies**

3D kinematics and kinetics. Euler's equations and angular velocity. Gyroscopic motion and precession. Application to rotating shafts and machinery. Vibrations and Oscillations

**\*Textbook Recommendations:\***

1. Hibbeler, R. C. Engineering Mechanics: Dynamics. 14th ed.
2. Bedford, A., & Fowler, W. . Engineering Mechanics: Statics & Dynamics. 6th ed. McGraw-Hill.



**CMEN -101C**

**FLUID MECHANICS**

**UNIT I**

**INTRODUCTION**

Units & Dimensions. Properties of fluids - Specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws capillarity and surface tension concepts of system, energy equation, momentum equation

**UNIT II**

**FLOW THROUGH CIRCULAR CONDUITS**

Laminar flow through circular conduits and circular annuli. Boundary layer concepts. Boundary layer thickness. Hydraulic and energy gradient. Darcy Weisbach equation. Friction factor and Moody diagram. Commercial pipes. Minor losses. Flow through pipes in series and in parallel.

**UNIT III**

**DIMENSIONAL ANALYSIS**

Dimension and units: Buckingham's II theorem Discussion on dimensionless parameters. Models and similitude. Applications of dimensionless parameters.

**UNIT IV**

**ROTO DYNAMIC MACHINES**

Homologous units. Specific speed. Elementary cascade theory. Theory of turbo machines. Euler's equation. Hydraulic efficiency. Velocity components at the entry and exit of the rotor. radial flow and axial flow machines. Centrifugal pumps, turbines,

**UNIT V**

**POSITIVE DISPLACEMENT**

Reciprocating pumps, Indicator diagrams, Work saved by air vessels. Rotary pumps.

**REFERENCES BOOKS**

1. S. Fluid Mechanics, Hydraulics and Fluid Machines, Dhanpat Rai
2. Bansal, R.K., Fluid Mechanics and Hydraulics Machines, Laxmi Publications

## **CMEN-101 D**

## **FREE BODY DIAGRAM MECHANICS**

### **UNIT I**

#### **Introduction to Free Body Diagrams**

Definition and importance of free body diagrams Basic concepts (forces, moments, torques)  
Drawing free body diagrams Identifying support reactions

### **UNIT II**

#### **Equilibrium of Particles and Rigid Bodies**

Equilibrium equations (2D, 3D) Force and moment analysis Application to simple machines  
(levers, pulleys.) Center of gravity and center of mass; Moments and force

### **UNIT III**

#### **Force in Beams and Frames**

Beam analysis (simply supported, cantilever). Frame analysis (simple, compound). Force and  
moment diagrams. Application to structural systems

### **UNIT IV**

#### **Torques and Rotational Equilibrium**

Torque and rotational equilibrium. Application to gears, pulleys, and shafts. Rotational kinematic  
Angular momentum.

### **UNIT V**

#### **Stress and Strain Analysis**

Introduction to stress and strain. Axial loading Torsional loading. Bending and shear stress

\*Textbook Recommendations:\*

1. Hibbeler, R. C. (2020). Engineering Mechanics: Statics & Dynamics. 14th ed. Pearson.
2. Beer, J. P., & Johnston, E. R. (2020). Mechanics of Materials. 8th ed. McGraw-Hill.

## CECN-101 FUNDAMENTALS OF ELECTRONICS

Cr. L T P  
4 3 1 0

### COURSE OBJECTIVES:

The objectives of this course are to

1. Understand the working principles of semiconductor diodes, their characteristics, and practical applications.
2. Learn the construction, operation, and configurations of Bipolar Junction Transistors (BJTs) and Field Effect Transistors (FETs).
3. Explore the basics and practical applications of Operational Amplifiers in analog circuits.
4. Master digital electronics concepts, including Boolean algebra, K-map minimization, and gate simplifications.
5. Gain knowledge of communication systems, focusing on modulation techniques and wireless communication technologies.

### Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Describe the concept of PN Junction and devices.
2. Explain the concept of BJT, FET and MOFET.
3. Apply the concept of Operational amplifier to design linear and non-linear applications.
4. Perform number systems conversions, binary arithmetic and minimize logic functions.
5. Describe the fundamentals of communication technologies.

### UNIT-I

**Semiconductor Diode:** Depletion layer, V-I characteristics, ideal and practical Diodes, Diode Equivalent Circuits, Zener Diodes breakdown mechanism (Zener and avalanche)

**Diode Application:** Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits

**Special Purpose two terminal Devices:** Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes.

### UNIT-II

**Bipolar Junction Transistor:** Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration

**Field Effect Transistor:** Construction and Characteristic of JFETs. Transfer Characteristic. MOSFET (MOS) (Depletion and Enhancement) Type, Transfer Characteristic.

### UNIT-III

**Operational Amplifiers:** Introduction, Op-Amp basic, Practical Op-Amp Circuits (Inverting Amplifier, Non-inverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator). Differential and Common-Mode Operation, Comparators.

### UNIT-IV

**Digital Electronics:** Number system & representation, Binary arithmetic, Introduction of Basic and Universal Gates, using Boolean algebra simplification of Boolean function. K Map Minimization upto 6 Variables.

## **UNIT-V**

**Fundamentals of Communication Engineering:** Basics of signal representation and analysis, Electromagnetic spectrum Elements of a Communication System, Need of modulation and typical applications, Fundamentals of amplitude modulation and demodulation techniques.

**Introduction to Wireless Communication:** Overview of wireless communication, cellular communication, different generations and standards in cellular communication systems, Fundamentals of Satellite & Radar Communication.

### **Text Books:**

1. Robert L. Boylestand / Louis Nashelsky “Electronic Devices and Circuit Theory”, Pearson Education.
2. George Kennedy, “Electronic Communication Systems”, McGrawPublication
3. David A. Bell, “Electronic Devices and Circuits”, Oxford UniversityPress.
4. Jacob Millman, C.C. Halkias, StayabrataJit, “Electronic Devices and Circuits”, McGrawHill.
5. A. Anand Kumar, “Fundamental of Digital Circuits,” PHI 4th edition, 2018.

4 3 1 0

**Unit-I**

**Bipolar Junction Transistors:** Transistor amplifier, small signal Equivalent circuits (Hybrid- $\pi$  model), Graphical Analysis, biasing the BJT for discrete-circuit design, Basic Single Stage BJT amplifier configurations.

**Unit-II**

**MOSFETS:** Construction of Enhancement and Depletion mode MOSFET, Drain & Transfer characteristics, Internal capacitances of MOSFET, MOSFET as an amplifier, Biasing in MOS amplifier circuits, Basic configurations of MOS amplifier, Analysis of Source follower.

**Unit-III**

**Frequency Response:** BJT internal capacitances and high frequency model, frequency response of CE amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier.

**Unit-IV**

**Feed Back:** Properties of negative feedback, four basic feedback topologies (series shunt; series-series; shunt-shunt; & shunt-series) determination of Loop gain

**Unit-V**

**Oscillators:** Basic principles of sinusoidal oscillator Different oscillator circuits (RC phase shift, Wein-bridge, Collpitts, Hartley, Clap. and Crystal Oscillators.)

**Reference Books:**

1. A.S. Sedra and K.C. Smith, "Microelectronic circuits", Oxford University Press (India).
2. Boylestad&Nashelsky "Electronic Device and Circuit."
3. Millman, J. and Grabel, A./"Microelectronics"/McGraw Hill.
4. Bell, David A/ "Electronic Devices & Circuits"/Prentice Hall (India) 4<sup>th</sup> Edition

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### Unit-I

**Introduction:** Types of Digital circuits and their characteristics, Number system: Direct conversion between bases, Negative numbers & BCD and their arithmetic's, Boolean algebra, Logic gates, Minimization of Boolean Functions: K-Map & Tabular method, Error detecting & correcting codes, hamming codes.

### Unit-II

**Combinational Logic Circuits:** Design Procedure, Adders, Subtractors, Code conversion, Multiplexers/ Demultiplexers, Encoder/ decoders, decimal adders & amplitude comparators. Decoder and driver circuits for 7-segment LED displays.

### Unit-III

**Sequential Logic Circuits:** Flip-Flops and their conversions, excitation table, state table & state diagram, state reduction, Shift registers and their applications. Design of synchronous and asynchronous counters.

### Unit-IV

**Memory and Programmable Logic:** RAM, Types of RAM. ROM, Types of ROM. Programmable Logic Device (PLD), Programmable Logic Array(PLA), Programmable Array Logic(PAL).

### Unit-V

**Asynchronous Sequential Logic:** Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

### Reference Books :

1. Digital Design by M Moris Mano, 2nd Edn.PHI
2. Introduction to Digital Microelectronic Circuits, by Gopalan, TMH.
3. Switching Circuit & Logic Design by Hill & Peterson, Wiley
4. Digital Circuit & Logic Design, by Holsworth.

## UNIT I

**Measuring Instruments:** Classification , deflecting, control and damping torques , Ammeters and Voltmeters , PMMC, moving iron type instruments , expression for the deflecting torque and control torque , Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type Extension of range of E.S. Voltmeters.

**Instrument transformers:** CT and PT – Ratio and phase angle errors , design considerations Type of P.F. Meters – dynamometer and moving iron type 1-ph and 3-ph meters , Frequency meters , resonance type and Weston type , synchrosopes.

## UNIT II

**Measurement of Power:** Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques , Extension of range of wattmeter using instrument transformers , Measurement of active and reactive powers in balanced and unbalanced systems.

## UNIT III

**Measurement of Energy:** Single phase induction type energy meter , driving and braking torques , errors and compensations , testing by phantom loading using R.S.S. meter. Three phase energy meter, trivector meter, maximum demand meters.

## UNIT IV

**Potentiometers:** Principle and operation of D.C. Crompton's potentiometer, standardization Measurement of unknown resistance, current, voltage.

**Resistance Measurements:** Method of measuring low, medium and high resistance , sensitivity of Whetstone's bridge , Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance , loss of charge method.

## UNIT V

**A.C. Bridges:** Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle, Desauty Bridge. Wien's bridge, Schering Bridge.

**Magnetic Measurements:** Ballistic galvanometer, equation of motion, flux meter, constructional details, comparison with ballistic galvanometer. Determination of B-H Loop methods of reversals six point method , A.C. testing , Iron loss of bar samples, core loss measurements by bridges and potentiometers.

**TEXT BOOKS:**

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, fifth Edition, Wheeler Publishing.
2. Electrical & Electronic Measurement & Instruments by A.K.Sawhney, DhanpathRai& Co.

**REFERENCE BOOKS**

1. Electrical Measurements by Buckingham and Price, Prentice Hall of India
2. Electrical Measurements: Fundamentals, Concepts, Applications by Reissland, M.U, New Age International (P) Limited, Publishers



**Unit-I**

Review of Vector analysis, Rectangular, Cylindrical and Spherical coordinates and their transformation. Divergence, gradient and curl in different coordinate systems. Divergence's theorem and Stoke's theorem.

**Unit-II**

Electric field intensity, Electric Flux density, Energy and potential. Current and conductors, Dielectrics and capacitance, Poisson's and Laplace's equation.

**Unit-III**

Steady magnetic field, magnetic forces, materials and inductance, Time varying field and Maxwell's equation.

**Unit-IV**

Uniform plane waves: wave propagation in free space, dielectrics, and conductors. Poynting Vector, Plane wave reflection at normal incidence.

**Unit-V**

Transmission lines: Line equations, line parameters and line examples. Smith chart, Application of transmission lines.

**Reference Books:**

1. William H.Hayt, John A.Buck, 'Engineering Electromagnetics', Tata McGraw Hill Publishing Co. Ltd., New Delhi Sixth edition.
2. Jordan E.C. and Balmain K.G. "Electromagnetic wave and radiating systems",PHI, Second edition.
3. Mathew M.O.Sadiku, "Element of Electromagnetics", Oxford Press, 4th Edition.

## CESN-101 Engineering Chemistry and Environmental Studies

Cr. L T P  
4 3 1 0

### Unit 1: Fuels:

Introduction, Classification of fuels, Calorific value, Methods for determination of Calorific value of fuel, Classification of coal by rank, Analysis of coal, Proximate & Ultimate analysis of coal, Biomass, Biogas, Biodiesel: Definition, Types, Physical Characteristics and Biodiesel Production procedure.

### Unit 2 Polymers:

Introduction, Nomenclature of polymers, Functionality, Types of Polymerization, Classification of Polymers, Plastics, Important Thermoplastic and Thermosetting Resins, Synthetic Fibres, Ion-exchange resins, Rubbers (Elastomers), Vulcanization of rubber, De-vulcanization, Synthetic rubbers or elastomers, Application of rubber, Bio-polymers, Degradation of polymers.

### Unit 3 Water Technology:

Introduction, Hardness of water: Temporary and Permanent hardness; Equivalents of Calcium Carbonate, units of hardness, Disadvantage of hard water, Boiler troubles, Scale and sludge formation in boilers and their disadvantage, Boiler corrosion, Caustic embrittlement, Priming and foaming, water softening methods: Permutit process, De-ionization process, Lime-soda process.

### Unit 4: Environmental pollution and its impact:

Environment and Atmosphere; Kinds of pollution; Air pollution: Greenhouse effect, Acid rains and global warming; Noise pollution; Water and Solid waste pollution: Industrial effluents and wastes, Ground water pollution, Lead pollution, Fluoride pollution; Radiation and chemical toxicology.

### Unit 5 Pollution Cleanup:

Prevention and control of air pollution: Source correction, Collection of pollutants, Cooling, Treatment; Prevention and control of water pollution: Stabilization of the ecosystem, Reutilization and Recycling of waste, Removal of Pollutants; Solid waste management: Collection, Disposal, etc.; Bioremediation: Introduction, Phytoremediation.

### Reference Books:

- Textbook of Engineering Chemistry, 2024, Wiley Publishers (ISBN: 9789357460972)972
- Jain, M. and Jain, P.C., Engineering Chemistry, 17th edition, DhanpatRai Publishing Company (P) Ltd., New Delhi.
- Engineering Chemistry Second Edition, Publisher: McGraw Hill Education India, ISBN: 9789352605774.

- Kuriacose and Rajaram, Chemistry in Engineering and Technology, TMH, Delhi.
- Sharma, P.D., Ecology and Environment, 11th edition, Rastogi Publications, Meerut.
- Gupta, K.M. Environmental Studies, Umesh Publications, Delhi.
- Gopalan, R.R., Environmental Studies: from crisis to cure, Oxford University Press, New Delhi.

# CESN-101 A

## Chemical Thermodynamics

**Course Description:** This course provides an in-depth understanding of chemical thermodynamics, focusing on the laws of thermodynamics, thermodynamic properties, phase and chemical equilibria, and the thermodynamics of solutions. It is designed for students, covering both fundamental and advanced topics.

### Unit 1: Basic Concepts of Thermodynamics

Thermodynamic Systems and Processes: Definition of system, surroundings, and boundaries, Types of systems: isolated, closed, and open systems, Thermodynamic processes: isothermal, adiabatic, isobaric, and isochoric processes, State and path functions (internal energy, work, heat)

Zeroth Law of Thermodynamics: Concept of thermal equilibrium, Temperature and its measurement

First Law of Thermodynamics: Concept of internal energy (U) and enthalpy (H), Mathematical form of the first law:  $\Delta U = q + w$ , Work done in various processes (PV work, electrical work), Specific heat capacities ( $C_p$  and  $C_v$ ) and their relation

Application of the First Law: Internal energy changes in ideal and real gases, Joule-Thomson effect, Joule-Thomson coefficient, inversion temperature

### Unit 2: Second Law of Thermodynamics and Entropy

Second Law of Thermodynamics: Limitations of the first law, Concepts of heat engines and refrigerators, Carnot cycle and its efficiency

Entropy (S): Definition of entropy and its physical significance, Entropy changes in reversible and irreversible processes, Entropy of the universe and the second law

Applications of the Second Law: Clausius inequality, Entropy change in mixing of gases, Free expansion of gases and its relation to entropy

Third Law of Thermodynamics: Nernst heat theorem, Absolute entropy and its significance

### Unit 3: Thermodynamic Potentials and Equilibrium

Thermodynamic Potentials: Definitions of thermodynamic potentials (Gibbs free energy, Helmholtz free energy, Enthalpy, Internal energy), Maxwell relations and their applications, Gibbs-Helmholtz equation and its significance

Criteria for Spontaneity: Conditions for equilibrium and spontaneity ( $\Delta G < 0$  for spontaneous processes), Phase equilibrium and phase rule, Le Chatelier's principle and its applications

Chemical Equilibrium: Law of mass action and equilibrium constant, Temperature dependence of equilibrium constant (Van't Hoff equation), Relation between free energy and equilibrium constant,

Phase Equilibria:Phase diagrams for one-component systems (water and sulfur), Clausius-Clapeyron equation and its applications

#### **Unit 4: Thermodynamics of Solutions**

Ideal and Non-Ideal Solutions:Raoult's law and deviations from ideal behavior, Henry's law and its applications, Activity, activity coefficient, and their significance

Thermodynamics of Mixing:Partial molar quantities (partial molar volume, partial molar Gibbs free energy), Gibbs-Duhem equation, Chemical potential and its variation with temperature and pressure

Colligative Properties:Lowering of vapor pressure, elevation of boiling point, depression of freezing point, Osmotic pressure and its applications in determining molecular weight

Applications in Electrolyte Solutions:Thermodynamic properties of electrolytes, Debye-Hückel theory of ion-ion interactions

#### **Recommended Books:**

1. "Thermodynamics: An Engineering Approach" by Yunus A. Çengel and Michael A. Boles (2021)
2. "Introduction to Chemical Engineering Thermodynamics" by J.M. Smith, H.C. Van Ness, and M.M. Abbott (2017)
3. "Chemical Thermodynamics: Advanced Applications" by J. Bevan Ott and Juliana Boerio-Goates (2019)
4. "Modern Thermodynamics: From Heat Engines to Dissipative Structures" by DilipKondepudi and Ilya Prigogine (2014)
5. "Molecular Driving Forces: Statistical Thermodynamics in Biology, Chemistry, Physics, and Nanoscience" by Ken A. Dill and Sarina Bromberg (2018)

## **CESN-101 B**

### **Chemical Kinetics**

**Course Description:** This course focuses on the study of the rates of chemical reactions and the factors influencing them. Topics include reaction mechanisms, theories of reaction rates, and advanced concepts in kinetics. The aim is to equip students with a thorough understanding of both the theoretical and practical aspects of chemical kinetics.

#### **Unit 1: Fundamentals of Chemical Kinetics**

Basic Concepts: Definition of reaction rate and rate laws, Order and molecularity of a reaction, Rate constant and its units for different orders of reactions, Elementary and complex reactions  
Integrated Rate Equations: Zero-order, first-order, second-order reactions, Half-life period for different orders of reactions, Determination of order of reaction using integrated rate laws  
Experimental Methods of Studying Kinetics: Methods of determining reaction rates (flow, stopped-flow, relaxation methods), Spectroscopic methods, electrical methods, and pressure measurement

#### **Unit 2: Theories of Reaction Rates**

Collision Theory: Basic postulates of collision theory, Effective collisions and activation energy, Dependence of rate on temperature and concentration  
Transition State Theory (TST): Concept of activated complex, Energy profiles of reactions, Eyring equation and its applications  
Arrhenius Equation: Temperature dependence of reaction rates, Interpretation of Arrhenius parameters ( $A$  and  $E_a$ ), Determination of activation energy  
Comparative Study of Collision and Transition State Theories: Merits and limitations of both theories

#### **Unit 3: Reaction Mechanisms**

Reaction Mechanisms: Elementary steps and their importance in mechanisms, Steady-state approximation and rate-determining step theory  
Unimolecular and Bimolecular Reactions: Lindemann-Hinshelwood mechanism for unimolecular reactions, Chain reactions:  $H_2-Br_2$  reaction and decomposition of acetaldehyde  
Catalysis and Reaction Mechanism: Homogeneous and heterogeneous catalysis  
Enzyme catalysis: Michaelis-Menten mechanism, Role of catalysts in altering reaction pathways

#### **Unit 4: Complex Reactions and Kinetics in Solutions**

Complex Reactions: Parallel, consecutive, and reversible reactions, Analysis of complex reaction mechanisms, Chain reactions and explosion limits (e.g., hydrogen-oxygen reaction)

Reactions in Solutions: Factors influencing reaction rates in solution (solvent effect, ionic strength), Diffusion-controlled and activation-controlled reactions

Kinetics of fast reactions in solutions: relaxation methods, flash photolysis

Kinetics of Polymerization: Free-radical polymerization kinetics, Chain initiation, propagation, and termination

### **Recommended Books:**

1. "Chemical Kinetics and Reaction Dynamics" by Paul L. Houston (2020)
2. "Essentials of Chemical Kinetics" by C. Kalidas and V. Rajaram (2019)
3. "Chemical Kinetics: From Molecular Structure to Chemical Reactivity" by Luis Arnaut, Sebastiao Jose Formosinho, and Hugh Burrows (2018)
4. "Reaction Kinetics: Principles and Applications in Organic and Biological Chemistry" by Keith J. Laidler (2018)
5. "Chemical Reaction Engineering and Kinetics" by Jorge Ancheyta (2021)

## **CESN-101 C**

### **Environmental Chemistry**

**Course Description:** This course provides an understanding of chemical processes occurring in the environment, including the atmosphere, hydrosphere, lithosphere, and biosphere. It focuses on the chemistry of pollutants, environmental degradation, and sustainable practices for environmental protection.

#### **Unit 1: Fundamentals of Environmental Chemistry**

Introduction to Environmental Chemistry: Definition, scope, and importance of environmental chemistry, Segments of the environment: atmosphere, hydrosphere, lithosphere, and biosphere, Chemical composition of air, water, and soil  
Environmental Cycles: Biogeochemical cycles (carbon, nitrogen, sulfur, phosphorus cycles), Role of microorganisms in biogeochemical cycles  
Concepts of Green Chemistry: Principles of green chemistry and sustainability, Environmental impact of chemical processes and industrial activities, green solvents, catalysts, and alternative energy sources

#### **Unit 2: Atmospheric Chemistry**

Structure and Composition of Atmosphere: Layers of the atmosphere: troposphere, stratosphere, mesosphere, thermosphere, Composition and chemical reactions in the atmosphere  
Air Pollution and Global Warming: Primary and secondary pollutants (SO<sub>x</sub>, NO<sub>x</sub>, CO, particulate matter, VOCs), Greenhouse gases and their effects on global warming, Photochemical smog, acid rain, and ozone depletion  
Monitoring and Control of Air Pollution: Air quality standards and monitoring techniques (AQI, particulate matter sensors), Control measures: scrubbers, electrostatic precipitators, catalytic converters

#### **Unit 3: Water Chemistry and Pollution**

Water Quality Parameters: Physical parameters (temperature, color, turbidity), Chemical parameters (pH, dissolved oxygen, BOD, COD, alkalinity, hardness), Biological parameters (coliform bacteria, microbial contamination)  
Water Pollution: Sources of water pollution (domestic, industrial, agricultural), Heavy metals in water (lead, mercury, cadmium, arsenic) and their toxicity, Eutrophication and its effects on aquatic ecosystems  
Water Treatment and Purification: Primary, secondary, and tertiary treatment of wastewater  
Methods of water purification: filtration, coagulation, flocculation, sedimentation, disinfection (chlorination, UV treatment), Desalination and reverse osmosis techniques



## **Unit 4: Soil Chemistry and Waste Management**

Soil Composition and Chemistry: Composition of soil: minerals, organic matter, water, air, Soil properties: pH, cation exchange capacity, nutrient availability, Soil pollutants: pesticides, heavy metals, industrial wastes

Soil Pollution: Sources of soil contamination: fertilizers, pesticides, industrial discharge, Effects of soil pollution on plant growth and food safety, Remediation techniques: bioremediation, phytoremediation, chemical methods

Solid Waste Management: Types of solid waste: municipal, hazardous, biomedical

Waste management practices: recycling, composting, incineration, landfills, Hazardous waste management and disposal

### **Recommended Books:**

1. "Environmental Chemistry: A Global Perspective" by Gary W. vanLoon and Stephen J. Duffy (2021)
2. "Environmental Chemistry" by Stanley E. Manahan (2022)
3. "Principles of Environmental Chemistry" by James Girard (2020)
4. "Introduction to Environmental Chemistry" by Julian E. Andrews, Peter Brimblecombe, and Tim D. Jickells (2020)
5. "Environmental Chemistry: Fundamentals" by Ronald A. Hites and Jonathan D. Raff (2021)

## **CESN-101 D**

### **Natural Resource Management**

**Course Description:** This course focuses on the sustainable management of natural resources such as water, soil, forests, and minerals. It covers the principles of conservation, management strategies, the socio-economic implications of resource use, and the role of policy and governance in resource management.

#### **Unit 1: Introduction to Natural Resources**

Definition and Classification of Natural Resources: Renewable and non-renewable resources  
Biotic and abiotic resources, Resource availability, scarcity, and carrying capacity  
Global and National Resource Distribution: Geographical distribution of resources (water, forests, minerals), Resource consumption patterns: global vs. local scenarios, Depletion and degradation of natural resources  
Principles of Sustainable Resource Management: Sustainability concepts and sustainable development goals (SDGs), The role of science, technology, and innovation in resource management

#### **Unit 2: Water Resource Management**

Water Resources: Types of water resources: surface water, groundwater, glaciers, oceans, Hydrological cycle and water balance, Freshwater availability and demand  
Water Pollution and Scarcity: Sources and types of water pollution (industrial, agricultural, domestic), Impact of water pollution on ecosystems and human health, Global water scarcity and strategies to combat it  
Water Conservation and Management: Rainwater harvesting, groundwater recharge, watershed management, Irrigation management techniques  
Policies for sustainable water resource management: National Water Policy, Integrated Water, Resource Management (IWRM)

#### **Unit 3: Forest Resource Management**

Importance of Forests: Forest ecosystems and their role in maintaining biodiversity, Forest resources and their economic, ecological, and social significance  
Deforestation and Forest Degradation: Causes of deforestation (agriculture, urbanization, logging), Impacts of deforestation on climate, biodiversity, and indigenous communities  
Forest Conservation and Sustainable Management: Afforestation, reforestation, and agroforestry, Forest certification programs (FSC) and sustainable logging practices, Community-based Forest management and Joint Forest Management (JFM)

#### **Unit 4: Soil and Mineral Resource Management**

Soil Resources:Types of soils, soil formation, and soil profiles, Soil fertility and its importance in agriculture, Soil erosion, desertification, and degradation

Soil Conservation Techniques:Soil conservation methods: contour plowing, terracing, crop rotation, Integrated soil management practices, Policies for sustainable agriculture and soil conservation

Mineral Resources:Types of mineral resources: metallic and non-metallic mineralsGlobal distribution of minerals and mining activities

Environmental impacts of mining: pollution, habitat destruction, land degradation

Sustainable Mining Practices:Techniques for reducing environmental impact of mining (e.g., rehabilitation, reforestation), Waste management in mining (tailings and their treatment),

Responsible mining initiatives and policies

### **Recommended Books:**

1. "Sustainable Resource Management: Global Trends, Visions, and Policies" by Stefan Brinzeu and AnkeSchandl (2021)
2. "Natural Resource and Environmental Economics" by Roger Perman, Yue Ma, and Michael Common (2020)
3. "Natural Resource Conservation: Management for a Sustainable Future" by Daniel D. Chiras and John P. Reganold (2021)
4. "Natural Resource Management: Principles and Practices" by B.W. Pandey (2020)
5. "Water Resources Management: Principles, Challenges and Solutions" by Neil S. Grigg (2020)

**Unit – I**

**Essential Grammar:** Basic Clause/Sentence Patterns, Correct Usage of Different Word-Classes, Articles, Tense, Syntactic Concord, Prepositions, Transformation, Synthesis, Graded Syntactic Structures.

**Unit – II**

**Essential Vocabulary:** Basic words, Synonyms, Antonyms, Homophones, One-Word Substitutes, Idioms and Phrases, Word-formation-**Suffix and Prefix**, Technical Vocabulary.

**Linguistic Skills:** Listening, Speaking, Reading, and Writing (Activities to be Selected by the Teacher).**Strategies for Active Listening, Introduction to Phonetics-Monophthongs, Diphthongs and Consonant sound symbols. Newspaper reading and Precis Writing, SQ3R technique of Reading& Comprehension Passage.**

**Unit – III**

**Language Through Literature:** Non-Fiction &/or Fiction, Verse, and Play  
Bacon's *Essays* (Selection) and/or Lamb's *Tales from Shakespeare* (Selection)  
Keats' *The Eve of St Agnes/ Ode To Autumn/Ode to A Nightingale*  
Tagore's *Chitra/ Gitanjali(Lyric 1-5)*

**Unit – IV**

**Speaking Professionally:** Job Interviews, Group-Discussions, **Difference between GD and Debate**, Public Speaking, Argumentative Skills, Role-Plays, Presentation Skills, **Significance of Body Language**

**Reference Books :**

1. Hornby, A.S. *Guide to Patterns & Usage in English*. 2<sup>nd</sup>ed. New Delhi: Oxford University Press, 2002. Print.
2. Swan, Michael. *Practical English Usage*. 3<sup>rd</sup>ed. New Delhi: Oxford University Press, 2006. Print.
3. Carter, R. and M. McCarthy. *Cambridge Grammar of English*. New Delhi: Cambridge University Press, 2006. CD-ROM, Print.
4. McCarthy, M. and F. O'Dell. *English Vocabulary in Use*. New Delhi: Cambridge University Press, 2006. Print.
5. Kumar, E. Suresh and P. Sreehari. *A Handbook for English Language Laboratories*. New Delhi: Cambridge University Press, 2007. Print.

## **English Communication**

### **CPCN-101 A**

Units: 1

Introduction: Theory of Communication, Types and modes of Communication Language of Communication: - Verbal and Non-verbal (Spoken and Written) - Personal, Social and Business - Barriers and Strategies - Intra Personal, Inter Personal and Group Communication

Unit 2

Listening Skills- Listening to others, Listening short Lectures and Videos, Types of Listening, How to improve our listening skills?

Unit: 3

Speaking Skills: - Monologue - Dialogue - Group Discussion - Effective Communication/ Mis-Communication - Interview - Public Speech

Unit 4

Reading and Understanding - Close Reading - Comprehension - Summary Paraphrasing - Analysis and Interpretation - Translation(from Indian language to English and vice-versa) Literary/Knowledge Texts

Unit 5

Writing Skills - Documenting - Report Writing - Making notes - Letter Writing

## **English**

**Sub Code: CPCN-101 B**

Unit: 1

Basic Essential Grammar: Parts of Speech, Tenses, Sentence Pattern, Correct Usage of different word classes, Syntax Concord, Transformation, Syntheses, Articles, Prepositions

Unit 2

Vocabulary: Synonyms, Antonyms, Homophones, Homonyms, One word substitution, Idiom and Phrases, Word Formation, Words often confused, Technical Vocabulary

Unit: 3

Linguistic Skills-Listening skills, Speaking Skills, Reading Skills, Writing Skills (Activities also done selected by teacher)

Unit 4

Professional Speaking- Group Discussion, Debate, Public Speaking, Job Interview, Role Plays, Presentation Skills

Unit 5

Writing Skills - Documenting - Report Writing - Making notes - Letter Writing, Proposal Writing, Paragraph Writing

## **Technical Communication**

**Sub Code: CPCN-101 C**

Unit: 1

Grammar rules -articles, tenses, auxiliary verbs (primary & modal) prepositions, subject-verb agreement, pronoun-antecedent agreement, discourse markers and sentence linkers  
General Reading and Listening comprehension – rearrangement & organization of sentences

Unit 2

Different kinds of written documents: Definitions- descriptions- instructions-recommendations- user manuals – reports – proposals, writing formal Letters, punctuation  
Scientific Reading & Listening Comprehension

Unit: 3

Technical paper writing: documentation style – document editing – proof reading – Organizing and formatting, Modifiers, phrasal verbs, tone and style, graphical representation  
Reading and listening comprehension of technical documents

Unit 4

Professional Speaking- Group Discussion, Debate, Public Speaking, Job Interview, Role Plays, Presentation Skills

Unit 5

Phonetics- International Phonetic Alphabet, Phonemes, Allophones, Phonetics Transcription, Organ of speech.

## **Human Values, De-addiction and Traffic Rules**

### **CPCN-101 D**

#### **Unit: 1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

- Understanding the need, basic guidelines, content and process for Value Education
- Self-Exploration– content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels

#### **Unit 2 Understanding Harmony in the Human Being - Harmony in Myself!**

- Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’  
Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha
- Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
- Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Swasthya

#### **Unit: 3 Understanding Harmony in the Family and Society- Harmony in Human Relationship**

- Understanding harmony in the Family- the basic unit of human interaction
- Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
- Understanding the meaning of Vishwas; Difference between intention and competence 16.  
Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

#### **Unit 4 Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature
- Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space
- Holistic perception of harmony at all levels of existence

#### **Unit 5 Implications of the above Holistic Understanding of Harmony on Professional Ethics**



- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

**COURSE OUTCOMES**

	<b>Course Outcome (CO)</b>
At the end of this course, the students should be able to:	
CO 1	Study and practice on machine tools and their operations
CO 2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
CO 3	Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
CO 4	Welding and soldering operations
CO 5	Apply basic electrical engineering knowledge for house wiring practice

**LIST OF EXPERIMENTS****Machine shop:**

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

**Fitting shop:**

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

**Carpentry:**

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

**Welding:**

- Instruction of BI standards and reading of welding drawings.

- Butt Joint

- Lap Joint

### **Smithy**

- Sharpening any arc and edge.

- Preparing small arc and edge,

- Repair of agricultural implements and power plough, use of power hammer etc.

### **Text Books:**

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, DhanpathRai& Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.andPranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

### □ Basic Drawing Operations

- Objective: Familiarize with basic drawing tools.
- Activities:
  - Draw a line using two endpoints.
  - Draw a circle given a center and radius.
  - Draw a rectangle with specified coordinates.

### □ Transformations

- Objective: Apply geometric transformations.
- Activities:
  - Implement translation of shapes (move by dx, dy).
  - Implement rotation of shapes around a point.
  - Implement scaling of shapes (increase/decrease size).

### □ Drawing 2D Shapes

- Objective: Create various 2D shapes.
- Activities:
  - Draw a triangle given three vertices.
  - Draw a polygon by specifying the number of vertices and their coordinates.

### □ Basic CAD Commands

- Objective: Understand basic CAD functionalities.
- Activities:
  - Draw an arc using center, radius, start angle, and end angle.
  - Implement a Bezier curve using control points.

### □ Parametric Equations for Curves

- Objective: Use parametric equations to draw curves.
- Activities:
  - Draw a parametric curve (e.g., a sine wave).
  - Visualize parametric equations in 2D space.

### □ 3D Projections

- Objective: Understand 3D object representation.
- Activities:
  - Create isometric projections of simple shapes.
  - Draw orthographic views (front, top, side) of 3D objects.

### □ Sectional Views

- Objective: Learn to create sectional views.
- Activities:
  - Generate a sectional view of a given solid object.
  - Illustrate the differences between full and half sections.

#### □ Dimensioning Techniques

- Objective: Apply dimensioning standards.
- Activities:
  - Add linear and angular dimensions to a drawing.
  - Practice dimensioning for clarity and accuracy.

#### □ Rendering Techniques

- Objective: Enhance drawings with rendering techniques.
- Activities:
  - Apply shading to 2D shapes.
  - Use textures and gradients for better visual representation.

#### □ CAD Software Basics

- Objective: Introduction to CAD software tools.
- Activities:
  - Create a simple project using CAD software.
  - Familiarize with layers, commands, and saving/exporting drawings.

## COMMUNICATION LAB

CPCN- 151

L

T P C

0 0 2 1

**The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.**

**Syllabus:**English Language and Communication Skills Lab (ELCS) shall have two parts:

**a. Computer Assisted Language Learning (CALL) Lab**

**b. Interactive Communication Skills (ICS) Lab**

**Listening Skills**

**Objectives 1.** To enable students develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation.

2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions.

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

**Speaking Skills**

**Objectives 1.** To involve students in speaking activities in various contexts

2. To enable students express themselves fluently and appropriately in social and professional contexts •

Oral practice: Just a Minute (JAM) Sessions

- Describing objects/situations/people
- Role play – Individual/Group activities

**Exercise – I**

**CALL Lab:**

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

### **ICS Lab:**

Understand: Communication at Work Place- Spoken vs. Written language. Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

### **Exercise – II**

#### **CALL Lab:**

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

### **ICS Lab:**

Understand: Features of Good Conversation – Non-verbal Communication. Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

### **Exercise - III**

#### **CALL Lab:**

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

### **ICS Lab:**

Understand: How to make Formal Presentations. Practice: Formal Presentations.

### **Exercise – IV**

#### **CALL Lab:**

Understand: Listening for General Details. Practice: Listening Comprehension Tests.

### **ICS Lab:**

Understand: Public Speaking – Exposure to Structured Talks. Practice: Making a Short Speech – Extempore.

### **Exercise – V**

#### **CALL Lab:**

Understand: Listening for Specific Details. Practice: Listening Comprehension Tests.

**ICS Lab:**

Understand: Interview Skills. Practice: Mock Interviews.

**Minimum Requirement of infrastructural facilities for ELCS Lab:****1. Computer Assisted Language Learning (CALL) Lab:**

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

**System Requirement (Hardware component):**

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

**2. Interactive Communication Skills (ICS) Lab:****The Interactive Communication Skills Lab:**

A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.



## ENGLISH COMMUNICATION LAB

### CPCN-151 A

1. Develop interactive quizzes or flashcards to enhance vocabulary through definitions, synonyms, and antonyms.
2. Create listening exercises using audio clips followed by questions to assess understanding and retention.
3. Implement a program for students to record, analyze, and improve their speeches based on feedback.
4. Design a workshop that allows students to practice and present topics using visual aids and presentation software.
5. Create a platform for conducting group discussions on various topics, focusing on turn-taking and effective communication.
6. Develop a program that provides writing prompts and feedback on grammar, structure, and style.
7. Implement role-playing exercises to simulate real-life situations and improve conversational skills and confidence.
8. Create an application that helps students practice pronunciation through audio playback and comparison.
9. Design a set of reading passages followed by comprehension questions to enhance critical reading skills.
10. Implement a digital journal for students to reflect on their communication experiences and receive peer feedback.

## ENGLISH LAB

### CPCN-151 B

- 1) Develop a program that identifies and corrects grammatical errors in written text.
- 2) Create an application with quizzes and games to help users expand their vocabulary.
- 3) Implement audio-based comprehension exercises that include questions to test understanding.
- 4) Design a tool that records speeches and provides feedback on pace, tone, and clarity.
- 5) Develop a program that presents reading passages followed by comprehension questions.
- 6) Create an application that allows users to practice pronunciation and receive feedback using audio samples.
- 7) Implement a tool that provides creative writing prompts to stimulate writing practice.
- 8) Design a platform for virtual group discussions where participants can practice speaking and listening skills.
- 9) Develop a program that guides users through creating and delivering effective presentations.
- 10) Create a platform for students to share their writing and receive constructive feedback from peers.

## TECHNICAL COMMUNICATION LAB

### CPCN-151 C

- Writing Technical Reports
  - Focus on structure, clarity, and audience.
- Creating User Manuals
  - Emphasize step-by-step instructions and usability.
- Developing Proposals
  - Learn to draft persuasive and structured proposals.
- Designing Presentations
  - Use of visuals and effective delivery techniques.
- Conducting Oral Communication Workshops
  - Improve verbal skills through practice and feedback.
- Practicing Resume and Cover Letter Writing
  - Tailor documents for job applications.
- Engaging in Peer Review Sessions
  - Provide and receive constructive feedback on documents.
- Utilizing Visual Aids Effectively
  - Incorporate charts, graphs, and images to enhance communication.
- Exploring Digital Communication Tools
  - Familiarization with software for documentation and collaboration.
- Analyzing Case Studies in Technical Communication
  - Examine real-world examples to identify best practices.

## HUMAN VALUES, DEADDICTION AND TRAFFIC RULES

### CPCN-151 D

1. Workshops on Ethics and Morality
  - Discuss fundamental ethical principles and moral dilemmas.
2. Community Service Projects
  - Engage in activities promoting social responsibility and compassion.
3. Conflict Resolution Training
  - Teach effective communication and mediation skills.
4. Empathy Development Sessions
  - Activities to foster understanding and empathy towards others.
5. Cultural Awareness Programs
  - Explore diversity and promote respect for different cultures.

### Addiction Awareness Programs

1. Substance Abuse Education
  - Provide information on the effects of drugs and alcohol.
2. Support Group Facilitation
  - Create safe spaces for sharing experiences and recovery stories.
3. Stress Management Workshops
  - Teach techniques for coping with stress without resorting to substances.
4. Healthy Lifestyle Promotion
  - Encourage activities like exercise and hobbies as alternatives to addictive behaviors.
5. Guest Lectures from Addiction Experts
  - Invite professionals to discuss prevention and treatment strategies.

### Traffic Rules Programs

1. Road Safety Workshops
  - Educate on traffic laws and safe driving practices.
2. Mock Traffic Situations
  - Simulate real-life scenarios to practice safe behavior.
3. Pedestrian Safety Campaigns
  - Promote awareness of pedestrian rights and safety tips.
4. Bicycle and Motorcycle Safety Training
  - Teach specific rules and safety measures for non-vehicle commuters.
5. Community Awareness Drives
  - Organize events to highlight the importance of following traffic rules.

## MATHEMATICS-II

CMAM-102

Cr. L T P

4 3 1 0

**Unit-I** **10**

**Integral Calculus:** Double and triple integrals, change of order of integration, Change of variables; Gamma, Beta functions and their properties, Dirichlet's integral; Applications to area and volume.

**Unit-II** **08**

**Vector Calculus:**

**Vectors Differentiation:** Gradient, Divergence, Curl and their physical meaning; Differential operators and their identities.

**Vector Integration:** Line and surface integrals; Green's Theorem in a plane; Gauss's Divergence theorem and Stokes's theorem and their applications.

**Unit-III** **06**

**Fourier Series & Fourier Transform:** Trigonometric Fourier series, Half range series, Harmonic analysis; Fourier Transform: Definition, Fourier sine and cosine transforms, Fourier integral formula and applications.

**Unit-IV** **10**

**Laplace Transform:** Laplace transform, Existence theorem, Properties of Laplace Transform, Laplace transform of derivative and integrals, Unit step function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem. Application of Laplace Transform to solve ordinary differential equation.

**Unit-V** **06**

**Z-Transform:** Definition of Z-transform of elementary functions; Shifting theorems, Convolution theorem, Initial and Final value theorems; Inverse of Z-transform; Application to solution of difference equations.

**Reference Books :**

1. Thomas, G. and R.L. Finney. *Calculus and Analytical Geometry*. 6<sup>th</sup> Edition. Addison Wesley/Narosa, 1998.
2. Grewal, B.S. *Engineering Mathematics*. 39<sup>th</sup> Edition. Khanna Publishers, 2005.
3. Prasad, C. *Mathematics for Engineers*. 19<sup>th</sup> Edition. Prasad Mudralaya.

# Differential Equations

## CMAN-102 A

### **Unit 1: Introduction to Differential Equations**

This unit covers the definitions and basic concepts of differential equations, distinguishing between ordinary and partial differential equations, as well as exploring their order and degree. It also addresses initial and boundary value problems.

### **Unit 2: First-Order Differential Equations**

In this unit, students will learn about the various types of first-order differential equations, including separable, homogeneous, and linear equations. It also includes methods such as exact equations and integrating factors, along with applications of first-order equations in real-world scenarios.

### **Unit 3: Higher-Order Differential Equations**

This unit focuses on linear differential equations of higher order with constant coefficients. Students will study methods for solving these equations, including the method of undetermined coefficients and variation of parameters, as well as exploring non-homogeneous equations and their applications.

### **Unit 4: Systems of Differential Equations**

Students will be introduced to systems of first-order differential equations, learning techniques for solving linear systems. This unit also includes phase plane analysis and the stability of equilibrium points.

### **Unit 5: Laplace Transforms**

This unit covers the definition and properties of the Laplace transform, along with the inverse Laplace transform and its applications. Students will learn how to solve ordinary differential equations using Laplace transforms.

## Probability and Statistics

### CMAN-102 B

#### **Unit 1: Introduction to Probability**

This unit introduces the fundamental concepts of probability, including sample spaces, events, and the basic rules of probability. It covers conditional probability and independence, along with applications of the counting principles.

#### **Unit 2: Random Variables and Probability Distributions**

In this unit, students learn about random variables and their types—discrete and continuous. The unit covers important probability distributions such as binomial, Poisson, and normal distributions, including their properties and applications.

#### **Unit 3: Expectation and Variance**

This unit focuses on the concepts of expectation and variance for random variables. Students will learn how to calculate expected values, variance, and standard deviation for various probability distributions, along with properties of linear combinations of random variables.

#### **Unit 4: Sampling Distributions and Estimation**

Students will explore the concept of sampling distributions, the Central Limit Theorem, and point estimation. This unit covers properties of estimators, methods of estimation, and confidence intervals for population parameters.

#### **Unit 5: Hypothesis Testing**

In this unit, students learn the fundamentals of hypothesis testing, including formulating null and alternative hypotheses. The unit covers Type I and Type II errors, test statistics, p-values, and conducting hypothesis tests for means and proportions.

## Mathematical Logic

CMAN-102 C

### **Unit 1: Introduction to Mathematical Logic**

This unit covers the fundamental concepts of mathematical logic, including syntax and semantics of formal languages, as well as the distinction between propositional logic and first-order logic. Students will explore the role of logic in mathematics and computer science.

### **Unit 2: Propositional Logic**

In this unit, students learn about propositional variables, logical connectives, and truth tables. The unit includes methods for evaluating logical expressions and techniques for proving logical equivalences, including De Morgan's laws and distributive laws.

### **Unit 3: First-Order Logic**

This unit introduces the syntax and semantics of first-order logic, including predicates, quantifiers, and the structure of first-order sentences. Students will learn how to express mathematical statements using first-order logic and explore the concepts of interpretation and validity.

### **Unit 4: Proof Techniques**

Students will study various proof techniques, including direct proofs, indirect proofs, proof by contradiction, and proof by induction. The unit emphasizes the importance of rigorous reasoning and clarity in mathematical arguments.

### **Unit 5: Set Theory and Relations**

This unit covers the basics of set theory, including operations on sets, relations, and functions. Students will learn about properties of relations, including equivalence relations and partial orders, and their relevance to logic.



## Differential Geometry

### CMAN-102 D

#### **Unit 1: Introduction to Differential Geometry**

This unit introduces the basic concepts and motivation behind differential geometry, covering the historical context and its applications in various fields such as physics and engineering. Students will learn about curves and surfaces, along with essential definitions and examples.

#### **Unit 2: Curves in Euclidean Space**

In this unit, students explore the properties of curves, including arc length, curvature, and torsion. The unit covers parameterizations of curves, the Frenet-Serret formulas, and the classification of curves based on their geometric properties.

#### **Unit 3: Surfaces in Euclidean Space**

This unit focuses on the study of surfaces, including definitions, parameterizations, and local properties. Students will learn about tangent planes, normal vectors, and the first and second fundamental forms, along with examples of standard surfaces.

#### **Unit 4: Metric and Curvature on Surfaces**

Students will explore the concepts of intrinsic and extrinsic geometry, including the definitions of Gaussian curvature and mean curvature. The unit covers important theorems, such as the Gauss-Bonnet theorem, and applications of curvature in understanding surface geometry.

#### **Unit 5: Differential Forms and Exterior Calculus**

In this unit, students are introduced to differential forms, their properties, and applications. The unit covers the exterior derivative, Stokes' theorem, and the concept of integration on manifolds, emphasizing the geometric interpretation of these concepts.

**UNIT-I :Relativistic Mechanics**

Inertial and non inertial frames, Galilean transformation equation, Einstein's postulates, Length contraction and time dilation, Addition of velocities, Mass energy equivalence. Lorentz transformation equation, Variation of mass with velocity.

**UNIT-II : Laser and Wave optics**

Spontaneous and stimulated emission of radiation, Einstein's coefficients, construction and working of Ruby, He- Ne lasers. Application of lasers.

Interference of light, Biprism experiment, displacement of fringes, Newtons ring, Polarization, Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, specific rotation, Optical activity.

**-III : Wave Mechanics**

Introduction to wave particle duality, de Broglie matter waves, phase and group velocities, Heisenberg's uncertainty principle and its applications, Wave function characteristics and significance, Time dependent and time independent Schrodinger's wave equations, Particle in one dimensional rigid box.

**UNIT- IV : Superconductivity and Nanomaterials**

Temperature dependence of resistivity, Effect of magnetic field (Meissner effect), isotope effect, London's equation, Type I and Type II superconductor, Temperature dependence of critical field, BCS theory, High temperature superconductors, Application of superconductors.

Introduction to nanomaterials, Basic principles of nano-science and technology, structure, properties and uses of carbon nanotubes, some application of nanomaterials.

**UNIT- V : Electromagnetics**

Maxwell's equations (integral and differential forms), Equation of continuity, Transverse nature of EM waves, EM- wave propagation and its propagation in free space, Poynting vector. Gradient, Divergence and Curl, Statement of gauss divergence and stokes theorems and useful vector identities.

**Reference Books :**

- 1.S.K.Gupta 'Engineering Physics-I' KrishnaPrakashan Media (P) Ltd. Meerut.
2. .S.K.Gupta 'Engineering Physics-II' KrishnaPrakashan Media (P) Ltd. Meerut.
3. Avandhanulu, M.N. and P.G. Kshirsagar. A Text book of Engineering Physics. S. Chand Publication, New Delhi.
4. Subrahmanyam, N. and BrijLal. A Textbook of Optics. S. Chand Publication, New Delhi.

# CLASSICAL MECHANICS

## CPHN -102 A

### **Unit 1: Introduction to Classical Mechanics**

This unit introduces the fundamental concepts of classical mechanics, including the historical development of the field and the importance of mechanics in physics. Students will learn about the basic principles of motion and the laws governing classical systems.

### **Unit 2: Kinematics of Particles**

In this unit, students explore the motion of particles in one and two dimensions. Topics include displacement, velocity, acceleration, and the equations of motion. The unit also covers projectile motion and circular motion.

### **Unit 3: Dynamics of Particles**

This unit focuses on the forces acting on particles and the application of Newton's laws of motion. Students will study concepts such as mass, weight, friction, and the relationship between force and acceleration.

### **Unit 4: Work and Energy**

Students will learn about the work-energy principle, the concept of kinetic and potential energy, and the conservation of mechanical energy. This unit also covers power and the work done by non-conservative forces.

### **Unit 5: Systems of Particles and Rigid Body Dynamics**

This unit examines the dynamics of systems of particles, including center of mass and linear momentum. Students will also study rigid body motion, moments of inertia, and the rotation of rigid bodies about fixed axes.

# ELECTROMAGNETIC THEORY

## CPHN -102 B

### Unit 1: Introduction to Electromagnetic Theory

This unit introduces the fundamental concepts of electromagnetism, including historical perspectives and the significance of electromagnetic theory in physics. Students will learn about the basic electromagnetic phenomena and the scope of the subject.

### Unit 2: Electrostatics

In this unit, students will explore the principles of electrostatics, including Coulomb's law, electric fields, and electric potential. The unit covers Gauss's law, electric field lines, and the concept of dielectric materials.

### Unit 3: Magnetostatics

This unit focuses on the study of magnetic fields and forces. Students will learn about the Biot-Savart law, Ampère's law, and the concept of magnetic flux. The unit also covers the properties of magnetic materials and their applications.

### Unit 4: Electromagnetic Induction

Students will investigate the principles of electromagnetic induction, including Faraday's law and Lenz's law. This unit covers the concepts of self-inductance and mutual inductance, as well as applications in electrical circuits.

### Unit 5: Maxwell's Equations

In this unit, students will study Maxwell's equations and their significance in electromagnetic theory. The unit covers the integral and differential forms of these equations, along with boundary conditions and their implications for electric and magnetic fields.

# QUANTUM MECHANICS

## CPHN -102 C

### **Unit 1: Introduction to Quantum Mechanics**

This unit introduces the fundamental concepts of quantum mechanics, including its historical development and the limitations of classical mechanics. Students will explore the basic principles and significance of quantum theory in modern physics.

### **Unit 2: Wave-Particle Duality**

In this unit, students will study the dual nature of matter and light, focusing on experiments such as the double-slit experiment. The unit covers the concept of wave functions and the implications of wave-particle duality in quantum mechanics.

### **Unit 3: Quantum States and Operators**

This unit covers the mathematical formulation of quantum mechanics, including the concepts of quantum states, state vectors, and operators. Students will learn about observables, commutation relations, and the role of Hermitian operators in measurements.

### **Unit 4: The Schrödinger Equation**

Students will explore the time-dependent and time-independent Schrödinger equations, their physical significance, and applications to various quantum systems. The unit includes solving the Schrödinger equation for simple potentials and boundary conditions.

### **Unit 5: Quantum Mechanics of One-Dimensional Systems**

This unit focuses on one-dimensional quantum systems, including the particle in a box, harmonic oscillator, and the potential barrier. Students will study the solutions to these systems and their physical interpretations.

## SOLID STATE PHYSICS

### CPHN -102 D

#### **Unit 1: Introduction to Solid State Physics**

This unit provides an overview of solid state physics, including its significance, basic concepts, and the classification of solids. Students will learn about crystal structures and the importance of symmetry in solid materials.

#### **Unit 2: Crystal Lattices and Structures**

In this unit, students will study the concept of crystal lattices, unit cells, and the various types of crystal structures, such as face-centered cubic, body-centered cubic, and hexagonal close-packed. The unit covers lattice parameters and the calculation of atomic packing fractions.

#### **Unit 3: X-ray Diffraction**

This unit focuses on the principles of X-ray diffraction and its applications in determining crystal structures. Students will learn about Bragg's law, diffraction patterns, and methods for analyzing crystal structures using X-ray techniques.

#### **Unit 4: Phonons and Thermal Properties**

Students will explore the concept of phonons, their role in lattice vibrations, and their significance in thermal properties of solids. The unit covers specific heat, thermal conductivity, and the Debye model of heat capacity.

#### **Unit 5: Band Theory of Solids**

In this unit, students will learn about the electronic band structure of solids, including the concepts of conduction bands, valence bands, and band gaps. The unit discusses conductors, semiconductors, and insulators, along with their electronic properties.

# COMPUTER FUNDAMENTALS AND PROGRAMMING USING C

CCSN-102

Cr. L T P  
4 3 1 0

## Unit-I

**Computer System:** Basics of computer systems, history, types, capability and limitations of computer systems, Concept of assembler, compiler, interpreter, loader and linker. Generation of Computers.

**Hardware Organization:** Anatomy of a digital computer, CPU, Memory, processor, I/O Devices. **Memory Units:** Hierarchy, primary memory, cache; Auxiliary storage

## Unit-II

**Number System:** Introduction to Number Systems-Types-Decimal, Binary, Octal, Hexadecimal; Conversion from one number system to other; Binary arithmetic operations; Representation of Negative Numbers; 1's complement and 2's complement, BCD code, ASCII code

**Computer Fundamentals-**Introduction of Operating system, Basics of computer networks, Introduction of software

**Idea of Algorithm:** Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

## Unit-III

**Programming Basics:** Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

**Arithmetic expressions and precedence :** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

## Unit-IV

**Conditional Branching:** Applying if and switch statements, nesting if and else, use of break and default with switch.

**Iteration and loops:** use of while, do while and for loops, multiple loop variables, use of break and continue statements.

**Functions:** Introduction, types of functions, Defining a Function, Function Declarations, Calling a Function , Passing parameters to functions, call by value, call by reference, recursive functions.

## Unit-V

**Arrays:** Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

**Character Arrays and Strings:** Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions, Example Programs (with and without using built-in string functions)

**Pointers:** Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free)

**File handling:** File I/O functions

**Structures:** Introduction, Defining a structure, declaring structure variables, accessing structure members, structure initialization, array of structures

**TEXT & REFERENCE BOOKS:**

1. Fundamentals of computers and programming with C, A. K. Sharma, Dhanpat Rai Publications, Daryaganj New Delhi
2. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988, PHI.
3. C Programming – A modern approach by K.N. King, 1996, WW Norton & Co.
4. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998, TMH



## CEEN-102 BASIC ELECTRICAL ENGINEERING

**Network Fundamentals:** Voltage and current sources, concept of linearity, unilateral and bilateral elements. Kirchoff's laws, Mesh and node analysis of D.C. networks; Transient analysis: RL & RC circuits; Network theorems: Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power theorem, Star-delta transformation.

### Unit-II

**Steady State Analysis of Single Phase AC Circuits:** Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors. Analysis of single phase AC Circuits consisting R-L-C combination (Series and Parallel) Apparent, active & reactive power, Power factor. Concept of Resonance in series & parallel circuits, bandwidth and quality factor. Three phase balanced circuits, voltage and current relations in star and delta connections.

### Unit-III

**Transformers:** Magnetic Circuit, Analogy with electrical circuits, Calculation for series, parallel and series parallel magnetic circuits, Eddy current and Hysteresis losses.

Single Phase Transformer: Basic constructional features and operating principle. Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.

### Unit-IV

**Electrical Machines:** Principle of operation and constructional features of DC machine, Emf and torque equation, Armature reaction, Types of D.C. motors starting and speed control of D.C. motors, Machines:

Principle of operation of single phase motor and methods of starting of single phase motor.

Three phase induction motor operating principle.

Constructional features, Synchronous generator, Basic principle of operation, Emf equation, Constructional features.

### Unit-V

**Measurement of Electrical Quantities:** Measurement of voltage current power and energy moving iron instruments. Measurement of 3 phase power, Accuracy class of meters.

### Unit-VI

**Electrical Installations:** Introduction of Switch Fuse Unit (SFU), MCB, ELCB, MCCB, ACB. Types of Wires, Cables and Bus-bars. Fundamentals of earthing and lightning protection. Types of Batteries.

# CPCN- 102 Technical Communication

## CPCN-102

Cr. L T P  
3 2 1 0

### Unit – I

**Basics of Technical Communication:** Meaning, Elements, Process, Origin, Scope and Significance, Forms, Channels & Media of Communication, Barriers to Communication, Organisation and Style in Technical Communication, Non-Verbal Communication. **The flow of Communication: Downward; upward, Lateral or Horizontal; Barriers to Communication**

**Technical Reports:** Nature & Significance, Types, Formats of Reports, Structure of Formal Reports: Project Report, Dissertation and Thesis, Strategies for Writing.

**Technical Articles:** Nature & Significance, Types, Elements, Research Methods, Writing Strategies.

**Technical Proposals:** Nature & Significance, Types, Structure of a Formal Proposal, Tips for Writing.

### Unit – II

**Guidelines for Effective Writing:** Requisites of Good Sentence Writing; Elements of a Paragraph, Requisites of Impeccable Paragraph Writing: Unity, Coherence and Logical Order; Development of Paragraphs. **Mechanics of Writing: Modifiers, phrasal verbs, tone and style, graphical representation**

**Specific Writing:** Note-Making; Summarising & Paraphrasing; Referencing; Professional Memos; e-Mails; e-Writing.

### Unit – III

**Professional Correspondence:** Letter Writing Skills; Form & Structure; Writing Personal & Official Letters, **Technical paper writing: documentation style – document editing – proof reading – Organising and formatting** Quotations, Supply Orders, Complaint and Adjustment Letters, Minutes for Meeting, Designing Resume/CV/Bio-Data, Job Application, Follow-up Letters, **E. Mail Writing.**

### Unit – IV

**Basics of Phonetics:** **Kinesics: Definitions; importance; Features of Body Language; Voice Modulation: Quality, Pitch; Rhythm; intonation; Pronunciation; Articulation; stress & accent; Linguistic features of voice control:** International Phonetic Alphabet, Phonemes, Allophones, Phonetic Transcription, Organs of Speech, Places and Manners of Articulation, Syllable, Stress, Rhythm, Intonation, **Weak Forms.**

### Reference Books :

1. Rizvi, M Ashraf. *Effective Technical Communication*. New Delhi: Tata McGraw-Hill, 2005. Print.
2. Raman, M. and S. Sharma. *Technical Communication: Principles and Practice*. New Delhi: Oxford University Press, 2004. Print.
3. Anderson, Paul V. *Technical Communication: A Reader-Centered Approach*. 6<sup>th</sup>ed. New Delhi: Cengage Learning, 2007. Print.

4. Taylor, Shirely. *Model Business Letters, E-mails and Other Business Documents*. 6<sup>th</sup>ed. New Delhi: Pearson Education, 2004. Print.
5. Roach, Peter. *English Phonetics and Phonology: A Practical Course*. 4<sup>th</sup>ed. New Delhi: Cambridge University Press, 2009. CD-ROM, Print.

## **CPCN-102 B**

## **Presentation Skills**

### Unit 1: Essential Grammar

Application of tenses, Auxiliaries- correct usage and importance informal communication, Business Vocabulary - Vocabulary exercises through web-base Applications, Written Communication

### Unit 2: Written Communication Skills

Email writing- Formal and Informal email writing structure, Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales Letters etc. Technical writing, Essay writing, Paragraph writing.

### Unit 3: Leader's Role, Responsibilities And Skill Required:

Understanding good Leadership Learning the difference between Leadership and Management, Gaining insight

into your Patterns, Beliefs and Rules, Defining Qualities and Strengths of leadership, Determining how well you perceive what's going on around you, interpersonal Skills and

Communication Skills, Learning about Commitment and How to Move Things Forward,

Making Key Decisions, Handling Your and Other People's Stress, Empowering, Motivating

and Inspiring Others, Leading by example, effective feedback. Problem Solving Skill:3: Writing Skills

### Unit 4: Corporate business etiquettes

Corporate grooming & dressing, etiquettes in social & office Setting-Understand the importance of professional behaviour at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities Diversity and Inclusion Part 2: Socio-Cultural and Cross-Cultural

### Reference Books:

Fred Luthans, Organizational Behaviour, McGraw Hill

Lesikar and petit, Report writing for Business

M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill

Wallace and masters, Personal Development for Life and Work, Thomson Learning,

Hartman Lemay, Presentation Success, Thomson Learning

Malcolm Goodale, Professional Presentations

Farhathullah, T. M. Communication skills for Technical Students

Michael Muckian, John Woods, The Business letters Handbook

Herta A. Murphy, Effective Business Communication

Lehman, Dufrene, Sinha BCOM, Cengage Learning

**Unit 1:**

Pulse Digital Modulation: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Time Division Multiplexing & Demultiplexing. Delta Modulation: Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, Noise in PCM and DM systems. Illustrative Problems.

**Unit 2:**

Digital Modulation Techniques: Introduction, ASK modulator, Coherent and Non-Coherent ASK detector, FSK modulator, Spectrum of FSK, coherent reception, non-coherent detection of FSK. BPSK transmitter, Coherent reception of BPSK, DPSK, QPSK. Data Transmission: Base band signal receiver, probability of error, The optimum filter, Matched filter, probability of error using matched filter. Optimum filter using correlator. Probability of error of ASK, FSK, BPSK and QPSK. Illustrative Problems

**Unit 3:**

Information Theory: Discrete messages, Concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties, Illustrative Problems. Source Coding: Introduction, Advantages, Hartley Shannon's theorem, bandwidth – S/N trade off, Shannon-Fano coding, Huffman coding, Illustrative Problems

**Unit 4:**

Linear Block Codes: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of linear block codes, Hamming codes. Cyclic Codes: Encoding, Syndrome Calculation, Decoding's

**Unit 5:**

Convolution Codes: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: State, Tree and Trellis diagram. Decoding using Viterbi algorithm Illustrative Problems

**Reference Books:**

Fred Luthans, Organizational Behaviour, McGraw Hill

Lesikar and petit, Report writing for Business

M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill

Wallace and masters, Personal Development for Life and Work, Thomson Learning,

Hartman Lemay, Presentation Success, Thomson Learning

Malcolm Goodale, Professional Presentations

Farhathullah, T. M. Communication skills for Technical Students

Michael Muckian, John Woods, The Business letters Handbook

Herta A. Murphy, Effective Business Communication

Lehman, Dufrene, Sinha BCOM, Cengage Learning

Unit 1 : Fundamentals of Communication and Voice Dynamics: Role and Purpose of Communication, Types & Flow of Communication, Barriers to Effective Communication, 7 C's of Communication, Code and Content; Stimulus & Response, Vowel Sounds, Consonant Sounds, Tone: Rising and Falling Tone.

Unit 2 : Communication Skills for Career Building CV and Résumé Writing, Interview Skills, Group Discussion, Effective Profiling, Communication and Networking: Building relationships, Writing the Statement of Purpose (SOP) for admission in Higher Studies, Seminar & Conference Paper Writing, Expert Technical Lecture: Writing and Presenting.

Unit 3: Communication Skills for Presentation: Writing, Designing, and Speaking Thesis and Project Report Writing, Technical Proposal Writing, How to Pitch an Idea: Process, Preparation and Structure, Elements of Speech Delivery: Passion, Poise & Illustrations.

Unit 4 : Communication and Leadership Development Leadership Communication, Communication and Social competence: context, feelings, intentions, behaviors, Providing and Receiving feedback, Difference between Tact and Intelligence, Emotional Intelligence: Trust through Communication, Thinking Skills: Meaning and Types.

Unit 5 : Digital Communication and Personality Making Content Creation for Social Media: Emails, Webinars, podcasts, Blogs. Effective and Ethical use of Social Media by Text and Technique, Speech and Personality, Personality Analysis: Types of Personality; Concept of Personality: Maslow, Freud, Vivekananda, Jung Typology & Personality Assessment.

**Prescribed Book:**

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2018, New Delhi
2. Personality Development and Soft Skills by Barun K. Mitra, OUP, 2012, New Delhi.
3. Technical Communication, by Pfeiffer, 6th edn (Pearson)
4. Soft Skills & Employability, Sabina Pillai and Agna Fernandez Cambridge University Press 2018.
5. Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delh

**Reference Books:**

Fred Luthans, Organizational Behaviour, McGraw Hill

Lesikar and petit, Report writing for Business

M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill



Wallace and masters, Personal Development for Life and Work, Thomson Learning,

Hartman Lemay, Presentation Success, Thomson Learning

Malcolm Goodale, Professional Presentations

Farhathullah, T. M. Communication skills for Technical Students

## Engg. Physics Lab.

### CPHM-152

1. Measurement of wavelength of monochromatic light by Newton's rings
2. Measurement of the specific rotation of cane sugar solution using Biquartzpolarimeter
3. Measurement of wavelength of spectral lines using plane transmission grating
4. Measurement of the specific resistance of the material of a given wire using Carey Foster Bridge
5. Study of the variation of magnetic field along the axis of current carrying coil and then to estimate the radius of the coil
6. Calibration of the given voltmeter and ammeter with a potentiometer
7. Measurement of the resistivity and energy band gap of a semiconductor material (four probe)
8. Study of Hall effect and determination of Hall coefficient and carrier density of a given semiconductor material
9. Measurement of acceleration due to gravity by compound pendulum
10. Measurement of electro-chemical equivalent (ECE) of copper using Helmholtz galvanometer
11. Measurement of Planck's constant 'h' by measuring radiation in a fixed spectral range
12. Measurement of wavelength of He-Ne Laser using a narrow slit (Diffraction pattern)
13. Measurement of the dielectric constant of different solids

### Reference Books :

1. Jain, R.K., DarakhshanSahar and D. Mishra. *Engineering Physics Practical Manual*. Shobhit University Publication, 2009.

## CLASSICAL MECHANICS LAB

### CPHN-152 A

#### List of Experiments:

- 1) Measurement of acceleration due to gravity using a simple pendulum.
- 2) Study of projectile motion using a projectile launcher.
- 3) Analysis of collisions using a ballistic pendulum.
- 4) Investigation of harmonic motion with a spring-mass system.
- 5) Determination of the moment of inertia using a rotational apparatus.
- 6) Study of the conservation of energy with a mechanical energy experiment.
- 7) Measurement of the coefficient of friction using an inclined plane.
- 8) Analysis of motion using a ticker tape timer.
- 9) Experiment to study the motion of a body under uniform circular motion.
- 10) Examination of the principles of linear momentum using a dynamics cart.
- 11) Investigation of damped harmonic motion with a damped oscillator setup.
- 12) Measurement of the gravitational force using a torsion balance.
- 13) Study of the laws of motion using a dynamic cart and track.
- 14) Experiment to analyze the motion of a pendulum with varying lengths.
- 15) Determination of the center of mass of a system of particles.
- 16) Investigation of rolling motion and its relation to translational motion.
- 17) Measurement of the energy loss during inelastic collisions.
- 18) Study of the oscillations of a compound pendulum.
- 19) Analysis of the effects of air resistance on falling objects.
- 20) Experiment to verify Kepler's laws using a planetary motion setup.
- 21) Investigation of the principles of energy transfer in a spring system.

## ELECTROMAGNETIC THEORY LAB

### CPHN-152 B

#### List of Experiments:

- 1) Measurement of electric field strength using a parallel plate capacitor.
- 2) Determination of capacitance of various capacitors.
- 3) Study of magnetic field around a current-carrying conductor using a magnetic field sensor.
- 4) Investigation of Faraday's law of electromagnetic induction using coils and magnets.
- 5) Measurement of resistance of different materials using a Wheatstone bridge.
- 6) Analysis of resonance in an LC circuit.
- 7) Experiment to determine magnetic field strength using a solenoid.
- 8) Study of the Hall effect in semiconductors.
- 9) Investigation of electromagnetic waves using antennas and oscilloscopes.
- 10) Measurement of the dielectric constant of various materials.
- 11) Determination of the characteristics of a transformer.
- 12) Analysis of the behavior of RLC circuits.
- 13) Experiment to observe the phenomenon of self-inductance and mutual inductance.
- 14) Study of the principles of rectification using diodes.
- 15) Measurement of the frequency response of an RLC circuit.

## QUANTUM MECHANICS LAB

### CPHN-152 C

#### List of Experiments:

1. Measurement of Planck's constant using a photoelectric effect experiment.
2. Determination of the energy levels of hydrogen using the Balmer series.
3. Experiment to observe electron diffraction patterns.
4. Study of the Stern-Gerlach experiment to investigate spin states.
5. Measurement of the energy levels of a quantum harmonic oscillator.
6. Investigation of the Compton Effect using X-rays.
7. Experiment to demonstrate quantum tunneling using a tunneling microscope.
8. Analysis of the characteristics of semiconductor diodes.
9. Measurement of the properties of lasers and their quantum aspects.
10. Study of the effects of temperature on the resistance of superconductors.
11. Experiment to observe the double-slit interference pattern with single photons.
12. Determination of the energy distribution of thermal photons.
13. Investigation of the Rydberg formula for hydrogen-like atoms.
14. Measurement of Zeeman Effect in a magnetic field.
15. Study of quantum entanglement using polarization filters.
16. Analysis of wave-particle duality through various experiments.
17. Experiment to investigate the effect of temperature on quantum states in solids.

## SOLID STATE PHYSICS LAB

### CPHN-152 D

#### List of Experiments:

1. Measurement of lattice parameters using X-ray diffraction.
2. Study of crystal structure using a polarizing microscope.
3. Determination of the thermal conductivity of a solid material.
4. Measurement of specific heat capacity of solids using the calorimetric method.
5. Investigation of electrical conductivity in different materials.
6. Analysis of the Hall effect in semiconductor samples.
7. Measurement of the band gap energy of semiconductors using a four-probe method.
8. Study of the magnetic properties of materials using a vibrating sample magnetometer.
9. Measurement of dielectric constant and loss tangent of materials.
10. Investigation of the characteristics of p-n junction diodes.
11. Determination of the resistivity of materials at varying temperatures.
12. Study of ferromagnetic hysteresis using a magnetometer.
13. Measurement of the phonon dispersion relation using inelastic neutron scattering.
14. Analysis of the temperature dependence of resistivity in metals and semiconductors.
15. Study of piezoelectric properties in certain crystals.
16. Measurement of the sound velocity in solids using ultrasonic methods.
17. Investigation of the mechanical properties of materials through stress-strain tests.
18. Study of the optical properties of semiconductors using a spectrophotometer.
19. Measurement of the thermal expansion of solid materials.
20. Investigation of defects in crystals using etch pit techniques.

# COMPUTER PROGRAMMING USING C LAB.

CCSN 152

Cr. L T P

1 00 2

1. Introduction of DOS Commands, Windows and C.
2. Writing Simple Batch Program.
3. Programming using 'C' Language involving in uses of following constructs of 'C'
4. Print "Hello, World!" to the console.
5. Read two integers and print their sum.
6. Calculate the factorial of a given number using recursion.
7. Determine if a number is prime.
8. Print the Fibonacci series up to a specified term.
9. Read a string and print it in reverse order.
10. Check if a given string is a palindrome.
11. Implement bubble sort to sort an array of integers.
12. Perform addition of two matrices.
13. Use the Euclidean algorithm to find the GCD of two numbers.
14. Convert temperatures between Celsius and Fahrenheit.
15. Count the number of vowels and consonants in a string.

Simple Input Output Functions, Arithmetic/Logical & Relational Operators, Sequence Control, Decision Control, Iteration, Arrays Single/Multi dimensional(Numeric/Character), Functions (Call by value/Call by reference), Recursive functions, Structures, Pointers, Library functions, File streams.

## Reference Books :

1. Sharma, A.K. *Fundamentals of Computers and Programming with C*. DhanpatRai Publications, New Delhi, 2005.
2. Sharma, Divya. *Lab. Manual: Fundamentals of Computers and Programming with C*, Shobhit University Publication, Meerut.

## BASIC ELECTRICAL ENGINEERING LAB

**CEEN 152**

*Cr. L T P*  
**1 0 0 2**

1. Verify the KCL
2. Verify the KVL
3. Short Circuit and Open Circuit
4. Study of Energy meter
5. Verification Thevenin Theorem
6. Verification of Norton theorem
7. Verification of superposition theorem
8. V-I Characteristics of PN Junction Diode
9. Study the half wave rectifier.
10. Study the full wave rectifier.



## **CIRCUIT THEORY LAB**

### **CEEN-152A**

- 1) Measurement of voltage, current, and resistance using a multimeter.
- 2) Analysis of series and parallel circuits using resistors.
- 3) Study of Ohm's law and its verification through experiments.
- 4) Investigation of Kirchhoff's voltage and current laws in circuit analysis.
- 5) Measurement of the characteristics of a diode.
- 6) Study of transistor characteristics and biasing configurations.
- 7) Experiment to analyze the behavior of RL circuits.
- 8) Measurement of capacitance using an RC circuit.
- 9) Study of the frequency response of an RLC circuit.
- 10) Analysis of AC and DC circuits using an oscilloscope.
- 11) Investigation of phase shift in RC and RL circuits.
- 12) Measurement of power in AC circuits using a wattmeter.
- 13) Study of the charging and discharging of a capacitor.
- 14) Analysis of resonance in RLC circuits.
- 15) Experiment to determine the time constant of an RC circuit.
- 16) Measurement of the input and output characteristics of a common-emitter amplifier.
- 17) Study of filter circuits: low-pass, high-pass, and band-pass filters.
- 18) Investigation of the use of breadboards for circuit prototyping.
- 19) Measurement of inductance using a series RLC circuit.
- 20) Study of the operation of a Wheatstone bridge.
- 21) Experiment to analyze the response of a feedback amplifier.

## **ELECTROMAGNETISM LAB**

### **CEEN-152B**

1. Measurement of electric field strength using a parallel plate capacitor.
2. Investigation of electrostatic potential using an electroscope.
3. Study of magnetic field lines using iron filings and a magnet.
4. Measurement of the resistance of different materials using a multimeter.
5. Analysis of the magnetic field around a current-carrying conductor using a compass.
6. Experiment to demonstrate Faraday's law of electromagnetic induction.
7. Measurement of the capacitance of capacitors in series and parallel configurations.
8. Study of the properties of solenoids and their magnetic fields.
9. Investigation of the Hall effect in semiconductor materials.
10. Measurement of the permeability of free space using a solenoid.
11. Study of Lenz's law using a coil and a falling magnet.
12. Experiment to determine the characteristics of a transformer.
13. Measurement of the dielectric constant of various materials.
14. Analysis of the behavior of RC and RL circuits.
15. Study of electromagnetic waves using a dipole antenna.
16. Investigation of resonance in RLC circuits.
17. Measurement of the speed of electromagnetic waves in different media.
18. Study of electric fields using field line patterns and potential plots.
19. Investigation of capacitive and inductive reactance in AC circuits.
20. Measurement of the magnetic field strength using a Gauss meter.
21. Experiment to analyze the effect of frequency on inductive and capacitive reactance.

## DIGITAL ELECTRONICS LAB

### CEEN-152 C

1. Study of basic logic gates: AND, OR, NOT, NAND, NOR, and XOR.
2. Construction and analysis of combinational circuits using logic gates.
3. Implementation of a half adder and full adder circuit.
4. Design and testing of a 4-bit binary adder/subtractor using full adders.
5. Construction of a 4-to-1 multiplexer and demultiplexer.
6. Implementation of a 2-bit binary comparator.
7. Design of a 7-segment display decoder using logic gates.
8. Analysis of flip-flops: SR, D, JK, and T flip-flops.
9. Construction of a 4-bit shift register and its operations.
10. Design and simulation of synchronous and asynchronous counters.
11. Study of digital-to-analog converters (DAC) and their applications.
12. Implementation of an analog-to-digital converter (ADC) circuit.
13. Experiment to analyze timing diagrams of digital circuits.
14. Design of a binary counter using flip-flops.
15. Construction of a state machine using flip-flops and logic gates.
16. Study of memory devices: RAM and ROM, and their applications.
17. Implementation of a priority encoder circuit.
18. Analysis of combinational and sequential logic circuit behaviors.
19. Simulation of digital circuits using software tools like Logisim or Multisim.
20. Study of noise margins and signal integrity in digital circuits.
21. Experiment to implement and analyze a basic ALU (Arithmetic Logic Unit).

## **ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB**

### **CEEN-152 D**

1. Measurement of voltage using a digital multimeter.
2. Measurement of current using a clamp meter.
3. Determination of resistance using a Wheatstone bridge.
4. Calibration of an ammeter and voltmeter using standard references.
5. Measurement of power in an AC circuit using a wattmeter.
6. Study of the characteristics of different types of electrical instruments.
7. Measurement of frequency using a frequency counter.
8. Determination of the phase angle in an AC circuit using an oscilloscope.
9. Experiment to measure the insulation resistance of cables.
10. Analysis of a potentiometer for voltage measurement.
11. Measurement of temperature using thermocouples and RTDs.
12. Study of the operation of an LCR meter for inductance and capacitance measurement.
13. Measurement of capacitance using a capacitance meter.
14. Experiment to analyze the response of a digital oscilloscope.
15. Measurement of power factor in an AC circuit.
16. Study of various transducers and their applications in measurements.
17. Experiment to measure the Earth resistance using an Earth tester.
18. Analysis of load characteristics of different electrical machines.
19. Measurement of magnetic field strength using a Gauss meter.
20. Experiment to evaluate the performance of a signal generator.
21. Study of data acquisition systems and their applications in instrumentation.

**Unit - I**

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT), Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic **Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List**, Operations on a Linked List. Insertion, Deletion, Traversal, **Polynomial Representation and Addition**, Generalized Linked List.

**UNIT - II**

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, **Evaluation of postfix expression, Recursion, Tower of Hanoi Problem**, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, **Dequeue and Priority Queue**.

**UNIT – III**

Trees: Basic terminology, Binary Trees, Binary Tree Representation: **Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.**

Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, HEAP (Max and min heap), Heap Implementation, Insertion and Deletion Operations, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees.

**UNIT – IV**

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: **Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijkstra Algorithm.**

**UNIT - V**

Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, **Two Way Merge Sort, Heap Sort, Radix Sort**, Practical consideration for Internal Sorting.

Complexity of Search Algorithm

Hashing Hash Function, Collision Resolution Strategies.

Storage Management: Garbage Collection and Compaction.

**Text Books:**

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
2. R. Kruse et al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi- 2002
3. A. M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
4. K Loudon, "Mastering Algorithms with C", Shroff Publisher & Distributors Pvt. Ltd.
5. Bruno R Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", Jhon Wiley & Sons, Inc.
6. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia Pvt. Ltd.(Singapore)

**Unit- I Introduction:**

An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and database language and interfaces, Data definitions language, DML, Overall Database Structure. Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

**Unit- II Relational data Model and Language:**

Relational data model concepts, CODD's Rules, integrity and constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. **Introduction on SQL:** Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL

**Unit- III Data Base Design & Normalization:**

Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

**Unit- IV Transaction Processing Concepts:**

Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, **Recovery from transaction failures**, log based recovery, checkpoints, deadlock handling.

**Unit- V Concurrency Control Techniques:**

Concurrency control and recovery system: Concurrency control, lock based protocols, time-stamp based protocols, validation based protocols, multiple granularity. Recovery system - failure classification, storage structure, recovery and atomicity, **log-based recovery**, shadow paging, buffer management, failure with loss of non-volatile storage, advanced recovery techniques, remote backup systems. Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

**Text Books**

- 1) Date C J, "An Introduction To Database System", Addison Wesley
- 2) Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
- 3) Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley
- 4) Leon & Leon, "Database Management System", Vikas Publishing House.
- 5) Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication
- 6) Majumdar & Bhattacharya, "Database Management System", TMH
- 7) Ramakrishnan, Gehrke, "Database Management System", McGraw Hill
- 8) Kroenke, "Database Processing: Fundamentals, Design and Implementation", Pearson Education.
- 9) Maheshwari Jain, "DBMS: Complete Practical Approach", Firewall Media, New Delhi

# JAVA PROGRAMMING

CCSN-207

Cr. L T P

4 3 1 0

**COURSE OBJECTIVES:** The objectives of this course are to:

1. Understand Object Oriented Programming concepts and basic characteristics of Java.
2. Know the principles of packages, inheritance and interfaces.
3. Define exceptions and use I/O streams.
4. Develop a java application with threads and generics classes
5. Design and build simple Graphical User Interfaces.

**COURSE OUTCOMES:** On successful completion of the course, the student will be able to:

1. Write Java programs with properly designed constants, variables, objects, methods and reusability functionality
2. Learn how and where to implement interface and exception-handling concepts.
3. Write multi-threaded programming concepts for concurrency control based applications.
4. Construct GUI based JAVA enterprise applications
5. Develop web applications using JDBC, RMI and Servlet methodologies.

## Unit – I

**Introduction to Java:** Overview of Java, Keywords, constants, variables and Data Types, Operators and Expressions, Decision Making, Branching and Looping, Jump statements: break, continue, return.

**Introducing classes, objects and methods,** constructors, class inheritance. Inheritance types, super keyword, preventing inheritance: final classes and methods.

**Arrays and String:** Creating an array, one and two dimensional arrays, string array and methods.

**Packages and interfaces:** Extending Interfaces, CLASSPATH, Access protection. Interfaces-defining an interface, implementing interfaces.

## Unit – II

**Exception handling** - Fundamentals of exception handling, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.

**Multithreading-** Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

## Unit – III

**Input/Output Programming:** Basics, Streams, Byte and Character Stream, predefined streams, Reading and writing from console and files.

**The Collection Framework:** collection interfaces, collection classes(ArrayList, LinkedList, Hash set), Accessing a Collection via an Iterator, Vector, More utility class

#### **Unit – IV**

Working with windows, Graphics and Text, using AWT controls, Button, Label, TextField Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout and Menus.

**GUI Programming with Swing** – Introduction, limitations of AWT, components, containers.

**Event Handling:** Event Classes, Listener Interfaces, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes. A Simple AWT Application

#### **Unit – V**

**Applets** – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, **Beans:** Introduction to Java Beans and Servlets.

**Database Connectivity JDBC architecture, establishing connectivity and working with connection interface, connecting to a database, working with statements, creating and executing SQL statements, working with Result Set**

#### **Course Outcomes:**

- An understanding of the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements;
- A competence to design, write, compile, test and execute straightforward programs using a high level language;
- An appreciation of the principles of object oriented programming;
- An awareness of the need for a professional approach to design and the importance of good documentation to the finished programs.
- Be able to implement, compile, test and run Java programs comprising more than one class, to address a particular software problem.
- Demonstrate the ability to use simple data structures like arrays in a Java program.
- Be able to make use of members of classes found in the Java API (such as the Math class)

#### **Reference Books:**

1. Patrick Naughton and Herbertz Schildt, “*Java-2 the Complete Reference*”, TMH, 7<sup>th</sup> Edition, 2006.
2. E. Balaguruswamy, “*Programming with Java: A Primer*”, TMH, First Reprint, 2007.



3. Horstmann, "*Computing Concepts with Java 2 Essentials*", John Wiley and sons inc, Third Edition, 2003.
4. Kathy Sierra, "*Head First Java*", O'Reilly, Second Edition, February 2005.
5. Programming in Java, S. Malhotra and S. Choudhary, Oxford Universities Press.

## OPERATING SYSTEMS (UNIXPROGRAMMING)

CCSN-205

L T P 3 1 0

### UNIT - I: Introduction to Operating System:

Operating Systems Objectives and functions, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Operating System services, user OS Interface, System Calls, Types of System Calls, System Programs.

### UNIT - II: Process and CPU Scheduling :-

Process concepts - The Process, Process State, Process Control Block, Threads, Process Scheduling - Scheduling Queues, Preemptive Scheduling, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread scheduling - Process Synchronization, The Critical section Problem, Reader's Writer's Problem, Dining Philosopher Problem, Semaphores, and Classic Problems of Synchronization.

### UNIT - III: Memory Management and Virtual Memory :

Logical & physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table, Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demanding Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

### UNIT - IV: I/O System :-

**I/O SYSTEM:** Mass storage structure - overview of mass storage structure, disk structure, disk attachment, disk scheduling algorithms, swap space management, stable storage implementation, tertiary storage structure.

**I/O:** Hardware, application I/O interface, kernel I/O subsystem, transforming I/O requests to hardware operations, streams, performance.

### UNIT - V: Deadlocks -:

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock. Banker's Algorithm

Protection - System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights.

### TEXT BOOKS:

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

### REFERENCES BOOKS:

1. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
2. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. Operating Systems, A. S. Godbole, 2nd Edition, TMH
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
6. Operating Systems, S, Haldar and A. A. Arvind, Pearson Education.
7. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
8. Operating Systems in depth, T. W. Doeppner, Wiley.

## DISCRETE MATHEMATICS

CCSN-209

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### Unit-I: Set Theory, Relations, and Functions (10 topics)

Sets: definition, countable/uncountable, Venn diagrams, power set, Relations: definition, types, composition, equivalence relation, partial ordering, Functions: definition, types, one-to-one, onto, inverse, composition, Theorem Proving Techniques: mathematical induction, pigeonhole principle, proof by contradiction.

### Unit-II: Propositional Logic (10 topics)

Propositions, logic operators, First-order predicate logic, Truth tables, tautologies, arguments, Contradictions, logical implications, equivalence, Predicates, universal/existential quantifiers. 1. Probability: definitions, axioms, properties, Random Variables: definitions, types, Probability Distributions: Bernoulli, Binomial, Conditional Probability and Independence,

### Unit-III: Posets, Hasse Diagrams, and Lattices (12 topics)

Permutations and Combinations, Recurrence Relations, Generating Functions, Ordered sets, Hasse diagrams, Isomorphic ordered sets, well-ordered sets, Lattices: properties, bounded, complemented, Boolean Algebra: basic definitions, sum/product forms, Logic gates, Karnaugh maps.

### Unit-IV: Algebraic Structures (10 topics)

Number Theory: divisibility, primality, Congruences: definitions, properties, Groups: definition, properties, types (Semi Group, Monoid, Abelian), Subgroup, cyclic groups, cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of groups, Rings and fields.

### Unit-V: Graphs and Combinatorics (10 topics)

Recurrence Relations, generating functions, Graphs: simple, multi, terminology, Representation, Bipartite, Regular, Planar, connected, Euler graphs, Hamiltonian path/circuits, Adjacency/Incidence Matrices, Graph coloring, Tree: definition, rooted, properties, binary search.

### Reference Books:

1. Seymour Lipschutz & M.L. Lipson, Discrete Mathematics, Tata McGraw Hill, 2nd Edition, 1999.
2. Trembley, J.P & R. Manhor, Discrete Mathematical Structure with Application to Computer Science, McGraw Hill, 1997.
3. Kenneth H. Rosen, Discrete Mathematical and its applications, McGraw Hill, 4th Edition, 2002.
4. JL Morr, AKandal and TP Baker, Discrete Mathematics for Computer Scientists and Mathematics, PHI, 1999.
5. Deo, Narsingh, Graph Theory With application to Engineering and Computer Science, PHI, 2007

## MATHMATICS

CCSN-209 A

L T P 31

2

### UNIT-I

Introduction, Elementary row and column transformations, Rank of matrix, Linear dependence, Consistency of linear system of equations, characteristic equation, CaleyHamilton Theorem, Eigen values and eigen vectors, Diagonalisation, Complex and unitary matrices

### UNIT-II

nth derivative, Leibnitz theorem, Partial differentiation, Euler's theorem, Curve tracing, Change of variables, Expansion of function of several variables..

### UNIT-III

Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications)

### UNIT-IV

Double and triple integrals, Change of order of the Integration, Change of variables, Beta and Gamma functions, Application to area and volume, Dirichlet's integral and its applications.

### UNIT-V

Point functions, Gradient, divergence and curl of a vector and their physical interpretations, Line, Surface and Volume integrals, Green's, Stoke's and Gauss divergence theorems.

### References:

1. Shanti Narayan A Text Book of Martices, S. Chand & Co.
2. Thomas/Finny Calculus and Analytical Geometry, Narosa House.
3. B.S. Grewal . Higher Engineering Mathematics, Publishers,
4. Piskunov, M. . Differential and Integral Calculus, Peace Pub.
5. Jaggi and Mathur : Advanced Engineering Mathematics, Khanna
6. C. Prasad . Mathematics for Engineers, Prasad

## BASICS MATHEMATICS

CCSN-209 B

L T P 31 2

### UNIT-I

Numbers, HCF & LCM, Decimal Fractions, Simplification, Square and Cube roots, Average, Problems on numbers, Problems on Ages, Surds and Indices, Percentage, Profit and Loss

### UNIT-II

Ratio and Proportion, Partnership, Chain rule, Time and work, Pipes and cisterns, Time and distance, Problems on trains, Boats and streams.

### UNIT-III

Number system and basic Arithmetic, Algebra, Trigonometry, Geometry and Cartesian, Geometry, Calculus- Differential and Integral, Matrix Algebra, Probability and Statistics.

### UNIT-IV

Double and triple integrals, Change of order of the Integration, Change of variables, Beta and Gamma functions, Application to area and volume, Dirichlet's integral and its applications.

### UNIT-V

Point functions, Gradient, divergence and Time and work, Pipes and cisterns, Time and distance, Problems on trains, Boats and streams, Simple and Compound interest, Miscellaneous curl of a vector and their physical interpretations, Line, Surface and Volume integrals, Green's, Stoke's and Gauss divergence theorems.

### References:

1. Shanti Narayan A Text Book of Matrices, S. Chand & Co.
2. Thomas/Finny Calculus and Analytical Geometry, Narosa House.
3. B.S. Grewal . Higher Engineering Mathematics, Publishers,
4. Piskunov, M. . Differential and Integral Calculus, Peace Pub.

## Mathematics-I

### (CCSN 209 C)

#### Unit – 1

Differential Calculus -1: determination of nth order derivatives of Standard functions - Problems. Leibnitz's theorem (without proof) - problems. Polar Curves - angle between the radius vector and tangent, angle between two curves, Pedal equation of polar curves. Derivative of arc length - Cartesian, Parametric and Polar forms (without proof) - problems. Curvature and Radius of Curvature – Cartesian, Parametric, Polar and Pedal forms (without proof) –problems

#### Unit -2

Differential Calculus -2 Taylor's and Maclaurin's theorems for function of one variable(statement only)- problems. Evaluation of Indeterminate forms. Partial derivatives – Definition and simple problems, Euler's theorem(without proof) – problems, total derivatives, partial differentiation of composite functions-problems. Definition and evaluation of Jacobians

#### Unit – 3

Vector Calculus: Derivative of vector valued functions, Velocity, Acceleration and related problems, Scalar and Vector point functions. Definition of Gradient, Divergence and Curl-problems. Solenoidal and Irrotational vector fields. Vector identities -  $\text{div}(\phi A)$ ,  $\text{curl}(\phi A)$ ,  $\text{curl}(\text{grad } \phi)$ ,  $\text{div}(\text{curl } A)$ .

#### Unit - 4

Differential Equations ; Solution of first order and first degree differential equations – Exact, reducible to exact and Bernoulli's differential equations .Orthogonal trajectories in Cartesian and polar form. Simple problems on Newton's law of cooling.

#### Unit - 5

Linear Algebra Rank of a matrix by elementary transformations, solution of system of linear equations - Gauss-elimination method, Gauss –Jordan method and Gauss-Seidel method Eigen values and Eigen vectors, Rayleigh's power method to find the largest Eigen value and the corresponding Eigen vector. Linear transformation, diagonalisation of a square matrix .  
Reduction of Quadratic form to Canonical form.

## **Advance Applied Mathematics**

### **(CCSN 209 D)**

#### Unit – I

Complex Analysis: Analytic function, Cauchy-Riemann equations, Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's series, Maclaurin's series, Laurent's series, Singularities and zeros.

#### Unit – II

Complex Analysis: Residue integration method, evaluation of real integrals Numerical Methods: Errors of numerical results, error propagation,., Lagrange Interpolation, Newton divided difference interpolation, Newton's forward and backward interpolation, Spline interpolation.

#### Unit - III

Numerical Methods: Numerical integration: The trapezoidal rule, The Simpson's rules, Gauss Integration formulas. Solution of ordinary differential equation: Euler's method, Improvement of Euler's method, Runge-Kutta methods, multistep methods, Methods for system and higher order ordinary differential equations.

#### Unit - IV

Probability Theory and Its Applications: Probability, Random variables, Probability distributions, Mean and variance; Features of Probability Distribution: Binomial, Poisson, Uniform and Normal distribution, Distribution of several random variables.

#### Unit – V

Statistical Techniques and Its Applications: Scope of Statistics, Random sampling, Sampling Distribution, Correlation analysis, Regression Analysis, Fitting Straight Lines, Estimation of Parameters, Statistical Hypothesis.



**CBSN-201 VALUE EDUCATION, HUMAN RIGHTS AND LEGISLATIVE PROCEDURE**

**UNIT – I :** Concept of Human Values, Value Education Towards Personal Development Aim of education and value education; Evolution of value oriented education; Concept of Human values; types of values; Components of value education.

Personal Development: Self-analysis and introspection; sensitization towards gender equality, physically challenged, intellectually challenged. Respect to - age, experience, maturity, family members, neighbors, co-workers.

**UNIT – II :** Value Education Towards National and Global Development National and International Values: Constitutional or national values - Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity. Social Values - Pity and probity, self-control, universal brotherhood. Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith. Religious Values - Tolerance, wisdom, character. Aesthetic values - Love and appreciation of literature and fine arts and respect for the same. National Integration and international understanding.

**UNIT – III :** Environment and Ecological balance – interdependence of all beings – living and non-living. The binding of man and nature – Environment conservation and enrichment.

**UNIT - IV :** Therapeutic Measures Control of the mind through a. Simplified physical exercise b. Meditation – Objectives, types, effect on body, mind and soul c. Yoga – Objectives, Types, Asanas d. Activities: (i) Moralization of Desires (ii) Neutralization of Anger (iii) Eradication of Worries (iv) Benefits of Blessings

**UNIT; V :** Human Rights 1. Concept of Human Rights – Indian and International Perspectives a. Evolution of Human Rights b. Definitions under Indian and International documents

2. Broad classification of Human Rights and Relevant Constitutional Provisions. a. Right to Life, Liberty and Dignity b. Right to Equality c. Right against Exploitation d. Cultural and Educational Rights e. Economic Rights f. Political Rights g. Social Rights

3. Human Rights of Women and Children a. Social Practice and Constitutional Safeguards (i) Female Foeticide and Infanticide (ii) Physical assault and harassment (iii) Domestic violence (iv) Conditions of Working Women

4. Institutions for Implementation a. Human Rights Commission b. Judiciary

5. Violations and Redressal a. Violation by State b. Violation by Individuals c. Nuclear Weapons and terrorism d. Safeguards.

## Humanities and Science

### (CBSN 201 A)

#### Unit I

Atomic and molecular structure Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules . Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

#### Unit II

Spectroscopic techniques and applications Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering

#### Unit III

Intermolecular forces and potential energy surfaces Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

#### Unit IV

Use of free energy in chemical equilibria First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

#### Unit V

Periodic properties Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

## **Public Policy**

**(CBSN 201B)**

### **Unit-I**

Introduction of Public Policy: Definition, Nature, Scope and Importance of Public Policy, Evolution of Public Policy and Policy Sciences, Public Policy and Public Administration. Approaches to Public Policy Analysis: The Process Approach, The Logical Positivist Approach, The Phenomenological Approach, The Participatory Approach and Normative Approach

### **Unit-II**

Theories and Process of Public Policy Making: Theories and Models of Policy Making, Perspectives of Policy Making Process, Institutions of Policy Making.

### **Unit-III**

Policy Implementation and Evaluation: Concept of Policy Implementation, Techniques of Policy Implementation, Concept of Policy Evaluation, Constraints of Public Policy Evaluation

### **Unit-IV**

Introduction of Governance: Definitions, Issues and Controversies, Reinventing Government, Reforming Institutions: The State, Market and Public domain. State and Governance: Origin and types of State, Democratic State and Democratic Administration, Neo-Liberalism and Rolling Back State and Governance as Government.

### **Unit-V**

Citizen and Techniques of Governance: Rule of Law and Human Rights, Accountability, Participation, Representation. Techniques of Governance: Openness and Transparency, Citizen Charter, Social Audit. Emerging Trends in Public and Private Governance: An Overview, Market, Civil Society, Information and Communication Technology

## **Leaders for Global Operations**

**(CBSN 201C)**

### UNIT –I

Introduction to Operations Management - Process Planning - Plant Location - Plant Lay out - Introduction to Production Planning.

### UNIT –II

Stages of Development of Operations Research- Applications of Operations Research Limitations of Operations Research- Introduction to Linear Programming- Graphical Method- Simplex Method - Duality.

### UNIT-III

Transportation Problem- Assignment Problem - Inventory Control - Introduction to Inventory Management - Basic Deterministic Models - Purchase Models - Manufacturing Models with and without Shortages.

### UNIT-IV

Shortest Path Problem - Minimum Spanning Tree Problem - CPM/PERT - Crashing of a Project Network.

### UNIT- V

Game Theory- Two Person Zero-sum Games -Graphical Solution of (2 x n) and (m x 2) Games - LP Approach to Game Theory - Goal programming - Formulations - Introduction to Queuing Theory - Basic Waiting Line Models: (M/M/1):(GD/a/a), (M/M/C):GD/a/a).

## PERL PROGRAMMING

CCSN-211

### Course Outcomes:

At the end of the course student will be able to

CO1: To identify basic perl constructs and to outline perl debugging commands.

CO2: To create and design simple perl programs with the available perl

CO3: pre-defined functions.

CO4: To demonstrate perl subroutines and perl references

CO5: To Apply Data Structures on perl programs and perl formats.

CO6: To install HTTP server and to design and execute perl programs CO5: through CGI.

### UNIT-I

(10 Lectures)

Introduction to perl# ! , Basic I/O, Variables variables& Backslash Interpolation, Scalar/list control operators, operator procedure, if unless, loops, loop control.

Debugging perl scripts Debugging commands, Debugger customization, Unattended execution, Debugging support, the perl profiler.

### UNIT-II

(10 Lectures)

Built in Function Perl functions by category, Perl functions in alphabetical order. Regular expressions Pattern Matching, operators, Meta character and meta symbols. Character classes, quantifiers, Pointers, capturing & clustering, Alternation, staying in control.

### UNIT-III

(10 Lectures)

Subroutines Syntax, Semantics, parsing references, prototypes, subroutine attributes. Formats Format variables, footers. References Creating References, using hard references, symbolic references, Braces, Brackets and Quotes.

### UNIT-IV

(10 Lectures)

Data Structure Arrays of Arrays, Hashes of arrays, Arrays of Hashes, Hashes of Hashes, Hashing as function , Elaborate records, Hashes of functions. CGI Programming CGI Basic, Forms, Methods.

### UNIT-V

(10 Lectures)

Here Docs, More CGI Emailing, Cookies, File uploading, E-mail.

### TEXT BOOKS

1. Tom Christiansen, Brian D Foy, Larry Wall, Jon Orwant, *Programming Perl*, O'Reily, 3rd Edition, 2010.

Scott Guelich, *CGI Programming with Perl*, O'Reily, et al., SPD publication , 2nd Edition , 2008.

## INTRODUCTION TO SOFT COMPUTING

CCSN-213

### UNIT - I INTRODUCTION TO SOFT COMPUTING 9

Concept of computing systems. "Soft" computing versus "Hard" computing, characteristics of Soft computing, Some applications of Soft computing techniques.

### UNIT - II FUZZY LOGIC 12

Fuzzy sets, logic operations, and relations; Fuzzy decision-making; fuzzy inference systems; design steps in fuzzy logic controller; application of fuzzy logic controller in Electrical engineering.

### UNIT III – NEURAL NETWORKS 12

Basic concepts and major classes of neural networks, supervised and unsupervised learning, Single-layer perceptron, Multi-layer perceptron, Back Propagation Neural network, Recurrent neural networks, support vector machine, Application of neural network modelling / control problems in Electrical engineering

### UNIT – IV OPTIMIZATION TECHNIQUES: 12

Genetic algorithms, Evolutionary Algorithm, Simulated Annealing, Ant colony optimization - Applications to Electrical engineering problems.

#### TEXT BOOKS

1. George J.Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic, Second Edition, PHI, 2006.
2. J.M.Zurada, Introduction to artificial neural systems, Jaico Publishing House, 2006
3. D.E. Goldberg, Genetic algorithms in search, optimization, and machine learning, Addison-Wesley.

#### REFERENCES

S.N.Sivanandam, and S.N.Deepa, Principles of Soft computing, Second Edition, Wiley India Pvt. Ltd, 2013.

1. N.P.Padhy and S.P.Simon, Soft computing with MATLAB programming, Oxford publishers, 2015.
2. <http://nptel.ac.in/courses/106106046/41>
3. <https://www.coursera.org/learn/neural-networks>
4. <http://www.iitk.ac.in/kangal/deb.shtml>

# MATLAB Programming For Engineers

CCSN-215

## Unit I

Introduction to MATLAB; Basics of MATLAB: windows - input & output - platform dependence - file types - general commands

## Unit II

Script Files; Function files: Functions – Sub functions; Global Variables, Loops, Branches and control-flow

## Unit III

Tutorials: Basics - Creating and working with arrays - Creating and Printing simple plots - Creating, saving and executing a script - Creating and executing a function file - Working with arrays and matrices - Importing and Exporting data - Files and Directories - Publishing reports

## Unit IV

Graphics; Plotting simple graphs; Basic 2D plots: Style Options – Labels, title and legend –

Axis Control, zoom in and zoom out – Using plot editor - Overlay plots – Specialized 2D Plots; Examples: fplot – semilogx – semilogy – loglog – fill – bar – barh – area – pie – hist – stem – stairs – compass – comet – pcolor; subplots

## Unit V

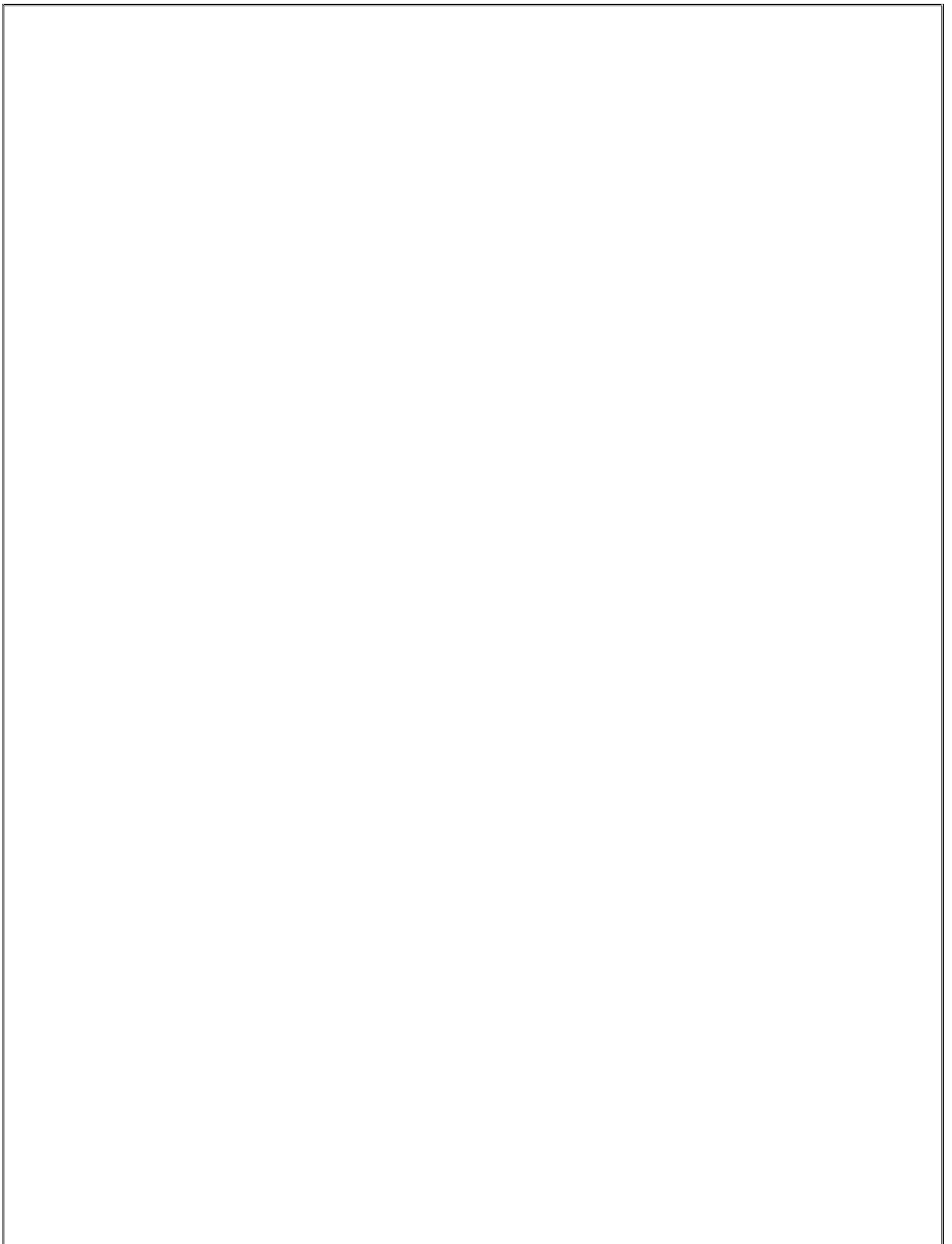
3D plots; View: view(2) and view(3) with examples; Mesh and surface plots; Examples:

plot3 – fill3 – surf – surfc -surf1 – meshz – waterfall – pie3 – stem3

## REFERENCES

1. Getting started with MATLAB- RudraPratap, Oxford University Press.
2. Mastering MATLAB 7- Duane Hanselma and Bruce Littlefield, Pearson Education.
3. Understanding MATLAB- S N Alam, I K International Publishing House.
4. Programming in MATLAB- Patel and Mittal, Pearson Education India
5. Web resource: [www.mathworks.com](http://www.mathworks.com)





1. Implement insertion, deletion, and display functions for a singly linked list.
2. Create a program to perform insertions and deletions in a doubly linked list.
3. Use arrays to implement a stack with push, pop, and display operations.
4. Create a queue using arrays, including enqueue, dequeue, and display functions.
5. Implement a circular queue with necessary operations.
6. Implement a stack using a linked list and perform standard operations.
7. Create a BST with functions for insertion, deletion, and traversal (in-order, pre-order, post-order).
8. Use adjacency list and matrix to represent a graph, including a function to add edges.
9. Implement DFS for graph traversal.
10. Create a program to perform BFS on a graph.
11. Implement a simple hash table with collision handling using chaining.
12. Create a max-heap and implement insert and delete operations.
13. Implement basic sorting algorithms (Bubble, Selection, Insertion).
14. Write a program to perform merge sort on an array.
15. Create a dynamic array that can grow and shrink in size, with functions for insertion and deletion.

**List of Experiments:**

1. Introduction SQL-SQL\*Plus
2. Road way travels E-R Diagrams
3. Various Data Types
4. Tables
5. My SQL Installation
6. DDL and DML Commands with Examples
7. Key Constrains-Normalization
8. Aggregate functions
9. Joins
10. Views
11. Index
12. PL/ SQL
13. Exception handling
14. Triggers
15. Cursors
16. Subprograms-procedure PL/ SQL
17. Functions of PL/ SQL

- 1) A simple program that prints "Hello, World!" to the console.
- 2) Implement a basic calculator that performs addition, subtraction, multiplication, and division.
- 3) Write a program to calculate the factorial of a number using both iterative and recursive methods.
- 4) Create a program to check if a given string is a palindrome.
- 5) Generate and display the Fibonacci series up to a specified number of terms.
- 6) Implement bubble sort, selection sort, and insertion sort algorithms for an array of integers.
- 7) Write a program to perform linear search on an array.
- 8) Implement binary search on a sorted array.
- 9) Create a program that performs various string operations (substring, concatenation, length, etc.).
- 10) Implement a singly linked list with methods for insertion, deletion, and traversal.
- 11) Create a stack using arrays with push, pop, and display operations.
- 12) Implement a queue using linked lists with enqueue, dequeue, and display operations.
- 13) Create a binary tree and implement in-order, pre-order, and post-order traversal methods.
- 14) Demonstrate the use of HashMap for storing and retrieving key-value pairs.
- 15) Write a program to read from a file and display its contents on the console.

**UNIT I: Introduction to C++:** History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Compiling and Executing Simple Programs in C++.

**Data Types, Variables, Constants, Operators and Basic I/O:** Declaring, Defining and Initializing Variables, Scope of Variables, Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Character I/O (getc, getchar, putc, putcharc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.hetc).

**UNIT II: Expressions, Conditional Statements and Iterative Statements:** Operators in C++, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

**UNIT III: Functions:** Utility of functions, Call, Functions returning value, void functions, Inline Functions, Return data type of functions, Functions parameters, Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments, virtual function.

**Arrays:** Creating and Using One Dimensional Arrays- ( Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops, use various types of arrays (integer, float and character arrays / Strings).

Two-dimensional Arrays- (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays

**Derived Data Types (Structures and Unions), Pointers and References in C++,**

**Memory Allocation in C++:** static and dynamic memory allocation, use of new and delete operators, storage of variables in static and dynamic memory allocation.

**UNIT IV: File I/O, Preprocessor Directives:** Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros. **Using Classes in C++:** Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Function overloading in classes, Class level variable and local variable, Objects as parameters, Specifying the Protected and Private Access, Overview of Template classes and their use.

**UNIT V: Overview of Function Overloading and Operator Overloading**

Need of Overloading functions and operators, Overloading functions by number and type of arguments, looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators), friend function in C++.

**Inheritance, Polymorphism and Exception Handling**

Inheritance, types of inheritance, Polymorphism (compile time and run time), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

**Reference Books**

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003

**Unit- I**

**Introduction:** Basics of Algorithms, Characteristics of Algorithms, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation.

**Unit- II**

**DIVIDE AND CONQUER:** General method, applications-analysis of binary search, quick sort, merge sort, AND OR Graphs.

**GREEDY METHOD:** General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.

**Unit- III**

**GRAPHS (Algorithm and Analysis):** Breadth first search and traversal, Depth first search and traversal, spanning trees, connected components and bi-connected components, Articulation points. **DYNAMIC PROGRAMMING:** General method, applications - optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

**Unit- IV**

**BACKTRACKING:** General method, Applications- n-queen problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles. **BRANCH AND BOUND:** General method, applications - travelling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution.

**Unit- V**

**NP-HARD AND NP-COMPLETE PROBLEMS:** Basic concepts, non-deterministic algorithms, NP-hard and NP-complete classes, Cook's theorem

**Text books:**

- 1) Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
- 2) E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
- 3) Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

**References:**

- 1) Jon Kleinberg and ÉvaTardos, Algorithm Design, Pearson, 2005.
- 2) Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
- 3) Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997 Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
- 4) Harsh Bhasin,"Algorithm Design and Analysis",FirstEdition,Oxford University Press.
- 5) Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995

## Internet and Web Technology

CCSN- 206

Cr L T P 4 3 1

2

### Unit 1

Introduction web: WWW, History, Protocols, Creating website for individual and corporate, Identification of objects, Cyber Laws, Web team, Communication, Quality assurance, Search Engine, Designing strategies, Database to web applications.

### Unit 2

HTML: History of HTML, Header, HTML Tags: concept of Tag, types of HTML tags, structure of HTML program, Text formatting through HTML: Paragraph breaks, line breaks, background and BGcolor attributes, Emphasizing material in a web page: Heading styles, drawing lines, text styles, Text styles and other text effects-centering, spacing, controlling font size & color, Lists: Using unordered, ordered, definition lists Adding Graphics To HTML Documents: Using Image tag, attributes of Image tag, changing width & height of image, tables, linking documents, Forms,

### Unit 3

Cascade Style Sheets: introduction to CSS, Need for CSS, basic syntax and structure, using CSS, font attributes, color and background attributes, text attributes, border attributes, margin related attributes, list attributes Using class and span tag, External Style Sheets, Creating Divs with ID style, Creating Tag& Class style, creating borders, Navigation links, creating effects with CSS.

### Unit 4

JavaScript: Introduction, Variables, Conditional statements, Operators, Popup box, Functions, Loops, Strings, Events, JavaScript and HTML, JavaScript Object Oriented Programming, use of JavaScript in web pages. Understand JavaScript event model, Variable declaration, Operators, Control Statements, Error Handling, Understanding arrays, Function Declaration, Built In Functions, Standard Date and Time Functions, Working with Objects, Call method in JavaScript.

### Unit 5

Introduction to PHP, Syntax, Common PHP Script Elements, Variables, String, Operators, If...Else, Switch, Arrays, Looping, Functions, Forms, \$\_GET, \$\_POST, Date, Include, Error, Exception, Filter, Working With Forms, Processing Forms, Form Validation

### Reference Books:

- 1) Ivan Bayross“ HTML, DHTML and JavaScript ”, Prentice Hall Inc., 3<sup>rd</sup> Edition, 2003.
- 2) Uttam K. Roy, “Web Technologies ”, Oxford, 1<sup>st</sup> Edition 2010.
- 3) TanweerAlam, “Internet and Java Programming ”, Khanna Book Publication, 1st Edition, 2010.

**UNIT I**

Introduction - History of Computer Networking and the Internet, Goals and Applications of Networks, Network structure and architecture, The Layered Architecture: Protocol Layering, The OSI Reference Model and the TCP/IP protocol, Network Topology Design – Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods.

**UNIT II**

**Data Link Layer:** Communication at the Data Link Layer; Nodes and Links, Examples of Data Link layer protocols.

**Design Issues:** Framing techniques: Byte Oriented and Bit Oriented Protocols; Error Control: Error Detection and Correction; Sliding Window Flow Control Protocols.

Media Access Control: Aloha, CSMA, CSMA/CD, CSMA/CA; Collision free protocols with Controlled Access; Limited Contention Protocols; Channelization: FDMA, TDMA, CDMA; Wavelength Division Multiple access for Fiber-Optic Data Communication.

**IEEE LAN standards:** Ethernet (Physical specifications, Encoding, Frame Format & MAC protocol); Token Ring and FDDI, Introduction to Wireless Networks: IEEE 802.11 Wireless LAN

**UNIT III**

**Network Layer:** Services, Routing Algorithms: Shortest path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing.

**Network layer in TCP/IP:** Basic characteristics of IP protocol; addressing and header format of IPv4 ; IPv6: Major goals& features.

**Congestion Control & Quality of Service:** General Principals; Congestion control in Virtual – Circuit Subnets; Congestion Control in Datagram Subnets: Choke packets, Load Shedding; Random Early Detection, Jitter Control; Over provisioning, Buffering, Traffic Shaping, Leaky bucket, token bucket, Resource Reservation, Admission Control, Packet Scheduling.

**UNIT IV**

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Datacompression techniques, cryptography - TCP - Window Management.

**UNIT V**

**Application Layer:** Application Layer: File Transfer, Access and Management, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

Application Layer Protocols: The Web and http: Persistent and Non- persistent connections, http message format, cookies, proxy server, Email: smtp, mail message formats, mail access protocols: pop3, imap, MIME DNS: Service

**Text Books:**

- 1.Computer Networks, by Andrew S Tanenbaum, PHI. (2010)
- 2.Data and Computer Communications , by Walliam Stallings, PHI. (2002)

**Reference Books:**

- 1.Data Communications, Computer networking on OSI , by Fred Halsall, Addison Wesley Publishing Co.1998



2. Computer Networking -A Top-Down Approach Featuring the Internet , James F. Kurose and Keith W. Ross , Addison Wesley Publishing Co. 2004
3. Computer Networks: Protocols standards and interfaces , by Uyles Black, Prentice Hall.2002
4. Data communication & Networks , by Behrou A. Forouzan, Tata McGraw Hill. 2002

**COURSE OBJECTIVES:** The objectives of this course are to:

1. Introduce the student to the concepts of theory of computation in computer science.
2. Acquire insights into the relationship among formal languages, formal grammars, and automata.
3. Learn to design automata and Turing machine.

**COURSE OUTCOMES:** On successful completion of the course, the student will be able to: 1. Apply the knowledge of automata theory, grammars & regular expressions for solving the problem.

2. Analyze the give automata, regular expression & grammar to know the language it represents.
3. Design Automata & Grammar for pattern recognition and syntax checking.
4. Distinguish between decidability and un-decidability of problems.
5. Identify limitations of some computational models and possible methods of proving them.

**UNIT I:**

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

**UNIT II:**

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA, Chomsky Hierarchy.

**UNIT III:**

Context Free Languages – Leftmost and rightmost derivation, parsing and ambiguity, ambiguity in grammar and languages, normal forms

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF.

**UNIT IV:**

Pushdown Automata – NDPDA, DPDA, context free languages and PDA, comparison of deterministic and non-deterministic versions, closure properties, pumping lemma for CFL, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, closure properties of CFLs.

**UNIT V:**

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Decidability, Undecidable problems about TMs. Post

correspondence problem (PCP), Modified PCP, Other Undecidable Problems Introduction to recursive function theory.

**Textbooks:**

1. An Introduction to Formal Languages and Automata, by Peter Linz, Third Edition, Narosa Publishers (1998)
2. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
3. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
4. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
5. Y.N.Singh "Mathematical Foundation of Computer Science", New Age International.
6. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI Learning Private Limited, Delhi India.
7. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation, Pearson Education.
8. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
9. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning.

## NANO SCIENCES

### CCSN 212

#### UNIT I

**Introduction to Nanotechnology:** Introduction, definition, history, effects of nanoscience and nanotechnology in different fields.

**Properties of nanomaterials:** Size and shape and based properties, colour, melting point, density of states, band gap and magnetism.

#### UNIT II

**Nanoparticles synthesis:** Top down and bottom-up approach, colloids, emulsions, micelles, polymers, mechanical attrition and high energy ball milling.

#### UNIT III

**Nanomaterials characterization:** Scanning electron microscopy, Transmission electron microscopy, Fourier transform infrared spectroscopy, Energy dispersive spectroscopy, Atomic force microscopy, X-ray diffraction, Dynamic light scattering, UV-Vis spectrophotometer.

#### UNIT IV

**Fabrication:** Lithography, chemical vapor deposition, physical vapor deposition, sol-gel synthesis, molecular self-assembly, crystal growth, epitaxy, etching, masking.

#### UNIT V

**Applications of nanotechnology in chemical industry:** Catalysis, fuel cells, drug delivery and diagnostics, coatings, nanocomposite polymers, fluid inks, dyes, block copolymers, dendrimers, carbon nanotubes applications.

#### Text Books:

1. Nanoscale materials in Chemistry, K.J. Klabunde, Wiley, 2001.
2. Introduction to Nanotechnology, C.P. Poole Jr. and F.J.Owens, Wiley, 2003.
3. Nanotechnology, M. A. Ratner and D. Ratner, Pearson, 2003.
4. The Chemistry of Nanomaterials: Synthesis, Properties and Applications, C.N.R Rao, Achim Müller, A. K. Cheetham, Wiley, 2004.

#### References:

1. Hand book of Nanostructured Materials and Nanotechnology, H. Nalwa, Vol. 1 to 5, Academic Press, 1999.
2. Hand book of Nanotechnology, B. Bhusan, Springer, 2004.
3. Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers and Architects, D. Schodek, P. Ferreira, M.F. Ashby, 2009.

Unit -1 Fundamentals of Technical Communication: Technical Communication: Features; Distinction between General and Technical Communication; Language as a tool of Communication; Dimensions of Communication: Reading & comprehension; Technical writing: sentences; Paragraph; Technical style: Definition, types & Methods; The flow of Communication: Downward; upward, Lateral or Horizontal; Barriers to Communication.

Unit - II Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Key-Note Speech: Introduction & Summarization; Expert Technical Lecture: Theme clarity; Analysis & Findings; 7 Cs of effective business writing: concreteness, completeness, clarity, conciseness, courtesy, correctness, consideration.

Unit - III Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; **Modes of Presentation**; Overcoming Stage Fear: Confident speaking; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Unit - IV Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; **Discourse competence: combination of expression & conclusion**; **Socio-linguistic competence: Strategic competence**: Solution of communication problems with verbal and non verbal means.

Unit - V Kinesics & Voice Dynamics: Kinesics: Definitions; importance; Features of Body Language; Voice Modulation: Quality, Pitch; Rhythm; intonation; Pronunciation; **Articulation; stress & accent**; **Linguistic features of voice control: Vowel & Consonant Sounds**. Reference Books

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
3. Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.
4. Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S.
5. A Text Book of Scientific and Technical Writing by S.D. Sharma; Vikas Publication, Delhi.
6. Skills for Effective Business Communication by Michael Murphy, Harvard University, U.S.
7. Business Communication for Managers by Payal Mehra, Pearson Publication, Delhi.

### Course Outcomes

1. Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.
2. Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
3. Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.
4. Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.
5. It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.

# BUSINESS COMMUNICATION

CBSN-202A

L T P Credits

3 1 0 4

## Unit 1: Nature of Communication:

Process of Communication, Types of Communication (verbal & Non Verbal), Importance of Communication, Different forms of Communication Barriers to Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers

## Unit 2 Business Correspondence:

Letter Writing, presentation, Inviting quotations, Sending quotations, Placing orders, Inviting tenders, Sales letters, claim & adjustment letters and social correspondence, Memorandum, Inter-office Memo, Notices, Agenda, Minutes, Job application letter, preparing the Resume.

## Unit 3 Report Writing:

Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, and check lists for reports.

## Unit 4 Vocabulary:

Words often confused, Words often misspelt, common errors in English.

## Unit 5 Oral Presentation:

Importance, Characteristics, Presentation Plan, Power point presentation, Visual aids.

## Suggested Readings:

1. Bovee, and Thill, Business Communication Today, Pearson Education
2. Lesikar, R.V. & Flatley, M.E. Kathryn Rentz; Business Communication Making Connections in Digital World, 11th ed., McGraw Hill Education.
3. Shirley Taylor, Communication for Business, Pearson Education
4. Locker and Kaczmarek, Business Communication: Building Critical Skills, TMH
5. LeenaSen, Communication Skills, PHI Learning

## Technical Writing

CBSN-202B

L T P Credits

3 1 0 4

### Unit 1

What is technical writing? Difference between technical writing and other forms of writing. Qualities and qualifications of technical writers.

### Unit 2

End products of technical writing. Professionals involved - project manager/editor, writers, graphic artists; liaison with product engineers/scientists and clients.

### Unit 3

Roles and responsibilities of writers, editors/project managers. 7 Cs of effective writing: Document formats – **hard and soft copy versions designs.**

### Unit 4

Principles of technical writing; styles in technical writing; clarity, precision, **coherence and logical sequence in writing.**

### Unit 5

Stages of Technical writing. Document development process, Technical documentation, Planning, Tools, architecture, templates, content development, **technical reviews, editorial reviews. Quality control.**

### Books for References

1. Technical writing style by – Dan Jones , Sam Dragga
2. Handbook of Technical writing by- Walter.E.ollu -1976
3. Technical Writing by- Serena Henning
4. Technical writing process by – Kieran Morgan and SanjaSpejic -2015
5. A guide to Technical writing by – T.A. Rickard



## INTERCULTURAL COMMUNICATION

CBSN-202C

L T P Credits

3 1 0 4

### Objectives:

This course introduces you to the fundamental principles and issues of intercultural communication from an interdisciplinary perspective. It proposes to develop a perception of and appreciation for different cultural perspectives and values.

### UNIT-I

Language and Culture - studying culture and communication - **Various Definitions of Culture** - basic approaches to the concept of culture - Communication and Culture - Intercultural communication: Interaction in a Diverse World - historic overview of the field - the academic field of intercultural communication - "Culture" in the Field of Intercultural Communication - **Three Principles of Interculturalism** - DMIS: Denial - Defense - Minimization.

### UNIT-II

Identity - Racial identity - Ethnic identity - Cultural identity; Plurality of Identity; Properties of Cultural Identity - Individual - relational and communal identity; Social and Cultural Identities - Gender identities - Age identities - Spiritual identity - Class identity - National identity - Regional identity - Personal identity; Stereotypes - **Cultural Diversity in Perception: Alternative Views of Reality.**

### UNIT-III

Verbal and nonverbal communication (including conversation styles, politeness, and expectations related to time and space) - low and high context communication processing - communication styles - **cultural speaking rules Politeness-perception,** interpretation and evaluation; nonverbal communication; Proxemics - Contact/low contact - Kinesics - Gestures, facial expressions, body language, eye contact; artifacts - Clothing, artifacts, living environments.

## UNIT-IV

Cultural values and communication-Cross-cultural Studies-Individualism and collectivism-Hierarchy and power distance; Intercultural Studies-Intercultural encounters and adaptation-Encounters and emotions-Culture Shock-Intercultural adaptation-U-curve model-honeymoon period-crisis period-adjustment period-acculturation period-W-curve model-Stress-Adaptation-Growth-emigrant assignment cycle.

## UNIT-V

Intercultural competence-Intercultural Competent Person-intercultural sensitivity-Milton Bennett's developmental model of intercultural sensitivity-Acceptance, Adaptation and Integration Measurement of Intercultural Sensitivity; Theory to practice-Cultural influences on context-the business setting, the educational setting and the healthcare setting.

## REFERENCES:

- Bennett, M.J. 1986. A developmental approach to training for intercultural sensitivity. *International Journal of Intercultural Relations*, 10(2), 179-196.
- Bennett, M.J. 1993. Toward ethno relativism: A developmental model of intercultural sensitivity. In R.M. Paige (ed.), *Education for the intercultural experience*. Yarmouth, ME: Intercultural Press. 21-71.
- Bennett, M.J. (ed.). 1998. *Basic Concepts of Intercultural Communication, selected readings*. Yarmouth, Maine: Intercultural Press, Inc.
- Bennett, M.J. 1998. *Intercultural Development Inventory Manual*. Portland: The Intercultural Communication Institute.
- Bhawuk, D.P.S. & H.C. Triandis. 1996. The role of culture theory in the study of culture and intercultural training. In D. Landis & R.S. Bhagat (eds.), *Handbook of Intercultural Training*. Thousand Oaks, CA: Sage Publications. 17-34.

1	Write a program to print HELLO WORLD in C++.
2	Write a program to add two numbers using C++.
3	Write a program to Swap two numbers using C++.
4	Write a program to Find Simple Interest in C++.
5	Write a program to Check Even or Odd Integers using if and else in C++.
6	Write a program to create object and class in C++.
7	Write a program to achieve compile time polymorphism in C++.
8	Write a program to using single inheritance in ++.
9	Write a program to using multiple Inheritances in C++.
10	Write a program to using virtual function in C++.
11	Write a program to create parameterized constructor in C++.
12	Write a program to using friend function in C++.
13	Write a program to create function overriding in C++.
14	Write a program to print matrix in C++.
15	Write a program to print addition of a single dimensional array in C++

## DESIGN AND ANALYSIS OF ALGORITHMS LAB

### CCSN-254

LIST OF EXPERIMENTS: (Any 12 experiments from the following list to be performed)

1. Implement Selection sort and find how many steps are required to sort 10 elements.
2. Implement and Analysis factorial of a number program using iterative and recursive methods.
3. Implement Insertion Sort and analyses the time complexity.
4. Given two strings, find the minimum number of edits required to convert one string to another.
5. Write a program to find the Greatest Common Divisor of two numbers using recursion and find how many steps are required to execute it.
6. Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n (the number of elements in the list to be sorted) and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
7. Write a program to check whether a given graph is connected or not using the DFS method.
8. Apply Greedy method to compress the given data using Huffman encoding.
9. Implement fractional knapsack problem using Greedy Strategy.
10. Implement minimum spanning tree using Prim's algorithm and analyses its time complexity.
11. Apply dynamic programming methodology to implement 0/1 Knapsack problem.
12. Solve the longest common subsequence problem using dynamic programming.
13. Find the length of the longest subsequence in a given array of integers such that all elements of the subsequence are sorted in strictly ascending order.
14. Apply dynamic programming methodology to find all pairs shortest path of a directed graph using Floyd's algorithm.
15. Implement matrix chain multiplication and find the optimal sequence of parentheses.

## INTERNET AND WEB TECHNOLOGY LAB

### CCSN-256

1. Create a simple webpage using HTML to display a personal profile, including text, images, and links.
2. Develop a webpage that uses CSS to style elements such as headings, paragraphs, and lists. Implement a navigation bar and footer.
3. Write a JavaScript program to validate user input in an HTML form, ensuring that required fields are filled out correctly.
4. Design a webpage that adapts to different screen sizes using CSS media queries. Test it on various devices or emulators.
5. Create a webpage that uses AJAX to fetch data from a public API and display it dynamically without reloading the page.
6. Build a webpage that dynamically updates its content using JavaScript. For example, create a simple to-do list where users can add and remove items.
7. Develop a web application that integrates with a third-party API, such as a weather API, to display current weather information based on user input.
8. Implement a web application that uses localStorage or sessionStorage to save user preferences or a simple note-taking feature.
9. Create a simple PHP application that connects to a MySQL database, allowing users to insert, update, and delete records.
10. Develop a web application that includes user registration and login functionality using PHP and a database.
11. Build a basic CMS that allows users to create, edit, and delete blog posts, using PHP and MySQL.
12. Create a simple chat application using WebSockets to enable real-time communication between users.
13. Develop a web application that allows users to upload images, storing them on a server and displaying them on the site.
14. Design an e-commerce product page using HTML, CSS, and JavaScript, including features like product descriptions, images, and a shopping cart.
15. Build a simple single-page application using a JavaScript framework (like React or Vue) that allows users to navigate between different views without refreshing the page.

UNIT-I

Introduction: Definition and scope of operations research (OR), Necessity of operation research in industry .phases of OR study. Linear Programming: Two variable Linear Programming model and Graphical method of solution

Unit-II

Game Theory: uses of game theory ,some applications and examples payoffs, characteristic of game theory ,Two person zero-sum game ,Pure and Mixed strategies, Saddle point and its existence.

Unit-III

Queuing Theory in operation research , Two phase method, Dual Simplex method, special cases of Linear Programming, duality, Dual Simplex algorithm.

UNIT-IV

Transportation Problems: Types of transportation problems, mathematical models, transportation algorithms, Assignment: Allocation and assignment problems and models, **processing of job through machines.**

UNIT-V

Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. Project Management: **Phases of project management, guidelines for network construction, CPM and PERT.**

Text / Reference Books:

1. Wayne L. Winston, "Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. PanneerSeevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

# SOFTWARE ENGINEERING

CCSN-301

Cr L-T-P  
4 3- 1-0

**COURSE OBJECTIVES:** The objectives of this course are to

1. Learn and understand the principles of Software Engineering.
2. Learn methods of capturing, specifying, visualizing, and analyzing software requirements.
3. Apply Design and Testing principles to S/W project development.
4. Understand project management through life cycle of the project.

**COURSE OUTCOMES:** On successful completion of the course, the student will be able to

1. Identify appropriate software design model based on requirement analysis.
2. Formulate Software Requirements Specification (SRS) reports for the real world application.
3. Translate a specification into a design and identify the components to build the architecture.
4. Plan a software engineering process to account for quality issues and non-functional requirements.
5. Estimate the work to be done, resources required and the schedule for a software project plan.

**UNIT – I- Introduction to Software Engineering:** Introduction, software applications, importance of software evolution of software, Software Components, Software Characteristics, Software Crisis & myths, Software Engineering paradigms, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, RAD model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

## UNIT - II

**Software Requirement Specifications (SRS):** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

## UNIT - III

**Software Design:** Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

## UNIT - IV

**software testing strategies:** Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-Down and Bottom-Up Testing Strategies: Structural Testing (white box), Functional Testing (black box testing), validation testing, system testing, debugging, Alpha and Beta Testing of Products.

## UNIT - V

**Software Reliability and Software Project Management:** fault avoidance and tolerance, exception handling, defensive programming. Software Maintenance: maintenance characteristics, maintainability, maintenance tasks, maintenance side effects. CASE: introduction, levels of case,

architecture, case building blocks, objectives, case repository, characteristics of case tools, categories, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

**References:**

1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, "Software Engineering", Cengage Learning.
8. Pfleeger, Software Engineering, Macmillan Publication



# COMPILER DESIGN

CCSN303

Cr L-T-P

4 3- 1- 0

## Unit - I

Introduction to Compiler: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers

Implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars

and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, **derivation and parse trees**, capabilities of CFG.

## Unit – II

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

## Unit - III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address

code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, **declarations and case statements**.

## Unit - IV

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Intermediate Code Generation Different Intermediate Forms - Abstract Syntax tree, Polish Notation, 3 address code, Implementation of 3 address code-Quadruple, Triples and Indirect triples

## Unit - V

Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, **DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis**.

### Reference Books:

1. Alfred V. Aho, Jeffrey D. Ullman, “*Principles of Compiler Design*”, Narosa Publication, 2002
2. A.V. Aho, R. Sethi and J.D Ullman, “*Compiler: principle, Techniques and Tools*”, Addison Wesley, 2<sup>nd</sup> Edition, 2006.

3. H.C. Holub, "*Compiler Design in C*", Prentice Hall Inc, Second Edition, Digitized Edition, 2010.
4. O.G. Kakde, "*Compiler Design*", Laxmi Publication, Seventh Edition, 2007

## OBJECT ORIENTED ANALYSIS AND DESIGN

CCSN-305

Cr L-T-P 4 3-1-0

### Unit – I

Object Modeling: Objects and classes, links and association, generalization and inheritance, aggregation, abstract class and abstract function, inheritance and multiple inheritance, Meta data.

### Unit – II

Dynamic Modeling: Events and states, operations, nested state diagrams, advanced dynamic modeling concepts, sample dynamic model.

### Unit – III

Functional Modeling: Data flow diagram, specifying operations, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD.

### Unit – IV

Java Programming: Introduction, Operator, Data types, Variables, Methods & Classes, Static methods, Static block, Interfaces, final method and classes, Multithread Programming, Thread life cycle, I/O, Java Applet. Java Library: String Handling, Input/Output exploring Java.io, Networking, Applets classes, Event Handling, Introduction to AWT, Working with window, Graphics, AWT Controls, Layout Manager and Menus, Images, AWT Basics, Event Handling, AWT Button, AWT Label, AWT TextField, AWT TextArea, AWT Checkbox.

### Unit – V

Software Development using Java: Java Beans, Java Swing, java Servlets, Servlets Basic Concepts, JSP, Features of JSP, creating simple JSP page, Application of java, Dynamic Billboard Applet, Image Menu: An image based menu, Lavatron Applets, Scrabblets, JDBC, Brief functioning of upper layer E-mail and their applications.

### Text Books:

1. James Rumbaughetal, “Object Oriented Modeling and Design”, PHI
2. Herbert Schildt, “The Complete Reference: Java”, TMH.
3. E. Balagurusamy, “Programming in JAVA”, TMH.

### References:

1. Booch Grady, “Object Oriented Analysis & Design with application 3/e”, Pearson Education, New Delhi.
2. BjarneStroustrup, “C++ Programming Language”, Addison Wesley
3. E. Balagurusamy, “Object Oriented Programming with C++”, TMH

# CRYPTOGRAPHY AND INFORMATION SECURITY

CCSN-307

Cr L-T-P  
4 3-1-0

## Unit - I

**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security .

**Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.

## Unit - II

**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers.

**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange and Knapsack Algorithm.

## Unit - III

**Cryptographic Hash Functions:** Message Authentication, Secure hash algorithm(SHA-512)

**Message Authentication Codes:** Authentication requirements.

**Digital signatures Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

## Unit - IV

**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

## Unit - V

**E-Mail Security:** Pretty Good Privacy, S/MIME

**IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange.

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

### Reference Books:

1. William Stallings,” *Cryptography and Network Security: Principles and Practice*”, Pearson Education, 5<sup>th</sup> edition, First impression 2011.
2. Forouzan A. Behrouz, “*Cryptography and Network Security* “, Tata McGraw Hill , 2<sup>nd</sup> Edition, 2008

# INTERNET WEB PROGRAMMING

## CCSN 309

### Unit 1: Introduction to Web Development

This unit introduces the fundamentals of web development, including an overview of the web's architecture. Students will learn about the roles of clients and servers, the basics of HTTP, and the difference between static and dynamic web pages.

### Unit 2: HTML and CSS

In this unit, students will explore HTML for structuring web content and CSS for styling it. They will learn to create semantic HTML documents, apply CSS styles, and understand the box model, layout techniques, and responsive design principles.

### Unit 3: JavaScript Basics

This unit focuses on JavaScript as the programming language of the web. Students will learn about variables, data types, functions, control structures, and the Document Object Model (DOM). They will practice manipulating HTML elements and responding to user events.

### Unit 4: Advanced JavaScript and AJAX

Building on the basics, this unit covers more advanced JavaScript concepts, including asynchronous programming, callbacks, and promises. Students will learn about AJAX for making asynchronous requests to servers, enabling dynamic content updates without reloading the page.

### Unit 5: Introduction to Front-End Frameworks

In this unit, students will be introduced to popular front-end frameworks such as React, Angular, or Vue.js. They will learn about component-based architecture, state management, and how to create interactive user interfaces.

# GRAPH THEORY

CCSN 311

## UNIT 1

**Introduction:** Graphs, Sub-graphs, Regular graph, Adjacency and incidence matrices, Finite and infinite graph, Incidence and degree, Isolated vertex, Pendent vertex and null graph, **Turan's theorem.**

## UNIT 2

**Paths and Circuits:** Isomorphism, Walk, Cycle, Paths and circuits, Simple and proper circuit, Connected and disconnected graph, Euler graphs, Operations on graphs, Hamiltonian paths and circuits, Bipartite graph, Berge theorem, Hall's theorem, Edge connectivity, Blocks, Menger's theorem.

**Trees and Fundamental Circuits:** Trees, Properties of tree, Pendant vertices in a tree, Distance and centers in a tree, Spanning tree, Cayley's Formula, Minimal spanning tree, Prim and Kruskal's algorithm, Matrix Tree theorem, Dijkstra's Shortest Path Algorithm, Floyd-Warshall algorithm, Huffman's Coding Algorithm, Depth-first and breath first algorithm.

## UNIT 3

**Cuts sets and cut-vertices:** Cut sets, Properties of cutset, all cut sets in a graph, 1-isomorphism, 2isomorphism.

**Planar graph and dual graphs:** Planar graphs, Homoeomorphic graph, Kuratowski's Two Graphs, Different representation of a planar graph, Tutte's f-factor theorem, Detection of planarity, Geometric dual, Combinatorial dual.

## UNIT 4

**Coloring, Covering and Partitioning:** Chromatic number, Chromatic Partitioning, Chromatic Polynomial, Covering, Four colour conjecture, Five-colour theorem, Dirac Theorem, **Brooks theorem, Vizing theorem.**

## UNIT 5

**Directed Graphs:** Directed graph, Diagraph and binary relations, Directed Paths, Euler diagraphs, **Acyclic digraphs, Topological sorting, Warshall's algorithm,** Bellman-Ford algorithm, Ramsey theorems.

### Recommended Books:

1. DeoNarsingh, Graph Theory with applications to Engineering and Computer Science, PrenticeHall of India (2007).
  2. Parmenter Michael M., Goodaire Edgar G., Discrete Mathematics with Graph Theory, Prentice-Hall of India (2007).
  3. Rosen, Kenneth H. Discrete Mathematics and its Applications, Tata Mcgraw-Hill (2003).
- Bondy, J.A. Murty U.S.R., Graph theory and Applications, North Holland Publications (1995).

# COMPUTER VISION

CUCS 341

## UNIT 1

**Overview of computer vision and its applications:** Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation

## UNIT 2

**Image Processing:** Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution, Fourier transformation and its applications in sharpening, **blurring and noise removal**

## UNIT 3

**Feature detection:** edge detection, corner detection, line and curve detection, active contours, SIFT and HOG descriptors, shape context descriptors, Morphological operations

**Segmentation:** Active contours, split & merge, watershed, region splitting, region merging, graph-based segmentation, mean shift and model finding, Normalized cut

## UNIT 4

**Camera calibration:** camera models; intrinsic and extrinsic parameters; radial lens distortion; direct parameter calibration; camera parameters from projection matrices; orthographic, **weak perspective, affine, and perspective camera models.**

**Motion representation:** the motion field of rigid objects; motion parallax; optical flow, the image brightness constancy equation, affine flow; differential techniques; feature-based techniques; regularization and robust estimation

## UNIT 5

**Motion tracking:** statistical filtering; iterated estimation; observability and linear systems; **the Kalman filter**

**Object recognition and shape representation:** alignment, appearance-based methods, invariants, image eigenspaces

### Books:

1. Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011.
2. Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011.
3. Introductory techniques for 3D computer vision, E. Trucco and A. Verri, Prentice Hall, 1998.

## ROBOTICS AND AUTOMATION

### CUCS 343

#### Unit 1: Introduction to Robotics

This unit covers the fundamental concepts of robotics, including an overview of its applications across various industries. Students will explore the historical development of robotics, different types of robots, and the basic components that make up robotic systems.

#### Unit 2: Robotics Kinematics

In this unit, students will learn about kinematics and its significance in robotics. The focus will be on forward and inverse kinematics, the use of homogeneous transformation matrices, and methods for representing position and orientation in three-dimensional space.

#### Unit 3: Robot Dynamics

This unit delves into the principles of dynamics as applied to robotic systems. Students will study Newton-Euler and Lagrangian methods for dynamic modeling, gaining insights into the behavior of robotic manipulators through simulation.

#### Unit 4: Control Systems for Robotics

Students will be introduced to control theory, emphasizing feedback and feedforward control mechanisms. The unit will cover PID control in robotic applications as well as advanced control strategies such as adaptive and robust control.

#### Unit 5: Sensors and Perception

This unit focuses on the various types of sensors utilized in robotics. Students will learn about sensor fusion techniques, vision systems, image processing, and the role of lidar and other spatial perception technologies in enhancing robotic functionality.



## HUMAN COMPUTER INTERACTION

### CUCS 347

#### UNIT I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

#### UNIT II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

#### UNIT III

Windows – New and Navigation schemes selection of window, selection of devices based and screen- based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

#### UNIT IV

HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction

#### UNIT V

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

**TEXT BOOKS:** 1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech. Units 1, 2, 3 2. Human – Computer Interaction. Alan Dix, Janet Finckay, Gregory, Abowd, Russell Bealg, Pearson Education Units 4,5

**REFERENCE BOOKS:** 1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia. 2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech. 3. User Interface Design, Soren Lauesen , Pearson Education. 4. Human –Computer Interaction, D. R. Olsen, Cengage Learning. 5. Human –Computer Interaction, Smith - Atakan, Cengage Learning.

**Unit - I**

Introduction to Cloud Computing: Evolution and History of Cloud Computing, Why Cloud Computing is Becoming Highly Important, Features of Cloud Computing, Advantages of Cloud Computing, Characteristics of Cloud Computing, Limitations of Cloud Computing. Cloud Computing Applications, Cloud Technologies, Security Risks of Cloud Computing **Cloud Service Provider Companies**.

**Unit - II**

Cloud Models and Types: Deployment Models, Service Models. Layers and Types of Cloud, Components of Cloud Computing, Cloud Computing Service Providers, Software as a Service (SaaS): Software as a Service, Evolution of SaaS, Brief Introductory part of Software as a Service, Characteristics of SaaS, Services Provided by SaaS, Advantages/ Disadvantages of SaaS, SaaS Providers and their services.

**Unit -III**

Platform as a Service (PaaS): Introduction to PaaS, Advantages of PaaS, Disadvantages of PaaS, Evolution of PaaS, PaaS Service Providers- Amazon AWS, Google App Engine, Force.com, PaaS Application Framework, PaaS Operator Verbs, PaaS Developer Verbs, Challenges of PaaS

**Unit -IV**

Infrastructure as a Service (IaaS): Evolution, IaaS Architecture- Advantages and Disadvantages of Infrastructure as a Service, IaaS Providers, IaaS Architecture, Advantages and Disadvantages of Infrastructure as a Service Data in Cloud: Evolution of Network Storage in Cloud, Data as a Service, **Database as a Service, Cloud Based Data Storage**, Advantages and Limitations of Cloud Based Storage Solution, Cloud Based Data Storage Service Providers

**Unit - V**

Virtualization: Introduction to Virtualization and its Technical Evolution, History of Virtualization, Types of Virtual Machines, Advantages of Virtualization, Components of Virtualization, Types of Virtualization, Cloud Hypervisor,

Infrastructure Security Network level security, Host level security, Application level security. Data privacy and security Issues. Access Control and **Authentication in cloud computing**.

**Reference Books:**

1. MICHAEL Miller, "*Cloud Computing: Web based application that change the way you work and collaborate*", Kindle , First Edition, 2011.
2. Barrie Sosinsky, "*Cloud Computing bible*", Wiley publishing INC, First Edition ,2011
3. George Reese, "*Cloud Application architecture*" O'Reilly, First Edition, 2009.

# ENERGY STUDIES

**CBSN-301**

**Cr L-T-P**

**2 2-0-0**

UNIT 1: Energy Sources - Fossil fuels, Nuclear fuels, hydel, solar, wind and bio fuels in India, Energy conservation, Nuclear energy through fission and fusion processes.

UNIT 2: Energy Conversion- Energy conversion from source to utility, Solar, Nuclear, Geothermal, Tide and Wind Energies.

UNIT 3: Global Energy Scenario- Role of energy in economic development and social transformation, Overall energy demand, availability and consumption, Depletion of energy resources and its impact on economy, **Non proliferation of nuclear energy.** International energy policies of G-8, G-20, OPEC and European Union countries.

UNIT 4: Indian Energy Scenario- Commercial and noncommercial forms of energy, Utilization pattern in the past, present and also future prediction, **Sector wise energy consumption.**

UNIT 5: Energy Policy: Energy policy issues at global level, national level and state level, Energy conservation act 2001, Electricity act 2003, Energy pricing and its impact on global variations.

## **Course Outcomes:**

At the end of this course, students will demonstrate the ability to

1. Understanding Energy Sources
2. Energy Conversion Processes
3. Global Energy Dynamics
4. Indian Energy Landscape
5. Energy Policy and Regulation
6. Sustainability and Conservation
7. Research and Communication Skills
8. Critical Thinking and Problem Solving

## **Text Books:**

1. Jose Goldenberg, Thomas Johanson, and Reddy, A.K.N., Energy for Sustainable World, WileyEastern, 2005.

2. Charles E. Brown, World Energy Resources, Springer Publication, New York, 2002.

3. Culp, A.W., Principles of Energy Conversion, McGraw Hill New York, 2004. 80

Reference Books:

1. Bukhootsow, B., Energy Policy and Planning, Prentice Hall of India, New Delhi, 2003.

2. TEDDY Year Book, The Energy Research Institute (TERI), 2011

# SUPPLY CHAIN MANAGEMENT

## CBSN-301A

### UNIT 1

#### **Introduction**

Introduction, Generic Types of supply chain, Various Definitions and Implications, Major Drivers of Supply chain.

#### **Strategic Decisions- in Supply Chain Management**

Introduction, Business Strategy, Core Competencies in Supply Chain, **Strategic SC Decisions**, Customer Relationship Management Strategy, Supplier Relationship Management Strategy

#### **Source of Management in Supply Chain**

Introduction, Elements of Strategic Sourcing, **A Collaborative Perspective**, Development of Partnership.

### UNIT 2

#### **Inventory Management in Supply Chain**

Introduction, Types of Inventory, Supply/ Demand Uncertainties, Inventory costs, Selective Inventory Control, Vendor Manage Inventory system, Inventory Performance Measure

#### **Logistics In Supply Chain Management**

Introduction, Strategy, Transportation Selection, Trade-off, Models for Transportation and Distribution, Third Party Logistics,, **Overview of Indian Infrastructure for Transportation**

### UNIT 3

#### **Information Technology in Supply Chain**

Introduction, Types of IT Solutions like Electronic Data Inter change (EDI), Intranet/ Extranet, Data Mining/ Data Warehousing and Data Marts, E-Commerce, E- Procurement, Bar Coding Technology.

#### **Information System in Supply Chain**

Introduction, Computer Based Information Systems, Computer Models and Perceptions about ERP, ERP & SCM

#### **Application of Mathematical Modeling in Supply Chain**

Introduction, Modeling, Consideration in Modeling SCM System, **Structuring the Logistic chain, Concept of Modeling.**

### UNIT 4

#### **Reverse Supply Chain**

Introduction, Reverse Supply Chain v/s Forward Supply Chain, Types of Reverse Flows, Issues in Management of Reverse Supply Chain, Reverse Supply Chain for Food items, Reverse

Logistic and Environment Impact.

#### **Integration & Collaborative Supply Chain**

Introduction, Evolution of collaborative SCM, Efficient Customer response, Collaboration at various levels, **Imperatives for Successful Integrative Supply Chains.**

## **UNIT 5**

### **Agile Supply Chain**

Introduction, Source of Variability, Characteristics of Agile Supply Chain, Achieving Agility in Supply Chain.

### **Cases of Supply Chain**

Cases of Supply Chain like, News Paper Supply Chain, Book Publishing, Mumbai Dabbawala, Disaster management, **Organic Food, Fast Food.**

### **Text Books & Reference Books:**

1 Supply Chain Management Theories & Practices, R. P. Mohanty, S. G. Deshmukh, Dreamtech Press, 19-A, Anari Road, Daryaganj, New Delhi

2 Supply Chain Management Strategy, Planning & Operation by Sunil Chopra, Peter Meindl

3 Total Supply Chain Management by Ron Basu, J. Nevan Wright

4 Supply Chain Management, Chopra, Pearson

5 Logistics Engineering and Management, Blanchard, pearson

# TRANSPORTATION

## CBSN-301B

### UNIT 1

Introduction to Transportation Engineering, Classification of roads, Typical cross sections of roads in urban and rural area, Requirements and factors controlling alignment of roads  
Introduction to geometric design of highways, Design controls and criteria, Design of highway cross section elements, Design of horizontal alignment - Stopping sight distance, Overtaking sight distance, super elevation, transition curve, length and shift of transition curve, **extra widening. Vertical alignment (introduction only)**

### UNIT 2

Introduction to highway materials, Desirable properties and testing of road aggregates, bituminous materials and sub grade soil. Introduction of flexible and rigid pavements, **Factors influencing the design of flexible pavements, Design** of flexible pavements by CBR method and IRC 37: 2018. Construction of bituminous pavements

### UNIT 3

Introduction to traffic engineering, Traffic characteristics, Capacity and Level of Service, Design Speed, Traffic surveys, Types of road intersections, **Traffic control devices (introduction only), Design of isolated signals by Webster's method.**

### UNIT 4

Railway Engineering - Component parts of a railway track - functions, concept of Gauges, coning of wheels, cant deficiency, compensation of gradients Tunnel Engineering: Tunnel – sections, tunnel surveying - alignment, transferring centre grade into tunnel. Harbours – classification, features, requirements. Break waters - necessity and functions, classification. Docks – **Functions and types - dry docks, wet docks ( Introduction only)**

### UNIT 5

Introduction to Airport Engineering, Components of airport, selection of site for airport. Runway orientation, basic runway length and corrections required, **Taxiways and aprons**

#### Text Books

1. Khanna, S.K. and Justo C.E.G., Highway Engineering, Nem Chand & Bros., 20152. Kadiyali, L. R. and N.B Lal, Principles and Practices of Highway Engineering, KhannaPublishers, 20133. Khanna, S. K. and Arora. M. G., Airport Planning and Design, Nemchand& Bros4. Mundrey J. S, Railway Track Engineering, Tata McGraw Hill, 2009



# Environment And Sustainability

CBSN-301 C

## UNIT 1

**Ecosystem:** Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem. Global warming - Causes, effects, GreenHouse Effect, Ozone depletion.

## UNIT 2

**Air Pollution:** Air pollution, Natural and manmade sources of air pollution, Effects of air pollution. Air Pollutants and Types. Control of air pollutants by Cyclone separator and Electrostatic Precipitator, Air (prevention and control of pollution) act 1981.

Noise Pollution: Noise pollution: sources of pollution, measurement of pollution level, Effects and Control of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000.

## UNIT 3

**Water and Soil Pollution:** Water pollution and Sources of water pollution, Types of water pollutants, Characteristics of water pollutants, control measures of water pollution.. Definition and list unit operations in water and WasteWater Treatment process, Water (prevention and control of pollution) act 1974, Water conservation – Importance of Rain Water Harvesting. Soil pollution, Causes, Effects and Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides.

## UNIT 4

**Renewable sources of Energy:** Solar Energy: Basics of Solar energy. Definition and advantages of advanced solar collectors. Solar water heater and Solar stills and their uses. Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Wind energy: Current status and future prospects of wind energy. Wind energy in India. Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources- Hydrogen energy, Ocean energy resources, Tidal energy conversion.

## UNIT 5

**Solid Waste Management and Environmental:** Solid waste generation, Sources and characteristics of Municipal solid waste, Solid Waste Management rules 2016- 3R in SWM. E-Waste generation, Sources and characteristics, E waste management rules 2016 Plastic Waste generation, Sources and characteristics, Recycled plastic rules 2016 Importance of Environment (protection) act 1986 Occupational health and safety measures.

References:

(a) Suggested Learning Resources: Books:

1. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and
4. Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099.
5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.

**List of Experiments:**

1. To prepare problem statement for any project.
2. Create a problem statement for an online learning platform.
3. Develop an understanding and Software Requirements Specification (SRS).
4. To draw a sample Entity Relationship Diagram for library management system.
5. To prepare DataFlow Diagram Online shopping management system.
6. To prepare the student / university management system Use Case Diagram
7. To draw a sample activity diagram for enterprise architectural modeling.
8. To draw a sample Class diagram for seminar.
9. To draw a Sequence Diagram for Online Shopping Checkout Process
10. To draw a Component Diagram for Library Management System.
11. To draw a Deployment Diagram for University Management System.
12. Develop a testing strategy for an online banking application.
13. Create a presentation that explains each phase of the SDLC with examples.

## COMPILER DESIGN LAB

### CCSN-353

1. Create a lexer using Lex/Flex to tokenize input source code and print tokens with types.
2. Build a recursive descent parser or use Yacc/Bison to parse a grammar and display parse trees for valid inputs.
3. Implement a semantic checker that traverses the parse tree to identify type mismatches and undeclared variables.
4. Develop a module that converts the parse tree to intermediate representation (e.g., three-address code).
5. Apply optimization techniques like constant folding and dead code elimination to the intermediate code.
6. Create a generator that translates intermediate code into assembly language for a specified target architecture.
7. Implement error detection and reporting for lexical, syntax, and semantic errors with meaningful messages.
8. Use ANTLR or LLVM to construct a complete compiler from grammar definitions to code generation.
9. Measure compilation time and memory usage, and evaluate the efficiency of the generated code.
10. Develop a mini compiler for a simple language combining all components: lexer, parser, semantic analyzer, optimizer, and code generator.

## OBJECT ORIENTED ANALYSIS AND DESIGN LAB

### CCSN-355

1. Design a class diagram for a simple system (e.g., library management) using UML notation.
2. Implement a program to create objects of defined classes and initialize their attributes.
3. Write a program demonstrating method overloading in one class and method overriding in a subclass.
4. Develop a class that uses private and public access modifiers to encapsulate data and provide getter/setter methods.
5. Create a base class and derive multiple subclasses, demonstrating the use of inherited properties and methods.
6. Implement a program that uses both compile-time (method overloading) and runtime (method overriding) polymorphism.
7. Design an interface and an abstract class, then implement classes that adhere to these definitions.
8. Write a program to illustrate the differences between composition and aggregation through class relationships.
9. Implement a design pattern (e.g., Singleton, Factory) in a sample application to demonstrate its utility.
10. Create use case and sequence diagrams for a given scenario to illustrate interactions and functionality.

# Computer Graphics

CCSN 302

L T P 4 0 2

## Unit – I

**Fundamentals of Computer Graphics:** Introduction, Area and Applications of computer Graphics, Graphical Input-Output Devices, Random scan displays, Raster scan displays. Cathode Ray Tube

**Graphics Primitives:** Algorithms for drawing various output primitives - Line, Circle, arcs & sectors, Polygon: Polygon Representation, Entering polygons, Boundary Fill & Flood Fill algorithm

## Unit – II

**Two Dimensional Transformations:** Introduction, Types of Transformation : Translation, Rotation, Scaling, Shear, Reflection, Homogenous coordinate system, Composite transformations.

## Unit – III

**Viewing & Clipping 2-D:** 2D Windowing, Window to View port transformation, Line Clipping Algorithms : Cohen Sutherland, Liang Barsky Line clipping algorithms, Polygon clipping algorithm : Sutherland Hodgeman,

## Unit – IV

**Three Dimensional Transformation :** 3-D geometry primitives, transformations. Viewing & Clipping: 3-D Viewing, Projections : Parallel and Perspective projections.

**Curves & Surfaces:** Curved Lines & surfaces, Interpolation & Approximation splines, Parametric & Geometric Continuity conditions, Bezier Curves & surfaces, B-spline curves & surfaces.

## Unit – V

**Illumination & Visible Surface Detection Methods:** : Classification of visible surface detection algorithms, Depth buffer method, Scan-line method, Depth-Sorting method, Subdivision Algorithm.

**Illumination Models & Surface Rendering:** Light sources, Light and Color, Phong Model, Surface Rendering methods, Basic Ray tracing algorithm.

### Text Books:

1. Donald D Hearn, M. Pauline Baker, “Computer Graphics, C version”, 2nd Edition, Pearson Education (1997).
2. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, “Computer Graphics: Principles & Practice in C”, 2nd Edition, Addison Wesley Longman (1995).

### Reference Books:

1. Donald Hearn and M Pauline Baker, “Computer Graphics with OpenGL”, Pearson education, 2004.
2. Zhigang Xiang, Roy A Plastock, “Computer Graphics”, Schaums Outline, TMH(2007).

3. Dave Shreiner, Mason Woo, Jackie Neider, Tom Davis, “OpenGL Programming Guide: The Official Guide to Learning OpenGL” (2013).

**UNIT I**

**Data Warehousing and Business Analysis:** - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

**UNIT II**

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture of A Typical Data Mining Systems- **Classification Of Data Mining Systems.**

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

**UNIT III**

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – **Ensemble Methods – Model Section..**

**UNIT IV**

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

**UNIT V**

**Mining Object, Spatial, Multimedia, Text and Web Data:**

**Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.**

**TEXT BOOKS**

1. J. Han and M. Kamber, “Data Mining: Concepts and Techniques”, Harcourt India /Morgan Kauffman, 2001. (UNITs 1 to IV)
2. Alex Berson and Stephen J. Smith, “Data Warehousing, Data mining and OLAP”, Tata McGraw-Hill, 2004. (UNIT V)

**REFERENCES**

1. Margaret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education, 2004.
2. Sam Anahory and Dennis Murry, “Data Warehousing in the Real World”, Pearson Education, 2003.



# MOBILE COMPUTING

CCSN-306

Cr. L T P  
4 3 1 0

## UNIT I: Introduction To Mobile Computing

Mobile Communications and Computing, Mobile Computing, novel applications, limitations, and architecture.

GSM : Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

## UNIT II: Cellular Concept And System Design Fundamentals

Introduction to wireless communication: Evolution of mobile communications, mobile radio systems- Examples, trends in cellular radio and personal communications. Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems. SDMA, FDMA, TDMA, CDMA.

## UNIT III: Mobile Radio Propagation

Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models, Indoor propagation models, Small scale Multipath propagation, Impulse model, Small scale Multipath measurements, parameters of Mobile multipath channels, types of small scale fading, statistical models for multipath fading channels.

## UNIT IV: Medium Access Control

(Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

## UNIT V: Wireless Lan Standards

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications

### TEXT BOOKS

1. Jochen Schiller,—Mobile Communications, Addison-Wesley. (Chapters 4,7,9,10,11), second edition, 2004.
2. Stojmenovic and Cacute, —Handbook of Wireless Networks and Mobile Computing, Wiley, 2002. (Chapters 11, 15, 17, 26 and 27)

### REFERENCE BOOKS

1. Reza Behravanfar, —Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML, ISBN: 0521817331, Cambridge University Press, October 2004.
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, —Fundamentals of Mobile and Pervasive Computing, ISBN: 0071412379, McGraw-Hill Professional, 2005

# KNOWLEDGE MANAGEMENT & EXPERT SYSTEM

CCSN-308

Cr. L T P  
4 3 1 0

## Unit - I

Introduction to knowledge Management Distinction between data, information & knowledge. Concept of knowledge creation, Intellectual Capital Creation, Human Capital, Customer Capital and Organizational Capital. History of KM, Importance of KM, Information Management to Knowledge Management, K M Cycle, Industrial Economy to Knowledge Economy

## Unit-II

Socio-cultural aspects & organizational aspects Tacit & Explicit knowledge & Knowledge Organization. Knowledge Storage and Distribution, KM tools, Data warehouse, Data mining, knowledge management evaluation & Valuation of Knowledge. Mechanics of Knowledge Management–Tools and Technologies, Communities of Practice and Knowledge conversion, **The knowledge Management Matrix.**

## Unit-III

Social Nature of Knowledge, Social Network Analysis, Obstacles to knowledge sharing, Organizational learning & Social Capital. Knowledge Application – Individual level, Group level & Organization Level.

## Unit – IV

Km Team–Roles & Responsibilities, Political issues in KM, Ethics in KM, Strategies issues in Knowledge Management, Future of Knowledge Management. Expert System Existing Expert Systems (DENDRAL, MYCIN), Architecture of expert system, Features of Expert system, Genetic algorithm, Fuzzy logic, Neural Networks, Intelligent Agents, Meta Knowledge, Expertise Transfer, Self-Explaining System, User and expert systems.

## Unit-V

KM Strategy, Knowledge audit, GAP Analysis, Road Map, KM Metrics, Balance Score Card. KM Tools – Knowledge Capture & Creation tools, Knowledge sharing & Dissemination Tools, Knowledge Acquisition & Application tools. K-Initiative, K-Strategic issues in knowledge management, K-Commerce

### Reference Books:

1. SudhirWarrier, “Knowledge Management”, Vikas publishing House, New Delhi, First edition, 2007.
2. Thotharti Raman, “Knowledge Management”, Excel Books ,New Delhi, First Edition,2004.
3. Stuart Barnes “Knowledge Management Systems: Theory & Practice”, Thomson Learning Press, New Delhi, First Edition, 2002.
4. Ronald Maier, “Knowledge Management System”, Springer, Germany, Second Edition,2002.
5. AmritTiwana, “Knowledge Management Tool Kit”, Pearson Education, New Delhi, First Edition, 2002.

# SOFTWARE PROJECT MANAGEMENT

CUCS-342

Cr. L T P  
4 3 1 0

**COURSE OBJECTIVES:** The objectives of the course are to:

1. Introduce the primary important concepts of project management related to managing software development projects.
2. Become familiar with the different activities involved in Software Project Management
3. Know how to successfully plan and implement a software project management activity, and to complete a specific project in time with the available budget.

**COURSE OUTCOMES:** Upon completion of this course, the students will be able to

1. Identify the different project contexts and suggest an appropriate management strategy.
2. Practice the role of professional ethics in successful software development.
3. Identify and describe the key phases of project management.
4. Determine an appropriate project management approach through an evaluation of the business context and scope of the project
5. Manage the people and control the defects.

## Unit – I

Introduction and Software Project Planning, Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Managing Human Resource and Technical Resource, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Costing and pricing of projects, Decision process.

## Unit – II

### Project Organization and Scheduling

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

## Unit - III

### Project Monitoring and Control

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Desk checks, Walkthroughs, Code Reviews, Pair Programming.

## Unit – IV

### Software Quality Assurance and Testing

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and

**Indicators**, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

Unit – V

Project Management and Project Management Tools

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk issues in Software Development and Implementation, Identification of Risks , Resolving and Avoiding risks, Tools and Methods for Identifying Risk Management. Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

#### TEXT BOOK(S)

1. Royce and Walker, “Software Project Management”, 2nd Edition, Pearson Education, 2002.

#### REFERENCES

1. Bob Hughes and Mike Cotterell, “Software Project Management”, 5th Edition, Tata McGrawHill, 2011.
2. Kelker, S. A, “Software Project Management”, 2nd Edition, Prentice Hall, 2003.
3. Gopaldaswamy Ramesh, "Managing Global Projects", 1st Reprint Edition, Tata McGraw Hill,2006.
4. Robert K. Wysocki, “Executive's Guide to Project Management”, 2nd Edition, John Wiley & Sons, 2011.
5. Teresa and luckey, Joseph Phillips, “Software project Management for dummies”, 3rd Edition, Wiley publishing Inc., 2006.

# MICROWAVE ENGINEERING

## CUCS 344

### Unit 1: Introduction to Microwave Engineering

This unit introduces the fundamental concepts of microwave engineering, defining microwaves and their applications in modern technology. Students will explore the characteristics of microwave signals, the frequency range of microwaves, and the importance of microwave engineering in telecommunications, radar, and medical devices.

### Unit 2: Microwave Transmission Lines

In this unit, students will study the principles of microwave transmission lines, including their types and characteristics. The unit will cover the concept of impedance, standing wave ratio (SWR), and the analysis of transmission line parameters. Students will also learn about microstrip and stripline technology.

### Unit 3: Microwave Components and Devices

This unit focuses on the various components and devices used in microwave engineering. Students will learn about passive components such as waveguides, couplers, and filters, as well as active devices like microwave amplifiers, oscillators, and mixers. The principles of operation and design considerations for these components will be discussed.

### Unit 4: Microwave Measurement Techniques

Students will explore microwave measurement techniques in this unit. The unit will cover methods for measuring power, voltage standing wave ratio (VSWR), frequency, and attenuation. Students will learn about the use of vector network analyzers and spectrum analyzers in microwave testing.

### Unit 5: Microwave Circuit Design

This unit delves into the principles of microwave circuit design. Students will study design methodologies for amplifiers, oscillators, and filters, focusing on techniques for achieving stability and performance at microwave frequencies. The unit will include design software tools for simulation and analysis.

## SUPPLY CHAIN MANAGEMENT-PLANNING

### CUCS 346

#### Unit 1: Introduction to Supply Chain Management

This unit introduces the fundamental concepts of supply chain management, emphasizing its importance in modern business operations. Students will explore the key components of a supply chain, the roles of various stakeholders, and the impact of effective supply chain planning on organizational performance.

#### Unit 2: Demand Forecasting

In this unit, students will study the techniques and methodologies used for demand forecasting. The unit will cover qualitative and quantitative forecasting methods, including time series analysis and causal models. **Students will learn how to analyze historical data and market trends to make informed predictions about future demand.**

#### Unit 3: Inventory Management

This unit focuses on inventory management strategies within the supply chain. Students will learn about different types of inventory, inventory control systems, and the Economic Order Quantity (EOQ) model. The unit will also address the challenges of inventory management, including stockouts, overstocking, and **the impact of lead times.**

#### Unit 4: Production Planning and Scheduling

Students will explore the principles of production planning and scheduling in this unit. The unit will cover strategies for capacity planning, master production scheduling, and **materials requirements planning (MRP)**. Students will learn about the importance of aligning production schedules with demand forecasts to optimize resource utilization.

#### Unit 5: Supply Chain Network Design

In this unit, students will learn about the design and optimization of supply chain networks. The unit will cover factors influencing network design, including facility location, **transportation modes, and distribution strategies.** Students will study models and tools used for network optimization and decision-making.

## SOFTWARE TESTING

### CUCS 348

#### Unit 1: Introduction to Software Testing

This unit introduces the fundamental concepts of software testing, defining its purpose and importance in the software development lifecycle. Students will explore the goals of testing, the difference between verification and validation, and the various levels of testing from unit to system testing.

#### Unit 2: Testing Principles and Strategies

In this unit, students will learn about the core principles of software testing. The unit will cover fundamental testing strategies, including black-box testing, white-box testing, and grey-box testing. Students will understand how to select appropriate testing strategies based on project requirements.

#### Unit 3: Test Planning and Design

This unit focuses on the process of test planning and design. Students will learn how to create effective test plans, define test objectives, and identify test cases. The unit will also cover techniques for test design, including equivalence partitioning, boundary value analysis, and decision table testing.

#### Unit 4: Test Execution and Defect Reporting

Students will explore the test execution process in this unit. The unit will cover the execution of test cases, the use of test management tools, and the process of logging and reporting defects. Students will learn how to document test results and communicate effectively with development teams.

#### Unit 5: Automated Testing

In this unit, students will examine automated testing methods and tools. The unit will cover the benefits and challenges of automation, scripting for automated tests, and the use of popular testing frameworks such as Selenium and JUnit. Students will also learn about continuous integration and its role in automated testing.

## Unit 1: Introduction to Environmental Studies

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

## Unit 2: Ecosystems

- Ecosystem: Structure & function of ecosystem;
- Forest ecosystem, Aquatic ecosystems, Desert ecosystem
- Energy flow in an ecosystem: food chains, food webs and ecological succession.

## Unit 3: Natural Resources: Renewable and Non-renewable Resources

- Land resources; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, water conflicts.
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs.

## Unit 4: Biodiversity and Conservation

- Biodiversity & Levels of biodiversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots.
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Importance of biodiversity services

## Unit 5: Environmental Pollution

- Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution human health risks
- Solid waste management: Control measures of urban and industrial waste.

## Unit 6: Environmental Policies &amp; Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water Conservation (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation, Environmental communication and public awareness.

## Suggested Readings:

- 1) Environment By Shankar IAS Academy- 2024.
- 2) Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
- 3) Ecology And Environment P.D. Sharma (Paperback, P.D Sharma) 2022 Ed.
- 4) Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment



- &Security. Stockholm Env. Institute, Oxford Univ. Press.
- 5) Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
  - 6) Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
  - 7) McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
  - 8) McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
  - 9) Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
  - 10) Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
  - 11) Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
  - 12) Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.

# Environmental Science

## CBSN-302A

Unit I: Concept and scope of Environmental Science; Environmental Science as a multidisciplinary subject; Nature, Man & Society; Introduction to natural resources and its depletion, life support system.

Unit II: Introduction to the Earth Systems: Composition, structure and evolution of lithosphere, hydrosphere and atmosphere; Geological time scale and **Past records of life.**

Unit III Chemical potential, acid base reaction, solubility of gases in water, the carbonate system, Classification of elements, **Chemical speciation**, Redox Potential, Concept of pH, Eh and their variations in water.

Unit IV: Fundamental concept of genetics: Concept of nucleic acids, replication, transcription, translation, operon concept; Fundamental concept of microbes: Microbial growth, kinetics, stress response and control; **Fundamental concept of statistical hypothesis testing: Mean, mode, median, concept of p- Value, t- test and chi- square test, ANOVA.**

### References:

1. Botkin, D.B.& Keller, E.A Environmental Science: Earth as a Living Planet, John Wiley, NY
2. College Botany, Vol. I, II & III- Gangulee, Kar and Das
3. Cunningham, W.P.& Cunningham, M.A., Environmental Science, Tata McGraw Hill. ND
4. Santra, S.C., Environmental Science
5. Maier, Pepper & Gerba, Environmental Microbiology.  
Das, N.G., Statistical Methods (Volume 1 and 2)

# NATURAL RESOURCE MANAGEMENT

## CBSN-302 B

### Unit 1: Introduction to Natural Resource Management

This unit introduces the concept of natural resource management, highlighting its significance in sustainable development. Students will explore different types of natural resources, including renewable and non-renewable resources, and discuss the relationship between natural resources and human well-being.

### Unit 2: Ecosystem Services and Biodiversity

In this unit, students will learn about ecosystem services and their role in supporting life on Earth. The unit will cover the importance of biodiversity, the threats it faces, and strategies for conservation. Students will explore how healthy ecosystems contribute to natural resource management.

### Unit 3: Water Resource Management

This unit focuses on the management of freshwater resources, including rivers, lakes, and groundwater. Students will examine water conservation techniques, the challenges of water scarcity, and integrated water resource management (IWRM). Topics such as watershed management and water quality assessment will also be covered.

### Unit 4: Soil and Land Management

In this unit, students will explore soil conservation and land management practices. The unit will cover soil types, erosion control methods, land use planning, and sustainable agricultural practices. The impact of land degradation and strategies for rehabilitation will also be discussed.

### Unit 5: Forest and Wildlife Management

This unit addresses the management of forest resources and wildlife conservation. Students will learn about sustainable forestry practices, the role of forests in carbon sequestration, and the importance of protecting wildlife habitats. Topics such as community-based forest management will also be explored.

## POLLUTION CONTROL

### CBSN-302C

#### Unit 1: Introduction to Pollution

This unit provides an overview of pollution, defining its types and sources. Students will learn about the environmental and health impacts of pollution, as well as the importance of pollution control in achieving sustainable development.

#### Unit 2: Air Pollution

In this unit, students will explore the sources and types of air pollutants, including particulate matter, nitrogen oxides, and volatile organic compounds. The unit will cover the effects of air pollution on human health and the environment, along with strategies for monitoring and controlling air quality.

#### Unit 3: Water Pollution

This unit focuses on the causes and effects of water pollution, examining pollutants such as heavy metals, nutrients, and pathogens. Students will study the methods for assessing water quality and the technologies used for water treatment and pollution prevention.

#### Unit 4: Soil Pollution

Students will learn about soil contamination in this unit, including sources such as industrial waste, agricultural chemicals, and landfill leachate. The unit will cover the impacts of soil pollution on ecosystems and human health, as well as remediation techniques and sustainable land management practices.

#### Unit 5: Noise Pollution

This unit addresses the sources and effects of noise pollution on communities and wildlife. Students will explore noise measurement methods, regulatory standards, and noise control strategies, including urban planning and sound insulation techniques.

## COMPUTER GRAPHICS LAB

### CCSN-352

1. Implement a program to draw basic shapes like lines, circles, and rectangles using a graphics library (e.g., OpenGL, SDL).
2. Create a program that demonstrates 2D transformations such as translation, rotation, and scaling on shapes.
3. Implement line clipping algorithms (e.g., Cohen-Sutherland or Liang-Barsky) to clip lines within a defined viewport.
4. Write a program that implements polygon filling algorithms (e.g., scan-line filling or flood fill) to color enclosed areas.
5. Develop a program to draw and manipulate Bézier curves using control points.
6. Create a program that renders simple 3D objects (e.g., cubes, spheres) and applies basic lighting effects.
7. Implement a program that demonstrates 3D transformations including translation, rotation, and scaling on 3D models.
8. Write a program to apply textures to 3D objects and demonstrate different texture filtering techniques.
9. Create a simple animation program that moves an object across the screen using keyframe interpolation.
10. Implement a program that simulates shadows in a 3D scene using shadow mapping or ray tracing techniques.

## DATA WAREHOUSING & DATA MINING LAB

### CCSN-354

1. Create a star or snowflake schema for a given business scenario using a database management system.
2. Develop an Extract, Transform, Load (ETL) process to populate a data warehouse from multiple data sources.
3. Implement Online Analytical Processing (OLAP) operations such as slicing, dicing, and drilling down on a data cube.
4. Write a program to clean a dataset by removing duplicates, handling missing values, and standardizing formats.
5. Implement the Apriori algorithm to discover frequent itemsets and generate association rules from transaction data.
6. Develop a program to apply clustering algorithms (e.g., K-means or DBSCAN) on a dataset and visualize the clusters.
7. Create a program that implements a decision tree algorithm for classification tasks and visualizes the tree structure.
8. Write a program to perform linear regression analysis on a dataset and evaluate the model's performance.
9. Develop a program to visualize data mining results using charts, graphs, or dashboards with tools like Matplotlib or Tableau.
10. Implement a predictive model using machine learning techniques to forecast future trends based on historical data.

## MINI PROJECT

### CCSN-356

1. Develop a console or web-based application for managing book inventory, user registrations, and transactions.
2. Create an e-commerce website that allows users to browse products, add to cart, and complete purchases.
3. Implement a system to manage patient records, appointments, and billing within a hospital environment.
4. Develop a program that stores and manages student data, including enrollment, grades, and attendance.
5. Create a personal finance application that allows users to track expenses, categorize them, and generate reports.
6. Build an application that fetches weather data from an API and displays current conditions and forecasts.
7. Implement a real-time chat application using sockets that enables users to send messages to each other.
8. Develop a task management application that allows users to create, update, and prioritize tasks.
9. Create a quiz platform that presents questions to users, records their responses, and provides instant feedback.
10. Build a dashboard that aggregates social media feeds and allows users to interact with their accounts from one interface.

## EMBEDDED COMPUTING SYSTEMS

### CCSN 310

#### Unit 1: Introduction to Embedded Systems

This unit introduces the fundamental concepts of embedded systems, defining what they are and their significance in modern technology. Students will explore the various types of embedded systems and their applications across different industries, as well as the basic components that make up an embedded system.

#### Unit 2: Microcontrollers and Microprocessors

In this unit, students will learn about the architecture and functioning of microcontrollers and microprocessors. The unit will cover different types of microcontrollers, their internal components, and how they differ from general-purpose processors. Practical examples of microcontroller applications will be discussed.

#### Unit 3: Programming Embedded Systems

This unit focuses on programming techniques for embedded systems. Students will learn about programming languages commonly used in embedded development, such as C and C++. The unit will also cover development environments, debugging techniques, and best practices for writing efficient embedded code.

#### Unit 4: Real-Time Operating Systems (RTOS)

Students will explore the principles of real-time operating systems in this unit. The unit will cover the characteristics of RTOS, task scheduling, inter-process communication, and resource management. Practical examples of RTOS in embedded applications will be provided.

#### Unit 5: Interfacing and Communication Protocols

This unit examines the various interfacing techniques and communication protocols used in embedded systems. Students will learn about digital and analog interfacing, as well as protocols such as UART, SPI, I2C, and CAN. Hands-on examples will illustrate how to implement these protocols in projects.



## SIMULATION AND MODELING

### CCSN 312

#### Unit 1: Introduction to Simulation and Modeling

This unit introduces the fundamental concepts of simulation and modeling, defining their significance in various fields such as engineering, science, and economics. Students will explore the types of models, the modeling process, and the applications of simulation in **problem-solving and decision-making.**

#### Unit 2: Types of Models

In this unit, students will learn about different types of models, including physical, mathematical, and computational models. The unit will cover deterministic versus stochastic models, continuous versus discrete models, and **the advantages and limitations of each type.**

#### Unit 3: Simulation Methodologies

This unit focuses on various simulation methodologies, including discrete-event simulation, system dynamics, and agent-based modeling. Students will explore the characteristics of each methodology **and how to choose the appropriate one for specific applications.**

#### Unit 4: Statistical Concepts for Simulation

Students will study the statistical concepts essential for simulation in this unit. The unit will cover probability distributions, random number generation, and statistical analysis techniques. Emphasis will be placed on the role of statistics in validating and interpreting simulation results.

#### Unit 5: Simulation Software Tools

In this unit, students will become familiar with various simulation software **tools commonly used in industry and research.** The unit will provide hands-on experience with tools such as **MATLAB, Simulink, AnyLogic, or Arena, focusing** on their features and applications.

# APPROXIMATION OF ALGORITHMS

CCSN 314

## Unit 1: Introduction to Approximation Algorithms

This unit introduces the concepts of approximation algorithms, defining their purpose and significance in solving NP-hard problems. Students will explore the challenges posed by computational complexity and the need for approximate solutions in practical applications.

## Unit 2: Complexity Classes and NP-Hard Problems

In this unit, students will learn about complexity classes, particularly focusing on NP, NP-hard, and NP-complete problems. The unit will cover fundamental concepts such as polynomial-time reductions and **the implications of these classifications for algorithm design.**

## Unit 3: Performance Metrics for Approximation Algorithms

This unit focuses on the metrics used to evaluate the performance of approximation algorithms. Students will learn about approximation ratios, worst-case guarantees, and the concept of efficiency in relation to exact solutions. **The trade-offs between accuracy and computational efficiency will also be discussed.**

## Unit 4: Greedy Algorithms

In this unit, students will explore greedy algorithms as a fundamental approach to approximation. The unit will cover classic problems that can be solved using greedy techniques, including the Knapsack problem and Minimum Spanning Tree. **Students will analyze the performance of greedy algorithms in these contexts.**

## Unit 5: Dynamic Programming and Approximation

Students will study how dynamic programming can be leveraged to develop approximation algorithms in this unit. The unit will examine problems like the Subset Sum and Longest Common Subsequence, **focusing on how dynamic programming techniques can lead to effective approximations.**

# ARTIFICIAL INTELLIGENCE

CCSN-401

Cr L-T-P

4 3- 1-0

## Unit - I

**Introduction:** Introduction to Artificial Intelligence, History, Importance of AI, and goal. AI programming techniques; Introduction to Intelligent Agents: Agents and environments. Game Playing: Minimax search, Mini-Max algorithm, Search algorithms: Informed search, Uninformed search, Hill Climbing, Depth first search, Best first search, A\*, And or graph.

## Unit - II

**Processing and understanding Natural Languages:** Natural Language processing: Steps in NLP, Applications of Natural Languages, Components of NLP, Understanding Natural Languages: Machine Translation (MT), Automated Reasoning, Question Answering, Speech Recognition: Types of Speech Recognition, Applications of Speech Recognition, , Production Rules: parsing techniques: Rules of parsing, Top down parsing, Bottom up parsing, Transformational grammars, **Context free grammar, Transition networks, Fillmore's grammars, Shanks Conceptual Dependency.**

## Unit - III

**Knowledge Representation:** Graphs, Frames structures and related structures, Semantic Nets and predicate logic, Scripts, Frames, inheritance, Introduction to PROLOG, Knowledge Based systems, Inference engine, Forward deductions and backward deductions, Scientific Analysis, **Medical Diagnosis Financial Analysis**

## Unit - IV

**Expert System** – Introduction, Basic concepts, Existing Expert Systems (DENDRAL, MYCIN), Architecture of expert system, how expert systems works, problem areas addressed by expert systems, Features of Expert system, Genetic algorithm, Fuzzy logic, Neural Networks, Intelligent Agents, **Meta Knowledge, Expertise Transfer, Self Explaining System, User and expert systems.**

## Unit - V

**Pattern Recognition** Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine perception, Line Finding, Interception, Semantic & Model, **Object Identification, visual perception,.**

### Reference Books :

1. Char Nick, "*Introduction to Artificial Intelligence*", Addison Wesley, 2007.
2. Stuart Russell and Peter Norvig, "*Artificial Intelligence: A Modern Approach.*", Prentice Hall, Third Edition, 2010.
3. Elaine Rich, Kevin Knight and ShivashankarB.Nair, "*Artificial Intelligence*", Tata McGraw-Hill, Third edition, 2009.

# DISTRIBUTED COMPUTING SYSTEMS

CCSN-403

Cr. L T P  
4 3 1 0

## Unit-I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, **global state, termination detection.**

## Unit-II

Time and Global States: Introduction, Clocks Events and Process States, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States, Distributed Debugging. Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication, **Consensus and Related Problems**

## Unit-III

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, **Algorithm for Implementation of Distributed Shared Memory.**

## Unit-IV

Inter Process Communication: Introduction, The API for the Internet Protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication, Case Study: **IPC in UNIX.** Distributed Objects and Remote Invocation: Introduction, **Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI.**

## Unit -V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: **System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.**

## REFERENCES:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna, Gehrke, "Database Management Systems", McGraw Hill
3. Vijay K. Garg Elements of Distributed Computing, Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education

## ADVANCED COMPUTER SYSTEM ARCHITECTURE

CCSN-405

Cr L-T-P

4 3- 1-0

### Unit - I

Parallel computer model: Evolution of computer architecture, system performance attributes, Multiprocessors and Multicomputer: shared memory multiprocessors and distributed memory multicomputer, Vector supercomputers, Program and network properties: conditions of parallelism: Data and Resource Dependences, Bernstein's Conditions, program partitioning and scheduling, program flow mechanism, System Interconnect Architectures.

### Unit – II

Principles of scalable performance: Performance metrics and measures: parallelism profile in programs, harmonic mean performance, efficiency utilization and quality, standard performance measure, Parallel Processing Applications: scalability of parallel algorithms, Speedup performance laws: Amdahl's law for fixed workload, Gustafson's law for scaled problems, Memory bounded speedup model.

### Unit – III

Processor and Memory hierarchy: Advanced processor technology: Design Space of Processors, Instruction set Architectures, CISC Scalar Processors, RISC Scalar Processors, superscalar and vector processor: Superscalar Processors, The VLIW Architecture, Vector and Symbolic Processors. Memory hierarchy technology: Hierarchical Memory Technology, Inclusion, Coherence, and Locality, Memory Capacity Planning, virtual memory technology.

### Unit – IV

Bus, cache and shared memory: Backplane bus system: bus specification, addressing and timing protocol, arbitration, transaction, and interrupt, cache memory organization: addressing models, direct mapping and associative caches, set-associative and sector cache, shared memory organization: Interleaved memory organization.

### Unit – V

Pipelining: Linear pipeline processors: Asynchronous and Synchronous Models, Clocking and Timing Control, Speedup, Efficiency and Throughput. Nonlinear pipeline processors: Reservation and Latency Analysis, Instruction pipeline design.

### Reference Books:

1. Kai Hwang, "Advanced Computer Architecture", McGraw-Hill, Revised Edition, 2003
2. Hwang and Briggs, "Computer Architecture and Parallel Processing", McGraw Hill, International Edition, 1986.
3. Moreshwar R. Bhujade, "Parallel Computing", New Age International(P) Ltd, Publishers, First Edition Reprint, 2004.
4. John L. Hennessy, David A. Patterson, "Computer Architecture: A Quantitative Approach", Elsevier Inc., Fifth Edition, 2011
5. Sima, Terence Fountain, PéterKacsuk, "Advanced Computer Architecture", Pearson Education, Seventh Impression, 2009.

# DIGITAL IMAGE PROCESSING

CCSN-407

## UNIT I DIGITAL IMAGE FUNDAMENTALS

Digital Image Representation – Fundamental steps in Image Processing)– Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - colour models.

## UNIT II IMAGE ENHANCEMENT

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – Frequency Domain: 2D Fourier Transform – Smoothing and Sharpening frequency domain filters

## UNIT III IMAGE RESTORATION AND SEGMENTATION

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering. Segmentation: Edge detection Edge Linking and Boundary detection – **Region based segmentation- Morphological processing- erosion and dilation.**

## UNIT IV IMAGE COMPRESSION AND REPRESENTATION

Compression: Fundamentals – Image Compression models – Error Free Compression – Lossy compression– Image Compression standards

## UNIT V IMAGE REPRESENTATION AND RECOGNITION

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – **Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.**

## TEXT BOOKS

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.

## REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. William K Pratt, “Digital Image Processing”, John Willey, 2002.
3. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.

## MULTIMEDIA COMPUTING

**CCSN-409**

### **Unit 1: Introduction**

Global Structure of Multimedia; Multimedia Application; Medium; Multimedia System and Properties; Characteristics of a Multimedia System; Challenges for Multimedia Systems; Components of a Multimedia System

### **Unit 2: Sound /Audio System**

Concepts of Sound System; Music and Speech; Speech Generation; **Speech Analysis; Speech Transmission**

### **Unit 3: Images and Graphics**

Digital Image Representation; Image and graphics Format; Image Synthesis, analysis and Transmission

### **Unit 4: Video and Animation**

Video Signal Representation; Computer Video Format; Computer-Based animation; Animation Language; Methods of Controlling Animation; Display of Animation; **Transmission of Animation**

### **Unit 5: Data Compression**

Storage Space; Coding Requirements; Source, Entropy and Hybrid Coding; Lossy Sequential DCT-based Mode; **Expanded Lossy DCT-based Mode; JPEG and MPEG**

### **Recommended Books:**

1. Multimedia: Computing, Communications and Applications, Ralf Steinmetz and Klara Nahrstedt, Pearson Education Asia
2. Multimedia Communications, Applications, Networks, Protocols and Standards, Fred Halsall, Pearson Education Asia
3. Multimedia Systems, John F. Koegel Buford, Pearson Education Asia

## PATTERN RECOGNITION

### CCSN-411

#### UNIT-1

Basics of Probability, Random Processes and Linear Algebra: Probability: independence of events, conditional and joint probability, Bayes' theorem; Random Processes: Stationary and nonstationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra; Linear Algebra: Inner product, outer product, inverses, eigen values, eigen vectors; Bayes Decision Theory

#### UNIT-2

Bayes Decision Theory: Minimum-error-rate classification, Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, discrete features

#### UNIT-3

Parameter Estimation Methods: Maximum-Likelihood estimation: Gaussian case; Maximum a Posteriori estimation; Bayesian estimation: Gaussian case

#### UNIT-4

Unsupervised learning and clustering: Criterion functions for clustering; Algorithms for clustering: K-Means, Hierarchical and other methods; Cluster validation; Gaussian mixture models; Expectation-Maximization method for parameter estimation; Maximum entropy estimation

#### UNIT-5

Sequential Pattern Recognition: Hidden Markov Models (HMMs); Discrete HMMs; Continuous HMMs

#### Text Books:

R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001

S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009

C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006:



# C# PROGRAMMING

CCSN-413

## Unit 1: Introduction to C#

Explore the fundamentals of C# as a programming language. Understand its origins, features, and its role within the .NET framework. Learn about the development environment, including Visual Studio, and how to set up projects.

## Unit 2: Basic Syntax and Data Types

Delve into C# syntax, including variables, constants, and data types. Examine how to declare and initialize variables, use built-in data types, and understand the concept of type conversion and type safety.

## Unit 3: Control Structures

Study control flow statements in C#, including conditional statements like if, else, and switch, as well as looping constructs such as for, while, and do-while. Analyze how to control program execution and manage decision-making processes.

## Unit 4: Methods and Parameters

Learn about the definition and invocation of methods in C#. Explore method parameters, return types, method overloading, and the concept of optional parameters. Understand the importance of methods in structuring code.

## Unit 5: Object-Oriented Programming Concepts

Examine the principles of object-oriented programming (OOP) as applied in C#. Discuss classes, objects, inheritance, polymorphism, encapsulation, and abstraction. Analyze how these concepts contribute to code reusability and organization.

## Python Programming

(CCSN-415)

### Unit - I

**Introduction To Python Programming:** Importance of Python, Installing and working with Python in Windows, Using Python as calculator, Comments, How to define main function in Python The concept of data types - Variables, Arithmetic Operators and Expressions String manipulations - Subscript Operator, Indexing, Slicing a string, Converting strings to numbers and vice versa, split function Control flow - if statements, for and while loops, nested loops, range() function, break and continue statements, pass statements, **Functions** Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, **\*args and \*\*kwargs, Command Line Arguments.**

### Unit - II

**Data Structures in Python:Lists** - Basic list operations, Replacing, inserting, removing an element; Searching and sorting a list, Methods of list objects, List and nested list Comprehensions  
**Strings**, Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, **Formatting Strings.**

### Unit- III

**Dictionaries**, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement, **Tuples and Sets**, Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Traversing of Sets, Frozen set.

### Unit - IV

**File and Exception Handling in Python** - Reading keyboard input, opening and closing file, Read, Write and Append mode, Create and Read a text file, Looping over a file object, Writing on a file, with statements, splitting lines in a text file, Renaming and Deleting files. Exception Handling - Exceptions, Why use exceptions, Raising an exception, try and except, try, except and else clause; try and finally **Regular Expressions in Python:** Regular Expressions - re module, Searching a string (match and search), Finding a string (findall), Break string into substrings (split), **Replace part of a string (sub)**

## **Unit - V**

**Object-Oriented Programming**, Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, The Polymorphism.

### **TEXT BOOK**

Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372

### **REFERENCE BOOKS / WEBLINKS:**

#### **Text Books:**

- Kenneth A. Lambert, "The Fundamentals of Python: First Programs", Cengage Learning., 2011

#### **Reference Books:**

- Laila M. Dawson, "Python Programming for the Absolute Beginner "
- Zed A. Shaw , "Learn Python the Hard Way "
- Mark Putz, "Learning Python"
- Python Documentation (<https://docs.python.org>)

## Client Server Computing

### CUCS-441

#### Unit 1

Client Server System Concepts – Introduction – Concepts – Client Server Architecture – Two-Tier Architecture – Three-Tier Architecture – N-Tier Architecture – N-Tier vs 2-Tier Architecture – Case Study of N-Tier Architecture – Client Server Models – Gartner Classification – Middleware – Characteristics and types of Server – File Server – Database Server – Communication Server – Object Server – Groupware Server – Transaction Server – Characteristics and types of Clients – Thin Client – Fat Client.

#### Unit 2

Components of Client Server Computing – Client – Role of the Client – Client Services – Request for Service – Components of Client Server Computing – Server – Role of the Server – Server Functionality in detail – Components of Client Server Applications – Connectivity – OSI – Communications Interface Technology.

#### Unit 3

Client Server System Architecture – Client Server Building Blocks – Hardware – Client Hardware – Server Hardware – Client Server Building Blocks – Software – Client Server Systems Development Methodology – Project Management – Architecture Definition – Systems Development Environment – Middleware – Types of Middleware – DCE, MOM, TP – Monitors – ODBC – Design Overview of ODBC – ODBC Architecture – Components – Applications – Driver Managers – Database Drivers – ODBC Data Sources – Network Operating System – Base Services – External Services.

#### Unit 4

SQL Database Servers – Server Architecture – Multithread Architecture – Hybrid Architecture – Stored Procedures – Triggers – Client Server Transaction Processing – Rules of Client Server Transaction Processing – Transaction Models – Chained and Nested Transactions – Transaction Management Standards – Data Warehousing – Warehousing Techniques – Data Mining.

#### Unit 5

Client Server Protocols – RPC – IPC – Recent Trends – Intranet – Extranet – Internet – CORBA.

#### Text Books

1. Robert Orfali, Dan Harkey and Jerri Edwards: Essential Client/Server Survival Guide, John Wiley & Sons Inc 1996

#### Reference

1. Alex Berson: Client Server Architecture
2. Patrick Smith, Steve Guengerich: Client Server Computing, Second Edition, Prentice Hall of India Pvt Ltd.

## NEURAL NETWORK

CUCS-443

### **UNIT -I Introduction to Artificial Neural Networks :**

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, **Artificial Neural Network (ANN) terminologies.**

### **UNIT - II Fundamental Models of Artificial Neural Networks :**

Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square(LMS)Rule, Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net. Perceptron Networks : Introduction, Single Layer Perceptron, **Brief Introduction to Multilayer Perceptron Networks.**

### **UNIT - III Adaline and Madaline Networks:**

Introduction, Adaline, Madaline. Associative Memory Networks: Introduction, Algorithms for Pattern Association, **Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi-directional Associative Memory.**

### **UNIT – IV Feedback Networks:**

Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets. Feed Forward Networks: **Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).**

### **UNIT – V Self Organizing Feature Map :**

Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

**Adaptive Resonance Theory :** Introduction, ART Fundamentals, ART 1, ART2

### **TEXT BOOKS:**

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL : 2005.

### **REFERENCES BOOKS:**

1. Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

# Engineering System Modelling and Simulation

## CUCS - 445

### Unit 1: Introduction to System Modelling

Explore the fundamental concepts of systems and their modeling. Understand the definitions and types of systems, the importance of modeling in engineering, and the relationship between real-world systems and their representations.

### Unit 2: Mathematical Foundations

Delve into the mathematical tools used in system modeling, including linear algebra, calculus, and differential equations. Learn how these mathematical concepts are applied to describe dynamic systems and their behavior.

### Unit 3: System Dynamics

Study the principles of system dynamics, focusing on feedback loops, time delays, and system stability. Analyze dynamic systems using block diagrams and stock-and-flow diagrams to visualize system interactions.

### Unit 4: Control Systems

Examine the fundamentals of control theory as it applies to system modeling. Discuss open-loop and closed-loop systems, stability analysis, and the design of control strategies to achieve desired system behavior.

### Unit 5: Discrete Event Simulation

Learn about discrete event simulation techniques and their applications. Understand the components of discrete event systems, including events, state variables, and queues, and explore simulation modeling tools and methodologies.

**Unit I: Computer Arithmetic and Errors**

Errors, Types of error, Floating-point representation, Significant digits and precision, , Associative and Distributive Laws in Floating Point arithmetic, Error propagation and Numerical Instability.

**Unit II: Nonlinear Equations and Linear Systems**

Bisection method, Secant method, Regula-Falsi method, Newton-Raphson method for nonlinear systems, Gauss-elimination method with and without partial pivoting, LU decomposition and Cholesky decomposition, Iterative methods for linear systems: Jacobi, Gauss-Jordan and Gauss-Seidel methods.

**Unit III: Interpolation and Approximation**

Lagrange's interpolation formula, Newton's divided difference formula, Piecewise polynomial interpolation: Linear, Quadratic, and Cubic spline, Least Squares Approximation, Orthogonal polynomials: Legendre and Chebyshev

**Unit IV: Numerical Differentiation and Integration**

Finite difference operators: forward, backward, and central differences, Richardson extrapolation, Numerical integration: Trapezoidal rule, Simpson's rule, and Romberg integration, Gaussian quadrature: Gauss-Legendre and Gauss-Hermite, Monte Carlo methods for integration,

**Unit V: Ordinary Differential Equations**

Euler's method, Modified Euler's methods: Heun and Mid-point methods, Runge-Kutta methods: 2nd and 4th order, Multi-step methods: Adams-Bashforth and Adams-Moulton, Finite difference methods for ODEs: explicit and implicit schemes.

**REFERENCE BOOKS:**

1. Gupta, R. S. (2009). Elements of numerical analysis. Macmillan India Ltd.
2. Jain, M. K. (1991). Numerical solution of differential equations. John Wiley & Sons.
3. Snedden, I. N. (2006). Elements of partial differential equations. Courier Dover Publications.
4. Gerald, C.F., & Wheatley, P.O. (2004). Applied numerical analysis. Pearson Education India
5. Jain, M. K., Iyengar, S. R. K., & Jain, R. K. (2019). Numerical methods for scientific and engineering computation (7th ed.). New Age International Pvt. Ltd.
6. Sastry, S. S. (2012). Introduction to numerical analysis (5th ed.). Prentice Hall of India.

## **CBSN-401 Law for Engineers**

### **Module 1A:**

Constitutional Law covering the Preamble; Fundamental Rights, Judicial Activism including Equality and Social Justice; Directive principles of State policy; Fundamental Duties; Emergency provisions – kinds, legal requirements and legal effects; (5 Lectures)

### **Module 1B:**

Human Rights and Public International Law covering Human Rights in International Law-Theoretical foundation, UN Mechanism and specialized agencies, (UNICEF, UNESCO, WHO, ILO, FAO, etc.);

International NGOs – Amnesty International, Human Rights Watch, Greenpeace Foundation; Enforcement of Human Rights in India including Supreme Court, High Courts, Public International Law covering: Customs, Treaties, State territories including Recognition of States and governments, Law of Sea; (5 Lectures)

### **Module 2A:**

General Principles of Contract under Indian Contract Act, 1872 covering General principles of contract – Sec. 1 to 75 of Indian Contract Act and including Government. as contracting party, Kinds of government contracts (4 Lectures)

### **Module 2B:**

Arbitration, Conciliation and ADR system covering Arbitration – meaning, scope and types, Arbitration tribunal – appointment, challenge, Distinction between conciliation, negotiation, mediation and arbitration, (5 Lectures)

### **Module 3A:**

Law relating to Intellectual property covering Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Other new forms such as plant varieties and geographical indications; International instruments on IP – Berne convention, TRIPS, Paris convention and international organizations relating IPRs, WIPO, WTO etc; Law relating to Copyright in India, including Historical evolution of Copy Rights Act, 1957, Law relating to Trademarks under Trademark Act, 1999; Law relating to Patents under Patents Act, 1970, Patent protection for computer programs, Duration of patents – law and policy considerations, Infringement and related remedies; (8 Lectures)

### **Module 3B:**

Right to Information Act, 2005 covering, Evolution and concept; Practice and procedures; Official Secret Act, 1923; Indian Evidence Act, 1872; Information Technology – legislation and procedures, Cyber crimes – issues and investigations; (3 Lectures)

### **Module 4A:**

Labour Laws, covering Industrial Disputes Act, 1947; Collective bargaining; Workmen's Compensation Act, 1923; (3 Lectures)

### **Module 4B:**



Corporate Law, covering Meaning of corporation; Law relating to companies, public and private (Companies Act, 1956) general provisions; FEMA 1999, collaboration agreements for technology transfer; Corporate liability, civil and criminal; (4 Lectures)

#### **Module 4C:**

Election provisions under Indian Constitution (Art.324–329); Superintendence, directions and control of elections to be vested in Election Commission; Prohibition as to ineligibility for inclusion in electoral roll on ground of religion, race, caste or sex; Power of parliament to make provisions with respect to elections to legislatures; Bar to interference by courts in electoral matters; Offences relating to elections under IPC1860 ( Sec.171-A to 171-I). (4 Lectures)

#### **Module 5:**

Gender Studies, covering Meaning of gender, international perspective and national perspective; Laws relating women in India; Judicial approach and responses Vishaka V/s State of Rajasthan 1997 SC; Rights enforcement mechanism in India; Landmark judicial decisions of Supreme Court relating to women; (4 Lectures)

#### **Text/Reference Books:**

1. D.D. Basu (1996), *Shorter Constitution of India*, Prentice Hall of India
2. M.P. Jain (2005), *Indian Constitutional Law*, Wadhwa & Co.
3. M.P. Singh (1998), *Constitutional Law of India*, Eastern Book Co.
4. P.M. Bakshi (2003), *Constitution of India*, Universal Law Publishing Co.
5. H.M. Seervai (1993), *Constitutional Law of India*, Tripathi Publications
6. *Constituent Assembly Debates* (1989), Vol.1 - 12
7. Agarwal H.O.(2008), *International Law and Human Rights*, Central Law Publications
8. S.K. Awasthi & R.P. Kataria (2006), *Law relating to Protection of Human Rights*, Orient Publishing
9. S.K. Kapur (2001), *Human Rights under International Law and Indian Law*, Central Law Agency
10. Meena Rao (2006), *Fundamental concepts in Law of Contract, 3rd Edn.* Professional Offset
11. Neelima Chandiramani (2000), *The Law of Contract: An Outline, 2nd Edn.* Avinash Publications Mum
12. Avtarsingh (2002), *Law of Contract*, Eastern Book Co.
13. Dutt (1994), *Indian Contract Act*, Eastern Law House
14. Anson W.R. (1979), *Law of Contract*, Oxford University Press
15. Kwatra G.K. (2005), *The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration*, Indian Council of Arbitration
16. Avtarsingh (2005), *Law of Arbitration and Conciliation*, Eastern Book Co.
17. Cornish W. R. (2008), *Intellectual Property Rights, Patents, Trademarks, Copyrights & Allied Rights*, Sweet & Maxwell
18. Wadhwa (2004), *Intellectual Property Rights*, Universal Law Publishing Co.
19. P. S. Narayan (2000), *Intellectual Property Rights*, Gogia Law Agency
20. T. Ramappa (2010), *Intellectual Property Rights Law in India*, Asia Law House
21. Bare text (2005), *Right to Information Act*
22. O.P. Malhotra, *Law of Industrial Disputes*, N.M. Tripathi Publishers
23. K.M. Desai (1946), *The Industrial Employment (Standing Orders) Act*
24. Rustamji R.F., *Introduction to the Law of Industrial Disputes*, Asia Publishing House

## INTELLECTUAL PROPERTY RIGHTS

### CBSN-401 A

#### Unit-1

INTRODUCTION TO IPR: Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights Introduction to TRIPS and WTO.

Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, **Plant Varieties and Traditional Knowledge**.

#### Unit-2

PATENT RIGHTS AND COPY RIGHTS— Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties. – 6 hours  
COPY RIGHT—Origin, Definition &Types of Copy Right, Registration procedure, **Assignment &licence, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software.**

#### Unit-3

TRADE MARKS— Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties. Domain Names on cyber space.

#### Unit-4

DESIGN- Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and **layout design Act-2000.**

#### Unit-5

BASIC TENENTS OF INFORMATION TECHNOLOGY ACT-2000 – IT Act - Introduction  
E-Commerce and legal provisions E- Governance and legal provisions Digital signature and **Electronic Signature.**

#### Course outcomes:

The students once they complete their academic projects, they get awareness of acquiring the patent

They also learn to have copyright for their innovative works.

They also get the knowledge of plagiarism in their innovations which can be questioned legally.

#### TEXT BOOKS:

1. Intellectual Property Rights and the Law, Gogia Law Agency, by Dr. G.B. Reddy
2. Law relating to Intellectual Property, Universal Law Publishing Co, by Dr. B.L.Wadehra
3. IPR by P. Narayanan
4. Law of Intellectual Property, Asian Law House, Dr.S.R. Myneni

**Unit 1: Introduction to Employment Law**

In this unit, students will be introduced to the fundamental concepts of Employment Law, including its definition and significance in contemporary society. The historical evolution of labor laws will be explored, starting from the Industrial Revolution and highlighting key legislative milestones such as the Fair Labor Standards Act and the National Labor Relations Act.

**Unit 2: Employment Contracts**

The focus of this unit will be on employment contracts, which are essential to the employment relationship. Students will explore the different types of employment contracts, including written, oral, and implied agreements. Emphasis will be placed on the key elements that constitute a valid employment contract, such as offer, acceptance, consideration, and essential terms like job duties and compensation.

**Unit 3: Employment Rights and Obligations**

In this unit, students will delve into the rights of employees and the corresponding obligations of employers. The discussion will include employees' rights to fair wages, benefits, and safe working conditions, as well as protections against retaliation for exercising these rights. The unit will provide an overview of the legal framework governing minimum wage laws and overtime regulations under the Fair Labor Standards Act.

**Unit 4: Discrimination in the Workplace**

This unit will address the critical issue of discrimination in the workplace. Students will learn about various types of discrimination based on protected classes, including race, gender, age, disability, and religion. The legal framework surrounding discrimination, particularly Title VII of the Civil Rights Act, the Americans with Disabilities Act, and the Age Discrimination in Employment Act, will be thoroughly examined.

**Unit 5: Health and Safety Regulations**

In this unit, students will study the Occupational Safety and Health Act (OSHA) and its implications for workplace safety. The unit will cover employer responsibilities regarding safety protocols and training, as well as the rights of employees to a safe work environment. Students will learn about the right to refuse unsafe work and the protections available for whistleblowers who report safety violations.

## **Dispute Resolution And Litigation**

### **CBSN 401-C**

#### **UNIT-1. INTRODUCTION:**

Evolution of mediation/conciliation as a mode of settlement of disputes, distinction between arbitration, mediation, conciliation, negotiation.

Nature, Scope, Limitations and necessity of alternative models of disputes resolution

Introduction of ADRMs in the Indian Legal System

What is Alternative Dispute Resolution Methods?

Advantages of ADRMs over the Conventional Adjudicatory System

Dispute Resolution at grass root level, LokAdalats, NyayaPanchayath, Legal Aid, Preventive and Strategic legal aid.

International Perspective/International Scenario

#### **UNIT-2. ARBITRATION: [ARBITRATION AND CONCILIATION ACT, 1996]**

Origin and Development of Arbitration

Meaning, features, theories and types of arbitration

Arbitration Agreement – Formation, essentials, validity, rule of severability, parties to arbitration agreement.

Arbitral Tribunal – Structure, Powers, Functions and Jurisdiction

“Fast Track” arbitration

Arbitration proceedings

#### **UNIT-3. CONCILIATION: [ARBITRATION AND CONCILIATION ACT, 1996]**

Meaning, features and modes and techniques of Conciliation

Appointment and role of conciliators

Conciliation proceedings – submission of statements – communication between conciliator and parties, suggestions for settlement – confidentiality of information – Admissibility of evidence in other proceedings, Termination of conciliation proceedings; costs and deposits.

Contractual provisions about conciliation

Difference between Arbitration and Conciliation

#### **UNIT-4. MEDIATION**

What is Mediation?

Characteristics of Mediation, Essential Elements of Mediation,

Advantages/ Benefits of Mediation,

What Kinds of Cases Can Be / Cannot Be Mediated?

Convening for Mediation, Guidelines to the Parties and Mediator, Training of the Mediator.

#### **UNIT-5. NEGOTIATION**

Eight Pillars of Negotiation Wisdom, Qualities of a Good Negotiator, Various phases in Negotiation, disadvantages of Negotiation and Setting the Stage for Productive Negotiations  
Certain Specific Titles in the Negotiation Process, Alternative Paths.  
Practical Approach towards Concepts – Mixed Motive Exchange, Winner’s Curse, and Interest based Bargaining, Negotiation ‘Dance’, BATNA, WATNA, MALATNA  
Integrative Negotiation & Distributive Negotiation

**Suggested Readings:**

G. K. Kwatra-The New Arbitration & Conciliation Law of India, ICA, 1998.

Gabrielle Kaufmann- Online Dispute Resolution: Challenges for Contemporary Justice, Kohler & Thomas Wolters Kluwer, UK Schultz.

“Law & Practice of Alternative Dispute Resolution in India – A Detailed Analysis”, by Anirban Chakraborty; 2016 Edition, LexisNexis, Gurgaon.

Madabhushi Sridhar – Alternative Dispute Resolution, Butterworth Lexis Nexis, (Reprint 2010) 1st edition.

O. P. Malhotra & Indu Malhotra, The Law and Practice of Arbitration and Conciliation, 3rd ed. (2014).

## **Environmental law**

### **CBSN-401 D**

#### **UNIT-1**

Basic Concepts in Environmental Law. An introduction to the legal system; Constitution, Acts, Rules, Regulations; Indian Judiciary, Doctrine of precedents, judicial review, Writ petitions, PIL—liberalization of the rule of locus standi, Judicial activism. Introduction to environmental laws in India; Constitutional provisions, Stockholm conference; Bhopal gas tragedy; Rio conference. General principles in Environmental law: Precautionary principle; Polluter pays principle; Sustainable development; Public trust doctrine. Overview of legislations and basic concepts.

#### **UNIT-2**

Forest, Wildlife and Biodiversity related laws Evolution and Jurisprudence of Forest and Wildlife laws; Colonial forest policies; Forest policies after independence Statutory framework on Forests, Wildlife and Biodiversity: IFA, 1927; WLPA, 1972; FCA, 1980; Biological Diversity Act, 2002; Forest Rights Act, 2006.

Strategies for conservation—Project Tiger, Elephant, Rhino, Modulew leopard

#### **UNIT-3**

Air, Water and Marine Laws National Water Policy and some state policies Laws relating to prevention of pollution, access and management of water and institutional mechanism: Water Act, 1974; Water Cess Act, 1977, EPA, 1986. Pollution Control Boards Ground water and law Judicial remedies and procedures Marine laws of India; Coastal zone regulations. Legal framework on Air pollution: Air Act, 1981; EPA, 1986

#### **UNIT-4**

Environment protection laws and large Projects Legal framework on environment protection- Environment Protection Act as the framework legislation—strength and weaknesses; EIA; National Green tribunal The courts infrastructure projects

#### **UNIT-5**

Hazardous Substances and Activities Legal framework: EPA and rules made thereunder; PLI Act, 199 Principles of strict and absolute liability

#### **Suggested readings**

1. Birnie P. (2009) et al., International Law and the Environment, 3rd ed., Oxford.
2. Desai A. (2002) Environmental Jurisprudence, 2nd ed., Modern Law House, Allahabad.
3. Gadgil M. and Guha R. (1995) Ecology and Equity, Oxford, New Delhi.
4. Gadgil M. and Guha R. (1997) This Fissured Land, Oxford, New Delhi.
5. Guha R. (2000) Environmentalism: A Global History, Oxford, New Delhi.
6. Kamala S. and Singh U.K. (eds.) (2008) Towards Legal Literacy: An Introduction to Law in India, Oxford, New Delhi.
7. Leelakrishnan P. (2006) Environmental Law Case Book, 2nd ed, Lexis Nexis, India.
8. Sands P. (2002) Principles of International Environmental Law, 2nd ed, Cambridge.

9. Singh C. (1986) Common Property and Common Poverty, Oxford, New Delhi.
10. Upadhyay S. and Upadhyay V. (2002) Hand Book on Environmental Law- Forest Laws, Wildlife Laws and the Environment; Vols. I, II and III, Lexis Nexis- Butterworths-India, New Delhi.

## ARTIFICIAL INTELLIGENCE LAB (CCSN-451)

### Course Objectives: This course is designed to:

1. Explore the methods of implementing algorithms using artificial intelligence techniques
2. Illustrate search algorithms
3. Demonstrate building of intelligent agents

### List of Experiments:

1. Write a program to implement DFS
2. Write a program to implement BFS
3. Write a Program to find the solution for travelling salesman Problem
4. Write a program to implement Simulated Annealing Algorithm
5. Write a program to find the solution for wampus world problem
6. Write a program to implement 8 puzzle problem
7. Write a program to implement Towers of Hanoi problem
8. Write a program to implement A\* Algorithm
9. Write a program to implement Hill Climbing Algorithm
10. Build a bot which provides all the information related to you in college.
11. Build a virtual assistant for Wikipedia using Wolfram Alpha and Python
12. The following is a function that counts the number of times a string occurs in another string:



## **DISTRIBUTED COMPUTING SYSTEMS LAB (CCSN-453)**

### **EXPERIMENT-1**

Implement concurrent echo client-server application

### **EXPERIMENT-2**

Implement concurrent day-time client-server application.

### **EXPERIMENT-3**

Configure following options on server socket and tests them: SO\_KEEPALIVE, SO\_LINGER, SO\_SNDBUF, SO\_RCVBUF, TCP\_NODELAY

### **EXPERIMENT-4**

Incrementing a counter in shared memory.

### **EXPERIMENT-5**

Create CORBA based server-client application

### **EXPERIMENT-6**

Design XML Schema and XML instance document

### **EXPERIMENT-7**

WSDL based: Implement ArithmeticService that implements add, and subtract operations / Java based: Implement TrigonometricService that implements sin, and cos operations.

### **EXPERIMENT-8**

Configuring reliability and security options

### **EXPERIMENT-9**

Monitor SOAP request and response packets. Analyze parts of it and compare them with the operations (java functions) headers.

### **EXPERIMENT-10**

Design and test BPEL module that composes ArithmeticService and TrigonometricService.

### **EXPERIMENT-11**

Test open source ESB using web service. LABWORK BEYOND CURRICULA

### **EXPERIMENT-12**

Implementing Publish/Subscribe Paradigm using Web Services, ESB and JMS

### **EXPERIMENT-13**

Implementing Stateful grid services using Globus WS-Core-4.0.3

## Seminar and Group Discussion

### CCSN-481

- **Educational technology**

A common topic at Decamps, this includes practical examples of using modern tools in the classroom and how to solve problems that technology can cause.

- **Current events**

Students can track current events and create a news show or podcast about them.

- **Artificial intelligence**

Seminars can help you learn about responsible **AI development and deployment**, and build a professional network.

- **Case studies and debates**

These activities can help students engage with the material and develop communication, critical analysis, and teamwork skills.

- **Classroom management**

This includes strategies and techniques for creating a learning environment that reduces disruptions.

- **Global issues in education and research**

This can include topics such as the impact of crisis on education, **ethical issues in education, and technology in teaching and learning.**

- **Psychology**

This includes core areas such as biological, cognitive, **developmental, social, and individual differences.**

## **INTERNSHIP AND Report Presentation**

### **CCSN-462**

#### **Unit 1: Introduction to Internship**

This unit introduces the concept of internships, highlighting their importance in bridging the gap between academic learning and practical experience. Students will explore the goals of internships, types of internships available, and **the expectations from both interns and organizations.**

#### **Unit 2: Preparing for the Internship**

In this unit, students will learn how to prepare for their internship experience. Topics will include resume writing, crafting cover letters, interview preparation, and professional networking. The unit will also cover the importance of setting clear learning objectives for the internship.

#### **Unit 3: Workplace Skills and Professionalism**

This unit focuses on essential workplace skills and professionalism. Students will learn about effective communication, teamwork, time management, and problem-solving in a professional environment. The unit will emphasize the importance of ethical behavior and **adaptability in the workplace.**

#### **Unit 4: Intern Responsibilities and Learning Outcomes**

**Students will explore their responsibilities during the internship in this unit. The unit will cover how to identify key tasks, contribute to team projects, and seek feedback. Students will learn to document their learning experiences and the skills they develop throughout the internship.**

#### **Unit 5: Project Development and Implementation**

In this unit, students will engage in project development related to their internship roles. They will learn how to define project goals, plan and execute tasks, and assess progress. The unit will also emphasize the importance of collaboration with supervisors and colleagues.



**Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

**School of School of Engineering and Technology**

**Ordinances, Regulations & Syllabus**

For

**Bachelor of Engineering, Four Year Programme**

**Semester System**

(w.e.f. session 2013-14)

**Approved and adopted in the year 2015 (5<sup>th</sup> Meeting, Board of Studies)**

## **Programme Educational Objectives (PEOs)**

**PEO 1** Graduates will acquire a strong foundation in engineering principles, enabling them to design, develop, and implement innovative solutions to complex engineering problems across various industries.

**PEO 2** Graduates will develop the ability to apply critical thinking, problem-solving skills, and engineering techniques to analyze, evaluate, and resolve real-world challenges in their chosen engineering discipline.

**PEO 3** Graduates will gain hands-on experience in using modern engineering tools, software, and technologies, enabling them to effectively design, model, and optimize engineering systems and processes.

**PEO 4** Graduates will demonstrate the ability to work collaboratively in multidisciplinary teams, manage engineering projects, and communicate technical information effectively to both technical and non-technical stakeholders.

**PEO 5** Graduates will adhere to professional and ethical standards, ensuring their engineering solutions are socially responsible, environmentally sustainable, and aligned with industry best practices and regulatory requirements.

**PEO 6** Graduates will develop leadership and management skills, preparing them to take on roles of responsibility in both technical and managerial aspects of engineering projects.

**PEO 7** Graduates will engage in lifelong learning and stay current with emerging technologies, ensuring continuous professional growth and adaptability to the evolving engineering landscape.

**PEO 8** Graduates will contribute to the betterment of society by creating innovative solutions that address societal challenges, promote sustainable development, and enhance the quality of life globally.

## **Programme Specific Objectives (PSO's)**

**PSO 1** To equip students with a solid foundation in core engineering concepts, preparing them to design, analyze, and develop solutions for complex technical challenges in various fields.

**PSO 2** To develop proficiency in modern engineering tools, techniques, and technologies, enabling students to effectively design, model, and optimize engineering systems and processes across diverse applications.

**PSO 3** To enhance problem-solving skills, encouraging students to apply engineering principles and critical thinking to develop innovative and sustainable solutions for real-world challenges in their discipline.

**PSO 4** To foster a strong understanding of professional ethics, environmental sustainability, and social responsibility, ensuring students create engineering solutions that are both technically sound and socially beneficial.

**PSO 5** To provide hands-on experience through laboratory work, internships, and projects, helping students gain practical exposure to the application of engineering concepts in real-world scenarios.

**PSO 6** To nurture teamwork, leadership, and communication skills, preparing students to effectively collaborate in multidisciplinary teams, manage engineering projects, and communicate complex ideas to diverse audiences.

**PSO 7** To ensure students develop a global perspective on engineering practices, preparing them to adapt and innovate in response to technological advancements and the needs of a rapidly changing world.

**PSO 8** To foster lifelong learning habits, ensuring students remain adaptable and stay updated with the latest trends, technologies, and advancements in their engineering field throughout their careers.

## **Programme Outcome Objectives (POO's)**

**POO 1** Graduates will have a strong foundation in engineering fundamentals, enabling them to apply core principles and methodologies to solve real-world engineering problems across various disciplines.

**POO 2** Graduates will possess the ability to analyze complex engineering systems, design innovative solutions, and optimize processes while considering technical, environmental, and societal constraints.

**POO 3** Graduates will be proficient in using modern engineering tools, software, and technologies to model, simulate, and solve engineering problems, ensuring efficient and effective system designs.

**POO 4** Graduates will develop critical thinking, problem-solving, and decision-making skills to address engineering challenges, ensuring that solutions are feasible, sustainable, and aligned with industry standards.

**POO 5** Graduates will demonstrate the ability to work effectively in multidisciplinary teams, manage projects, and communicate technical information clearly to diverse audiences, both within and outside of engineering fields.

**POO 6** Graduates will adhere to ethical, professional, and legal standards in engineering practice, ensuring their solutions positively impact society, the environment, and the global engineering community.

**POO 7** Graduates will be capable of undertaking independent research, applying engineering principles to explore new solutions, and contributing to advancements in technology and engineering practices.

**POO 8** Graduates will have strong leadership and interpersonal skills, enabling them to manage engineering projects, lead teams, and coordinate with stakeholders to achieve desired outcomes.

**POO 9** Graduates will demonstrate an understanding of sustainability, applying green engineering principles to minimize the environmental impact of their designs and promote socially responsible engineering practices.

**POO 10** Graduates will embrace lifelong learning, continuously updating their knowledge and skills to stay relevant with evolving technologies, methodologies, and trends in engineering, ensuring professional growth throughout their careers.

# Scheme of Teaching

## TEACHING SCHEME OF B.TECH. 1<sup>ST</sup> YEAR (1<sup>ST</sup> SEMESTER)

### (COMMON FOR ALL BRANCHES)

CODE	SUBJECT	CREDIT	L	T	P
CMAN-101 CMAN-101 A/ CMAN-101 B/ CMAN-101 C/ <b>CMAN-101 D</b>	MATHEMATICS-I STATISTICAL TECHNIQUES IN COMPUTER SCIENCE I MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE I APPLIED MATHEMATICS I <b>ADVANCED APPLIED MATHEMATICS I</b>	4	3	1	0
CMEN-101 CMEN-101 A/ CMEN-101 B/ CMEN-101 C/ <b>CMEN-101 D</b>	ENGINEERING MECHANICS INTRODUCTION TO ENGINEERING MECHANICS MATERIAL SCIENCE AND ENGINEERING DYNAMICS OF MACHINERY <b>THERMODYNAMICS</b>	4	3	1	0
CECN-101 CECN-101 A/ CECN-101 B/ CECN-101 C/ CECN-101 D	FUNDAMENTALS OF ELECTRONICS INTRODUCTION TO ELECTRONICS OPERATIONAL AMPLIFIERS AND THEIR APPLICATIONS DIGITAL SIGNAL PROCESSING EMBEDDED SYSTEMS	4	3	1	0
CESN-101 CESN-101 A/ CESN-101 B/ CESN-101 C <b>CESN-101 D</b>	ENGINEERING CHEMISTRY AND ENVIRONMENTAL SCIENCE INTRODUCTION TO ENGINEERING CHEMISTRY CHEMICAL THERMODYNAMICS MATERIALS SCIENCE AND ENGINEERING <b>GREEN CHEMISTRY AND SUSTAINABLE PRACTICES</b>	4	3	1	0
CPCN-101 CPCN-101 A/ CPCN-101 B/ CPCN-101 C/ <b>CPCN-101 D</b>	PRESENTATION AND COMMUNICATION SKILLS INTRODUCTION TO COMMUNICATION SKILLS INTERPERSONAL COMMUNICATION TECHNICAL WRITING <b>COMMUNICATION IN DIGITAL MEDIA</b>	3	3	0	0
CMEN-151	ENGINEERING WORKSHOP PRACTICE	1	0	0	2
CMEN-153	ENGINEERING GRAPHICS LAB	1	0	0	2
CPCN-151 CPCN-151 A CPCN-151 B CPCN-151 C CPCN-151 D	ENGLISH LAB INTRODUCTION TO COMMUNICATION SKILLS INTERPERSONAL COMMUNICATION TECHNICAL WRITING COMMUNICATION IN DIGITAL MEDIA	1	0	0	2



TOTAL		22	15	4	6
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**TEACHING SCHEME OF B.TECH. 1<sup>ST</sup> YEAR (2<sup>ND</sup> SEMESTER)**

<b>CODE</b>	<b>SUBJECT</b>	<b>CREDIT</b>	<b>L</b>	<b>T</b>	<b>P</b>
CMAN-102	MATHEMATICS-II	4	3	1	0
CMAN-102 A	STATISTICAL TECHNIQUES IN COMPUTER SCIENCE II				
CMAN-102 B	MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE II				
CMAN-102 C	APPLIED MATHEMATICS II				
<b>CMAN-102 D</b>	<b>ADVANCED APPLIED MATHEMATICS II</b>				
CPHN -102	ENGINEERING PHYSICS	4	3	1	0
CPHN -102 A	INTRODUCTION TO ENGINEERING PHYSICS				
CPHN -102 B	ELECTROMAGNETISM				
CPHN -102 C	MATERIALS SCIENCE AND ENGINEERING				
CPHN -102 D	WAVES AND VIBRATIONS				
CCSN-102	COMPUTER FUNDAMENTALS AND PROGRAMMING USING-C	4	3	1	0
CEEN-102	BASICS OF ELECTRICAL ENGINEERING	4	3	1	0
CEEN-102 A	INTRODUCTION TO ELECTRICAL ENGINEERING				
CEEN-102 B	ELECTRICAL MACHINES				
CEEN-102 C	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION				
<b>CEEN-102 D</b>	<b>TRANSMISSION AND DISTRIBUTION SYSTEMS</b>				
CPCN-102	TECHNICAL COMMUNICATION	3	3	0	0
CPCN-102 A	INTRODUCTION TO TECHNICAL COMMUNICATION				
CPCN-102 B	TECHNICAL DOCUMENTATION				
CPCN-102 C	TECHNICAL EDITING AND PROOFREADING				
CPCN-102 D	TECHNICAL RESEARCH AND ANALYSIS				
CPHN-152	ENGINEERING PHYSICS LAB	1	0	0	2
CPHN-152A	INTRODUCTION TO ENGINEERING PHYSICS LAB				
CPHN-152B	ELECTROMAGNETISM LAB				
CPHN-152C	MATERIALS SCIENCE AND ENGINEERING LAB				
<b>CPHN-152D</b>	<b>WAVES AND VIBRATIONS LAB</b>				
CCSN-152	COMPUTER PROGRAMMING USING C LAB	1	0	0	2
CEEN-152	BASIC ELECTRICAL ENGINEERING LAB	1	0	0	2
CEEN-152A	INTRODUCTION TO ELECTRICAL ENGINEERING LAB				
CEEN-152B	ELECTRICAL MACHINES LAB				
CEEN-152C	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB				
CEEN-152D	TRANSMISSION AND DISTRIBUTION SYSTEMS LAB				
<b>TOTAL</b>		<b>22</b>	<b>15</b>	<b>4</b>	<b>6</b>

**SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)**  
**TEACHING SCHEME**  
**Effective from 2015**

**B. TECH. (COMPUTER SCIENCE & ENGINEERING)**  
**III semester**

Code	Course Title	Cr.	L	T	P
CCSN-201	DATA STRUCTURE USING 'C'	4	3	1	0
CCSN-203	DBMS	4	3	1	0
CCSN-205	OPERATING SYSTEMS (UNIX PROGRAMMING)	4	3	1	0
CCSN-207	JAVA PROGRAMMING	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-I	4	3	1	0
CBSN-201	VALUE EDUCATION, HUMAN RIGHTS AND LEGISLATIVE PROCEDURES	2	2	0	0
CBSN-201 A	PERSONALITY DEVELOPMENT- I				
CBSN-201 B	BEHAVIOUR SKILL- I				
CBSN-201 C	LANGUAGE PROFICIENCY AND ENGLISH I				
<b>CBSN-201 D</b>	<b>PUBLIC SPEAKING AND PRESENTATION I</b>				
CCSN-251	DATA STRUCTURE USING 'C' LAB	1	0	0	2
CCSN-253	DBMS LAB	1	0	0	2
CCSN-255	JAVA PROGRAMMING LAB	1	0	0	2
	Total	25	17	5	6

**PROFESSIONAL ELECTIVE-I**

1. CCSN 209 DISCRETE MATHEMATICS
  - i. CCSN 209 A ENGINEERING MATHEMATICS-I
  - ii. CCSN 209 B BASIC MATHEMATICS
  - iii. CCSN 209 C STATISTICAL TECHNIQUES IN COMPUTER SCIENCE
  - iv. CCSN 209 D ELEMENTARY MATHEMATICS**
2. CCSN 211 PERL PROGRAMMING
3. CCSN 213 INTRODUCTION TO SOFT COMPUTING (Neural Networks, Fuzzy Logic and Genetic Algorithm)
4. CCSN 215 MATLAB PROGRAMMING FOR ENGINEERS

**SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)**  
**TEACHING SCHEME**  
**Effective from 2015**

**B. TECH. (COMPUTER SCIENCE & ENGINEERING)**  
**IV semester**

Code	Course Title	Cr.	L	T	P
CCSN-202	OBJECT ORIENTED PROGRAMMING USING C++	4	3	1	0
CCSN-204	DESIGN AND ANALYSIS OF ALGORITHMS	4	3	1	0
CCSN-206	INTERNET AND WEB TECHNOLOGY	4	3	1	0
CCSN-208	COMPUTER NETWORKS	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-II	4	3	1	0
CBSN-202	TECHNICAL ENGLISH	2	2	0	0
CBSN-202 A	TECHNICAL COMMUNICATION				
CBSN-202 B	TECHNICAL PRESENTATION SKILLS				
CBSN-202 C	USER MANUALS AND GUIDES				
<b>CBSN-202 D</b>	<b>BUSINESS COMMUNICATION</b>				
CCSN-252	OBJECT ORIENTED PROGRAMMING USING C++ LAB	1	0	0	2
CCSN-254	DESIGN AND ANALYSIS OF ALGORITHMS LAB	1	0	0	2
CCSN-256	INTERNET AND WEB TECHNOLOGY LAB	1	0	0	2
	Total	25	17	5	6

**PROFESSIONAL ELECTIVE-II**

- 1.CCSN 210      FORMAL LANGUAGES & AUTOMATION THEORY
- 2.CCSN 212      NANO SCIENCES

**SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)**  
**TEACHING SCHEME**  
**Effective from 2015**

**B. TECH. (COMPUTER SCIENCE & ENGINEERING)**  
**V semester**

Code	Course Title	Cr.	L	T	P
CCSN-301	SOFTWARE ENGINEERING	4	3	1	0
CCSN-303	COMPILER DESIGN	4	3	1	0
CCSN-305	OBJECT ORIENTED ANALYSIS AND DESIGN	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-III	4	3	1	0
CUCS-XXX	OPEN ELECTIVE-I	4	3	1	0
CBSN-301	ENERGY STUDIES	2	2	0	0
CCSN-351	SOFTWARE ENGINEERING LAB	1	0	0	2
CCSN-353	COMPILER DESIGN LAB	1	0	0	2
CCSN-355	OBJECT ORIENTED ANALYSIS AND DESIGN LAB	1	0	0	2
	Total	25	17	5	6

**PROFESSIONAL ELECTIVE-III**

1. CCSN 307      CRYPTOGRAPHY & INFORMATION SECURITY
2. CCSN 309      INTERNET WEB PROGRAMMING
3. CCSN 311      GRAPH THEORY

**OPEN ELECTIVE-I**

1. CUCS 341      COMPUTER VISION
2. CUCS 343      ROBOTICS AND AUTOMATION
3. CUCS 345      WEB SERVICE AND SERVICE ORIENTED ARCHITECTURE
4. CUCS 347      HUMAN COMPUTER INTERFACE

**SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)**  
**TEACHING SCHEME**  
**Effective from 2015**

**B. TECH. (COMPUTER SCIENCE & ENGINEERING)**  
**VI Semester**

Code	Course Title	Cr.	L	T	P
CCSN-302	COMPUTER GRAPHICS	4	3	1	0
CCSN-304	DATA WAREHOUSING & DATA MINING	4	3	1	0
CCSN-306	MOBILE COMPUTING	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-IV	4	3	1	0
CUCS-XXX	OPEN ELECTIVE-II	4	3	1	0
CBSN-302	ENVIRONMENTAL STUDIES	2	2	0	0
CCSN-352	COMPUTER GRAPHICS LAB	1	0	0	2
CCSN-354	DATA MINING LAB	1	0	0	2
CCSN-356	MINI PROJECT	1	0	0	2
	Total	25	17	5	6

**PROFESSIONAL ELECTIVE-IV**

1. CCSN 308 KNOWLEDGE MANAGEMENT & EXPERT SYSTEM
  - i. CCSN 308 A Introduction to Knowledge Management
  - ii. CCSN 308 B Information Systems and Technology
  - iii. CCSN 308 C Organizational Learning
  - iv. CCSN 308 D Emerging Trends in Knowledge Management
1. CCSN 310 EMBEDDED COMPUTING SYSTEMS
2. CCSN 312 SIMULATION AND MODELING
3. CCSN 314 APPROXIMATION OF ALGORITHMS

**OPEN ELECTIVE-II**

1. CUCS 342 SOFTWARE PROJECT MANAGEMENT
  - i. CUCS 342 A Project Planning and Scheduling
  - ii. CUCS 342 B Risk Management in Software Projects
  - iii. CUCS 342 C Project Quality Management
  - iv. CUCS 342 D Stakeholder Management
2. CUCS 344 MICROWAVE ENGINEERING
3. CUCS 346 SUPPLY CHAIN MANAGEMENT-PLANNING
4. CUCS 348 SOFTWARE TESTING

**SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)**  
**TEACHING SCHEME**  
**Effective from 2015**

**B. TECH. (COMPUTER SCIENCE & ENGINEERING)**  
**VII Semester**

<b>Code</b>	<b>Course Title</b>	<b>Cr.</b>	<b>L</b>	<b>T</b>	<b>P</b>
CCSN-401	DISTRIBUTED COMPUTING SYSTEMS	4	3	1	0
CCSN-403	ADVANCED COMPUTER SYSTEM ARCHITECTURE	4	3	1	0
CCSN-405	ARTIFICIAL INTELLIGENCE	4	3	1	0
CCSN-XXX	PROFESSIONAL ELECTIVE-V	4	3	1	0
CUCS-XXX	OPEN ELECTIVE-V	4	3	1	0
CBSN-401	LAW FOR ENGINEERS	2	2	0	0
CBSN-401 A	INTRODUCTION TO ENGINEERING LAW				
CBSN-401 B	INTELLECTUAL PROPERTY LAW				
CBSN-401 C	ETHICS AND PROFESSIONAL RESPONSIBILITY				
CBSN-401 D	LEGAL ASPECTS OF INTELLECTUAL PROPERTY IN ENGINEERING				
CCSN-451	DISTRIBUTED SYSTEM LAB	1	0	0	2
CCSN-453	ARTIFICIAL INTELLIGENCE LAB	2	0	0	4
	Total	25	17	5	6

**PROFESSIONAL ELECTIVE-V**

1. CCSN 407 DIGITAL IMAGE PROCESSING
2. CCSN 409 MULTIMEDIA COMPUTING
3. CCSN 411 PATTERN RECOGNITION
4. CCSN 413 VLSI DESIGN & ALGORITHMS

**OPEN ELECTIVE-III**

1. CUCS 441 CLIENT-SERVER COMPUTING
2. CUCS 443 NEURAL NETWORK
3. CUCS 445 ENGINEERING SYSTEM MODELING AND SIMULATION

# **SHOBHIT UNIVERSITY, GANGOH (SAHARANPUR)**

## **TEACHING SCHEME**

**Effective from 2015**

### **B. TECH. (COMPUTER SCIENCE & ENGINEERING)**

#### **VIII Semester**

<b>Code</b>	<b>Course Title</b>	<b>Cr.</b>	<b>L</b>	<b>T</b>	<b>P</b>
CCSN-482	INTERNSHIP/MAJOR PROJECT	20	0	0	40
CCSN-484	PRESENTATION & VIVA	4	0	0	8



# ***SYLLABUS***

## Mathematics-I

CMAM-101

Cr. L T P

4 3 1 0

### Unit-I

**Functions of Several Variables:** Limit continuity and differentiability of functions of two variables; Euler's theorem, Tangent plane and normal, Change of variables, Chain rule; Jacobians, Taylor's Theorem for two variables; Extrema of functions of two or more variables, Lagrange's method of undetermined multipliers.

### Unit-II

**Ordinary Differential Equations:** Solution of linear differential equations with constant coefficients, Euler-Cauchy equations, Solution of second order differential equations by change of dependent and independent variables; Method of variation of parameters for second order differential equations.

### Unit-III

**Numerical Solution of ODE:** Picard's method, Taylor's series, Euler method & Modified Euler method.

**Infinite Series:** Convergence of infinite series; Comparison test, Ratio test, Root test, Logarithmic test, De Morgan's test, Cauchy integral test.

### Unit-IV

**Solution in Series:** Solution in series of second order linear differential equations with polynomial coefficients; Bessel and Legendre equations and their series solutions; Properties of Bessel functions and Legendre polynomials.

### Unit-V

**Matrix Algebra:** Rank of a matrix, Inverse of a matrix by elementary operations; Solution of linear simultaneous equations and their numerical solutions by Gauss elimination and Gauss-Seidel methods, Eigenvalues and Eigenvectors of matrices by Cayley-Hamilton theorem; Diagonalisation of matrices; Orthogonal, Hermetian, Skew-Hermetian, Normal and Unitary matrices and their elementary properties; Quadratic forms.

**Reference Books :**

1. Kreyszig, E. *Advanced Engineering Mathematics*. 8<sup>th</sup> Edition. Wiley Eastern, 2004.
2. Grewal, B.S. *Engineering Mathematics*. 39<sup>th</sup> Edition. Khanna Publishers, 2005.

## Statistical Techniques in Computer Science

CMAN-101 A

CREDIT L T P

4 3 1 0

### Course Objectives:

- To understand the fundamental concepts of statistics and their application in computer science.
- To analyze and interpret data using statistical methods.
- To apply statistical techniques in various areas such as machine learning, data mining, and software engineering.

### Unit 1: Introduction to Statistics and Probability Theory

Definition and scope of statistics, Types of data: qualitative vs. quantitative, Levels of measurement: nominal, ordinal, interval, ratio, Descriptive statistics: measures of central tendency (mean, median, mode) and dispersion (variance, standard deviation, range), Basic concepts of probability, Conditional probability and Bayes' theorem, Random variables and probability distributions, Discrete distributions: binomial, Poisson, Continuous distributions: normal, exponential, uniform

### Unit 2: Inferential Statistics

Sampling methods and sampling distributions, Estimation: point estimation and confidence intervals, Hypothesis testing: types of errors, significance levels, p-values, t-tests, chi-square tests, and ANOVA, Simple linear regression: assumptions, estimation, and interpretation, Multiple linear regression: model building and evaluation, Correlation coefficients: Pearson's and Spearman's, Application of regression analysis in predictive modeling

### Unit 3: Non-parametric Methods

Introduction to non-parametric tests, Mann-Whitney U test, Wilcoxon signed-rank test, Kruskal-Wallis test, Applications in real-world scenarios, Control charts and process capability, Six Sigma principles, Applications in software testing and performance evaluation

### Unit 4: Statistical Techniques in Machine Learning

Role of statistics in machine learning algorithms, Feature selection and dimensionality reduction techniques, Evaluation metrics for classification and regression models, Cross-validation techniques

### Unit 5: Data Visualization and Interpretation

Importance of data visualization, Tools for data visualization (e.g., Matplotlib, Seaborn, Tableau)  
Techniques for effective presentation of statistical findings

# MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE I

**CMAN-101B**

**CREDIT L T P**

**4 3 1 0**

## **1. Set Theory**

Basics of sets, subsets, power sets, Operations on sets: union, intersection, difference, Cartesian products, Applications in database theory, Propositional logic: propositions, logical connectives, Truth tables, logical equivalences Predicate logic: predicates, quantifiers Proof techniques: direct proof, contradiction, induction

## **2. Functions and Relations**

Definitions of functions: one-to-one, onto, bijections, Composition and inverse of functions, Relations: properties, equivalence relations, partial orders, Applications of relations in computer science

## **4. Graphs and Trees**

Basic definitions: vertices, edges, degrees, Types of graphs: directed, undirected, weighted, Graph representations: adjacency matrix, adjacency list, Trees: binary trees, traversal algorithms (pre-order, in-order, post-order), Divisibility, prime numbers, and GCD, Modular arithmetic, Applications in cryptography.

## **5. Combinatorics**

Basic counting principles: permutations and combinations, The pigeonhole principle, Binomial coefficients and the binomial theorem, Applications in algorithm analysis, Basic concepts: sample space, events, probability axioms, Random variables and expected value, Discrete and continuous probability distributions

### **Suggested Textbooks:**

- "Discrete Mathematics and Its Applications" by Kenneth H. Rosen
- "Discrete Mathematics" by Richard Johnsonbaugh
- "Mathematics for Computer Science" by Eric Lehman, F. Thomson Leighton, and Albert R. Meyer (available online)

## APPLIED MATHEMATICS I

**CMAN-101C**

**CREDIT L T P**

**4 3 1 0**

### **Unit 1: Calculus and Differential Equations**

This unit focuses on the fundamentals of differential calculus, integration techniques, and first-order differential equations. The topics include limits, continuity, differentiability, techniques of integration, and solving linear differential equations. Applications to real-world problems in physics and engineering are explored.

### **Unit 2: Linear Algebra and Matrix Theory**

This unit covers the basics of matrix operations, systems of linear equations, and vector spaces. Topics include matrix inversion, determinants, eigenvalues, eigenvectors, and diagonalization. The focus is on the application of linear algebra to solving systems of linear equations and analyzing transformations.

### **Unit 3: Vector Calculus and Applications**

In this unit, the primary concepts of vector fields, gradient, divergence, and curl are studied. Theorems like Green's Theorem, Stokes' Theorem, and Gauss's Divergence Theorem are discussed, with applications to fluid dynamics, electromagnetism, and other fields requiring spatial analysis.

### **Unit 4: Probability and Statistics**

This unit introduces basic concepts in probability theory, including conditional probability, random variables, and probability distributions. Key statistical methods, such as hypothesis testing, estimation, and regression analysis, are also covered, along with their applications in data analysis and decision-making processes.

### **Unit 5: Fourier Analysis and Partial Differential Equations**

The final unit explores Fourier series and Fourier transforms, including their applications to solving partial differential equations. The focus is on classical problems in heat conduction, wave propagation, and diffusion. Methods for solving linear partial differential equations and their real-world applications are also discussed.

## ADVANCED APPLIED MATHEMATICS I

CMAN-101 D

### **Unit 1: Advanced Calculus and Multivariable Analysis**

This unit explores advanced topics in multivariable calculus, including partial derivatives, multiple integrals, and vector-valued functions. The theory behind gradients, directional derivatives, and the application of Green's, Stokes', and Gauss's Theorems in higher dimensions is emphasized. It also delves into the concept of higher-order derivatives and the method of Lagrange multipliers.

### **Unit 2: Ordinary and Partial Differential Equations**

Focusing on advanced techniques for solving both ordinary and partial differential equations, this unit includes methods like separation of variables, integral transforms, and the use of Green's function. The theory behind second-order linear differential equations, boundary value problems, and the classification of partial differential equations is also covered.

### **Unit 3: Complex Analysis and its Applications**

This unit examines complex variable theory, focusing on analytic functions, contour integration, residue calculus, and conformal mappings. Applications to fluid dynamics, electrostatics, and potential theory are explored. The unit also includes advanced topics such as Riemann surfaces and complex mappings.

### **Unit 4: Functional Analysis and Operator Theory**

This unit introduces the concepts of normed vector spaces, Banach and Hilbert spaces, and continuous linear operators. The theory of spectral decomposition, compact operators, and Fourier series in function spaces is covered, as well as the application of these concepts in solving integral and differential equations.

### **Unit 5: Advanced Probability, Stochastic Processes, and Statistical Methods**

The final unit delves into advanced probability theory, including stochastic processes, Markov chains, Brownian motion, and applications to queuing theory and reliability analysis. The unit also includes multivariate statistical methods, estimation theory, and large-sample theory, with applications in statistical inference and machine learning.



**UNIT-I**

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Lami's Theorem, Distributed force system, Free body diagrams, Types of supports- Support reactions for beams with different types of loading-Concentrated.

**UNIT-II**

Beam: Introduction, Shear force and Bending Moment, Shear force and Bending Moment Diagrams for Statically Determinate Beams

Trusses: Introduction, Method of Joints and Method of Sections.

**UNIT-III**

Kinematics of Rigid Body: Introduction, Plane Rectilinear Motion of Rigid Body, Plane Curvilinear Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion, Relative Velocity. Translation and Rotational Motion, Relative Velocity.

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction,

**UNIT-IV**

Centroid and Moment of Inertia: Centroid of plane, curve, area and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Mass Moment of Inertia

Vibration: Definitions, concepts. Simple harmonic motion. Free vibrations. Simple, compound and torsional pendulum - Numerical problems

**UNIT-V**

Surveying: Introduction to Surveying

**Reference Books :**

1. "Engineering Mechanics: Statics", J.L Meriam , Wiley
2. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI 10. "Engineering Mechanics", D. P. Sharma, PHI 11.
3. "Engineering Mechanics", M. V. Sheshagiri Rao, and D. Rama Durgaiyah, University Press.
4. "Engineering Mechanics", K L Kumar and V. Kumar, McGraw Hill
5. "Engineering Mechanics", Bhattacharya , Oxford Press
6. "Engineering Mechanics", Dr Sadhu Singh , Umesh Publications
7. "Engineering Mechanics", Bhavikatti , New Age

## **Introduction to Engineering Mechanics**

**CMEN-101 A**

**Cr. L T P**

4 3 1  
0

### **Unit 1: Fundamentals of Engineering Mechanics**

This unit introduces the basic concepts of engineering mechanics, including the study of forces, moments, and equilibrium. It covers the vector representation of forces, the principle of static equilibrium, and the concepts of force systems. The unit also discusses the role of engineering mechanics in understanding the behavior of structures and mechanical systems.

### **Unit 2: Force Systems and Equilibrium**

In this unit, the emphasis is on analyzing different types of force systems, including concurrent, parallel, and general force systems. The unit focuses on the conditions of equilibrium, both in two and three dimensions, and the application of these principles to solve static problems in engineering.

### **Unit 3: Properties of Areas and Centroid**

This unit deals with the determination of the centroid and the moment of inertia of various geometric shapes. It covers the calculation of the first and second moments of area and their significance in structural analysis. Applications to the design of beams and other structural elements are also included.

### **Unit 4: Friction and Dynamics of Particles**

Friction is introduced as a force that opposes motion, and the unit covers the principles of static and kinetic friction, as well as their applications in machines and structures. The unit also includes the study of particle dynamics, including the motion of particles under the influence of forces and the application of Newton's laws in dynamic analysis.

### **Unit 5: Kinematics and Kinetics of Rigid Bodies**

This unit explores the motion of rigid bodies, including the concepts of displacement, velocity, and acceleration. The unit covers the kinematics of rigid body motion, both in planar and three-dimensional spaces. The kinetics section addresses the forces and moments responsible for the motion of rigid bodies, and the application of Newton's laws of motion and work-energy principles.

### **Suggested Books:**

1. **Engineering Mechanics: Dynamics** by J.L. Meriam and L.G. Kraige
2. **Engineering Mechanics: Statics and Dynamics** by R.C. Hibbeler

## Reference Books:

1. **Vector Mechanics for Engineers: Statics and Dynamics** by Ferdinand P. Beer and E. Russell Johnston
2. **Engineering Mechanics** by S. Timoshenko and D.H. Young

CMEN-101 B

### Material Science and Engineering

Cr. L T P

4 3 1 0

#### Unit 1: Introduction to Materials Science and Engineering

This unit introduces the fundamental concepts of materials science, including the classification of materials, their properties, and their relationship with structure. The unit covers atomic structure, bonding in solids, and the role of crystallography in understanding material behavior. It provides an overview of the basic types of materials used in engineering, such as metals, ceramics, polymers, and composites.

#### Unit 2: Atomic and Crystal Structure of Materials

Focusing on the atomic and microscopic level, this unit explores the different types of crystal structures, the concept of unit cells, and crystallographic planes. The unit also delves into the principles of crystal defects, dislocations, and their impact on the mechanical properties of materials. The understanding of the relationship between crystal structure and material properties is emphasized.

#### Unit 3: Mechanical Properties of Materials

This unit deals with the mechanical behavior of materials under various loading conditions. Topics include stress, strain, and the different types of mechanical properties, such as tensile strength, hardness, ductility, and toughness. The unit also covers the behavior of materials under cyclic loading, fatigue, and fracture mechanics, as well as the principles behind material selection for different engineering applications.

#### Unit 4: Phase Diagrams and Heat Treatment of Materials

The unit provides a comprehensive study of phase diagrams, including binary phase diagrams and their application to materials design and processing. Topics include phase transformations, eutectic systems, and the relationship between microstructure and properties. The heat treatment processes, such as annealing, quenching, and tempering, are discussed in detail, focusing on their effect on the mechanical properties and microstructure of metals and alloys.

#### Unit 5: Materials Processing and Failure Analysis

This unit covers the various methods of material processing, such as casting, forging, welding, and additive manufacturing, and their impact on material properties. The unit also addresses the principles of

materials failure, including the causes of failure due to mechanical, thermal, and environmental factors. Failure analysis techniques, including fracture mechanics and corrosion analysis, are explored to understand how materials fail in real-world applications.

### **Suggested Books:**

1. **Materials Science and Engineering: An Introduction** by William D. Callister Jr.
2. **Materials Science and Engineering** by V. Raghavan

### **Reference Books:**

1. **Fundamentals of Materials Science and Engineering** by William D. Callister Jr. and David G. Rethwisch
2. **Mechanical Behavior of Materials** by Thomas H. Courtney

# **Dynamics of Machinery**

**CMEN-101 C**

## **Unit 1: Introduction to Dynamics**

**4 3 1 0**

- Definition and Importance of Dynamics in Machinery
- Types of Mechanisms: Kinematic Pairs, Chains, and Mechanisms
- Kinematic Analysis: Velocity and Acceleration Analysis

## **Unit 2: Kinematics of Machinery**

- Types of Motion: Linear and Rotational Motion
- Instantaneous Center of Rotation
- Analysis of Simple Mechanisms: Four-Bar Chain, Slider Crank Mechanism

## **Unit 3: Dynamics of Machinery**

- Forces in Mechanisms: Analysis of Forces and Couples
- Dynamic Equilibrium: Inertia Forces and their Applications
- Cam and Follower Mechanisms: Types and Applications

## **Unit 4: Balancing of Machinery**

- Need for Balancing: Static and Dynamic Balancing
- Balancing of Rotating Masses: Single and Multiple Rotating Bodies
- Application of Balancing to Crank and Slotted Link Mechanisms

## **Unit 5: Vibration Analysis**

- Types of Vibrations: Free and Forced Vibrations
- Natural Frequency and Damping
- Vibration Isolation and Control
- Applications of Vibration Analysis in Machinery

**Suggested Books:**

1. **Theory of Machines and Mechanisms** by G. K. Gupta
2. **Mechanism and Machine Theory** by A. G. Ambekar

**Reference Books:**

1. **Machine Design: An Integrated Approach** by Robert L. Norton
2. **Dynamics of Machinery** by J. B. Rao and R. V. Dukkipati

# THERMODYNAMICS

## CMEN-101 D

### Unit 1: Introduction to Thermodynamics

This unit introduces the basic concepts of thermodynamics, including the laws of thermodynamics, energy, and the system-environment relationship. Topics include the classification of systems, properties, and state functions. The unit also covers the concepts of work, heat, and the energy balance in various thermodynamic processes.

### Unit 2: First Law of Thermodynamics and Applications

Focusing on the first law of thermodynamics, this unit explores the principle of energy conservation, including internal energy, heat, and work. Applications to engineering systems, such as the analysis of closed and open systems, are discussed. The unit also covers specific heat, thermodynamic processes, and cyclic processes in engines and refrigerators.

### Unit 3: Second Law of Thermodynamics and Entropy

This unit delves into the second law of thermodynamics, focusing on entropy and its significance in understanding irreversible processes. The unit includes the concept of entropy change, the Clausius and Kelvin-Planck statements, and the Carnot cycle. The laws are applied to real-world systems, including heat engines and refrigeration cycles, and the limitations imposed by the second law.

### Unit 4: Thermodynamic Properties of Pure Substances

This unit focuses on the thermodynamic behavior of pure substances, including phase changes and the use of property tables and Mollier diagrams. Topics include the P-V, T-S, and H-S diagrams and the application of these properties to real-world thermodynamic cycles such as Rankine and Brayton cycles. The unit emphasizes the calculation of work and heat in different phases of the substance.

### Unit 5: Power Cycles and Refrigeration Cycles

The final unit explores the working principles of various thermodynamic cycles, including the Rankine, Otto, Diesel, and Brayton cycles. The unit also covers refrigeration cycles, including the vapor-compression cycle and absorption refrigeration systems. Efficiency and performance analysis of these cycles are discussed, along with methods for improving cycle efficiency and minimizing losses in practical systems.

## FUNDAMENTALS OF ELECTRONICS

P	Cr.	L	T
CECN-101	4	3	1
0			

### Unit1:

*Electronics and Semiconductor:* Electronics: Application, History, Components, Voltage Source and Current Source, Classification of Solids, Forbidden Energy Gap, Insulator, Conductor, and Semiconductor: Types.

### Unit 2:

*Diodes and Applications* covering, Semiconductor Diode – Diode, Operation, Forward Bias, Reverse Bias, Drift and Diffusion, Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications;

### Unit 3:

*Transistor Characteristics* covering, Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration

### Unit 4:

*Operational Amplifiers and Applications* covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground; Op-Amp Applications – Inverting, Non-Inverting, Summing and Difference Amplifiers, Voltage Follower, Comparator, Differentiator, Integrator;

### Unit 5:

*Basic Digital Electronics* covering, Binary Number Systems and Codes; Basic Logic Gates and Truth Tables, Boolean Algebra, De Morgan's Theorems, Logic Circuits.

### Text/Reference Books:

1. R. L. Boylestad & Louis Nashlesky (2007), *Electronic Devices & Circuit Theory*, Pearson Education
2. Santiram Kal (2002), *Basic Electronics- Devices, Circuits and IT Fundamentals*, Prentice Hall, India
3. David A. Bell (2008), *Electronic Devices and Circuits*, Oxford University Press
4. Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals*, Pearson Education
5. R. S. Sedha (2010), *A Text Book of Electronic Devices and Circuits*, S.Chand & Co.
6. R. T. Paynter (2009), *Introductory Electronic Devices & Circuits – Conventional Flow*



*Version, Pearson Education*

# **Introduction to Electronics**

**CECN-101 A**

## **Unit 1: Fundamentals of Electronics**

This unit introduces the basic concepts of electricity, including voltage, current, resistance, and Ohm's Law. Students will learn about the fundamental circuit components such as resistors, capacitors, inductors, diodes, and transistors, along with an overview of integrated circuits.

## **Unit 2: Circuit Analysis Techniques**

In this unit, students will explore Ohm's and Kirchhoff's Laws, focusing on the analysis of series and parallel circuits. They will study Thevenin's and Norton's theorems for circuit simplification, as well as techniques for analyzing both AC and DC circuits, including the use of phasors and impedance.

## **Unit 3: Semiconductor Devices**

This unit covers the essential semiconductor devices, starting with diodes and their applications, such as PN junctions, Zener diodes, and rectifiers. Students will then delve into transistors, including bipolar junction transistors (BJTs) and field-effect transistors (FETs), learning about their configurations and characteristics. The unit will conclude with an introduction to operational amplifiers and their basic principles and applications.

## **Unit 4: Digital Electronics**

In this unit, students will examine number systems and codes, including binary, octal, decimal, and hexadecimal systems, as well as ASCII and BCD codes. The unit will cover basic logic gates such as AND, OR, NOT, NAND, NOR, and XOR, along with Boolean algebra for simplifying logic expressions. Students will learn to design combinational and sequential logic circuits, including adders, multiplexers, and flip-flops.

## **Unit 5: Introduction to Circuit Design and Testing**

The final unit introduces basic circuit design principles, emphasizing hands-on experience with breadboarding and circuit simulation tools. Students will learn testing and troubleshooting techniques using multimeters, oscilloscopes, and signal generators. The unit will also cover safety practices and best methods for handling electronic components and tools.

## **Course Objectives**

Students will gain a foundational understanding of electronics, develop skills in circuit analysis and design, and acquire practical experience in testing and troubleshooting electronic circuits.

## Recommended Textbooks

Key texts for this course include "Electronics Fundamentals: A Systems Approach" by Neil Storey, "Digital Design" by M. Morris Mano, and "Microelectronic Circuits" by Adel S. Sedra and Kenneth C. Smith.

## OPERATIONAL AMPLIFIERS AND THEIR APPLICATIONS

### CECN-101 B

**Unit 1: Introduction to Operational Amplifiers** This unit covers the basic concepts of operational amplifiers, including their structure, ideal and practical characteristics, and the significance of feedback in amplifier circuits. Students will learn about the different types of operational amplifiers and their key parameters.

**Unit 2: Basic Operational Amplifier Configurations** In this unit, students will explore various configurations of operational amplifiers, such as inverting and non-inverting amplifiers. The analysis of these configurations, including gain calculations and frequency response, will be emphasized.

**Unit 3: Advanced Applications of Operational Amplifiers** This unit delves into advanced applications, including integrators, differentiators, and active filters. Students will learn how to design and analyze these circuits for specific applications in signal processing.

**Unit 4: Practical Considerations in Op-Amp Circuits** Focusing on real-world applications, this unit addresses practical issues such as power supply considerations, input/output impedance, and noise. Students will also learn about the limitations of operational amplifiers and how to mitigate these effects in circuit design.

**Unit 5: Specialized Op-Amp Configurations** Students will study specialized configurations such as comparators, oscillators, and voltage followers. This unit emphasizes the unique characteristics and applications of these configurations in various electronic systems.

# DIGITAL SIGNAL PROCESSING

CECN-101 C

**Unit 1: Introduction to Digital Signal Processing** This unit provides an overview of digital signal processing, including the fundamental concepts of signals and systems. Students will explore the differences between analog and digital signals, the sampling theorem, and quantization processes.

**Unit 2: Discrete-Time Signals and Systems** In this unit, students will learn about discrete-time signals, their representation, and the mathematical tools used to analyze them. The focus will be on linear time-invariant (LTI) systems, convolution, and the properties of discrete-time systems.

**Unit 3: Fourier Analysis of Discrete-Time Signals** This unit covers the Fourier analysis of discrete-time signals, including the Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Students will study the Fast Fourier Transform (FFT) algorithm and its applications in signal analysis.

**Unit 4: Z-Transform and Its Applications** Students will explore the Z-transform as a tool for analyzing discrete-time systems. This unit includes the properties of the Z-transform, inverse Z-transform, and applications in system stability and frequency response analysis.

**Unit 5: Digital Filter Design** This unit focuses on the design and implementation of digital filters, including both Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters. Students will learn about filter specifications, design techniques, and performance evaluation.

# EMBEDDED SYSTEMS

## CECN-101 D

### **Unit 1: Introduction to Embedded Systems**

Overview of embedded systems, characteristics, and applications. Comparison with general-purpose computing systems. Components of embedded systems including hardware and software.

### **Unit 2: Microcontrollers and Microprocessors**

Architecture and organization of microcontrollers and microprocessors. Instruction sets and addressing modes. Programming concepts and development tools for embedded applications.

### **Unit 3: Embedded System Design**

Design methodologies for embedded systems. System design life cycle. Hardware/software co-design and integration. Real-time operating systems (RTOS) and their role in embedded systems.

### **Unit 4: Interfacing and Communication**

Techniques for interfacing various peripherals (sensors, actuators, displays). Communication protocols (I2C, SPI, UART, CAN) and their applications in embedded systems.

### **Unit 5: Embedded Software Development**

Software development life cycle in embedded systems. Programming languages commonly used (C, C++, assembly). Tools for debugging and testing embedded software.

## CESN-101      Engineering Chemistry and Environmental Studies

	Cr.	L	T
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### Unit 1: Fuels:

Introduction, Classification of fuels, Calorific value, Bomb Calorimeter, Theoretical Calculation of Calorific value of a fuel, Coal, Classification of coal by rank, Analysis of coal, Biomass, Biogas, Biodiesel: Definition, Types.

### Unit 2 Polymers:

Introduction, Nomenclature of polymers, Functionality, Types of Polymerization, Synthetic Fibres, Ion-exchange resins, Rubbers (Elastomers), Vulcanization of rubber, Synthetic rubbers or elastomers, Application of rubber.

### Unit 3 Water Technology:

Introduction, Hardness of water: Temporary and Permanent hardness; Equivalents of Calcium Carbonate, units of hardness, Disadvantage of hard water, Scale and sludge formation in boilers and their disadvantage, Boiler corrosion, Caustic embrittlement, Priming and foaming, water softening methods: Permutitprocess, De-ionization process.

### Unit 4:Environmental pollution and its impact:

Environment and Atmosphere; Kinds of pollution; Air pollution: Greenhouse effect, Acid rains and global warming; Noise pollution; Water and Solid waste pollution: Industrial effluents and wastes, Ground water pollution, Marine pollution, Lead pollution, Fluoride pollution; Radiation and chemical toxicology.

### Unit 5 Pollution Cleanup:

Prevention and control of air pollution: Source correction, Collection of pollutants, Cooling, Treatment; Stabilisation of the ecosystem, Reutilisation and Recycling of waste, Removal of Pollutants; Solid waste management: Collection, Disposal, etc.; Bioremediation: Introduction, Phytoremediation.

### Reference Books:

- Jain, M. and Jain, P.C., Engineering Chemistry, 17<sup>th</sup> edition, DhanpatRai Publishing Company (P) Ltd., New Delhi.
- Kuriacose and Rajaram, Chemistry in Engineering and Technology, TMH, Delhi.
- Sharma, P.D., Ecology and Environment, 11<sup>th</sup> edition, Rastogi Publications, Meerut.
- Gupta, K.M. Environmental Studies, Umesh Publications, Delhi.
- Gopalan, R.R., Environmental Studies: from crisis to cure, Oxford University Press, New Delhi.

# Introduction to Engineering Chemistry

## CESN-101 A

### **Unit 1: Basic Concepts of Chemistry**

This unit covers fundamental concepts, including atomic structure, periodic properties, and chemical bonding. It introduces molecular geometry and the principles of stoichiometry, along with discussions on states of matter and thermodynamics relevant to chemical processes.

### **Unit 2: Chemical Thermodynamics**

Focuses on the laws of thermodynamics, concepts of enthalpy, entropy, and Gibbs free energy. The unit explores the principles of chemical equilibria, including equilibrium constants and Le Chatelier's principle, as well as applications in engineering processes.

### **Unit 3: Kinetics and Reaction Mechanisms**

This unit examines the rates of chemical reactions, factors affecting reaction rates, and the Arrhenius equation. It also delves into reaction mechanisms, including elementary reactions and complex reaction pathways, with applications to industrial processes.

### **Unit 4: Electrochemistry**

Covers the principles of electrochemical cells, standard electrode potentials, and Nernst equation. The unit explores applications of electrochemistry in batteries, fuel cells, and corrosion, along with methods of corrosion prevention and control.

### **Unit 5: Materials Chemistry**

Focuses on the chemistry of materials, including metals, polymers, ceramics, and composites. It discusses properties, synthesis, and applications of various materials, as well as the principles of material selection in engineering applications.

# CHEMICAL THERMODYNAMICS

## CESN-101 B

**Unit 1: Introduction to Thermodynamics** Overview of thermodynamic principles; definitions of systems, surroundings, and the universe; types of systems (open, closed, isolated); thermodynamic processes and state functions.

**Unit 2: Laws of Thermodynamics** First law of thermodynamics: internal energy, work, and heat; applications of the first law; enthalpy and its significance. Second law of thermodynamics: concepts of spontaneity and equilibrium; Carnot cycle; efficiency of heat engines; introduction to entropy.

**Unit 3: Thermodynamic Properties and State Functions** Extensive and intensive properties; thermodynamic potentials: Gibbs free energy and Helmholtz free energy; relationships between different thermodynamic properties; Maxwell's relations.

**Unit 4: Phase Equilibria and Phase Diagrams** Concepts of phase, phase transitions, and phase equilibrium; Clausius-Clapeyron equation; phase diagrams for pure substances and binary mixtures; applications of phase rule.

**Unit 5: Chemical Reactions and Thermodynamics** Gibbs free energy change and spontaneity of reactions; standard state and standard enthalpy of formation; Hess's law; calculation of equilibrium constants and their relation to Gibbs free energy.



# **MATERIALS SCIENCE AND ENGINEERING**

## **CESN-101 C**

### **Unit 1: Introduction to Materials Science**

Overview of materials science and engineering. Classification of materials: metals, ceramics, polymers, and composites. The importance of materials in engineering applications. Structure-property relationships and the role of atomic structure in material behavior.

### **Unit 2: Atomic Structure and Bonding**

Atomic models and crystal structures. Types of bonding: ionic, covalent, metallic, and van der Waals. Crystallography basics, including unit cells, lattice parameters, and Miller indices. Defects in solids and their effects on material properties.

### **Unit 3: Thermodynamics of Materials**

Fundamental thermodynamic principles as applied to materials. Phase diagrams and phase transformations. Gibbs free energy and its significance in phase stability. Concepts of equilibrium and non-equilibrium phase transformations.

### **Unit 4: Mechanical Properties of Materials**

Stress-strain relationships and mechanical testing methods. Elastic and plastic deformation. Hardness, toughness, ductility, and fatigue. Overview of failure mechanisms and the role of microstructure in mechanical properties.

### **Unit 5: Materials Processing and Fabrication**

Overview of various processing techniques for different materials. Techniques such as casting, forging, welding, and additive manufacturing. The influence of processing on microstructure and properties. Quality control and material selection in fabrication.

# GREEN CHEMISTRY AND SUSTAINABLE PRACTICES

## CESN-101 D

### **Unit 1: Introduction to Green Chemistry**

This unit provides an introduction to the principles and concepts of green chemistry. It covers the basic philosophy of green chemistry, emphasizing the design of chemical processes that are environmentally benign, economically viable, and energy-efficient. The unit also explores the role of green chemistry in sustainability and its application to the reduction of hazardous substances in chemical products and processes.

### **Unit 2: Green Chemistry Principles and Practices**

In this unit, the core principles of green chemistry are examined in detail, including the design of safer chemicals, the use of renewable resources, and the minimization of waste. Topics such as atom economy, the reduction of toxicity, and energy efficiency in chemical reactions are discussed. Practical examples and case studies illustrating the application of these principles in industrial and laboratory settings are also included.

### **Unit 3: Sustainable Materials and Alternative Energy Sources**

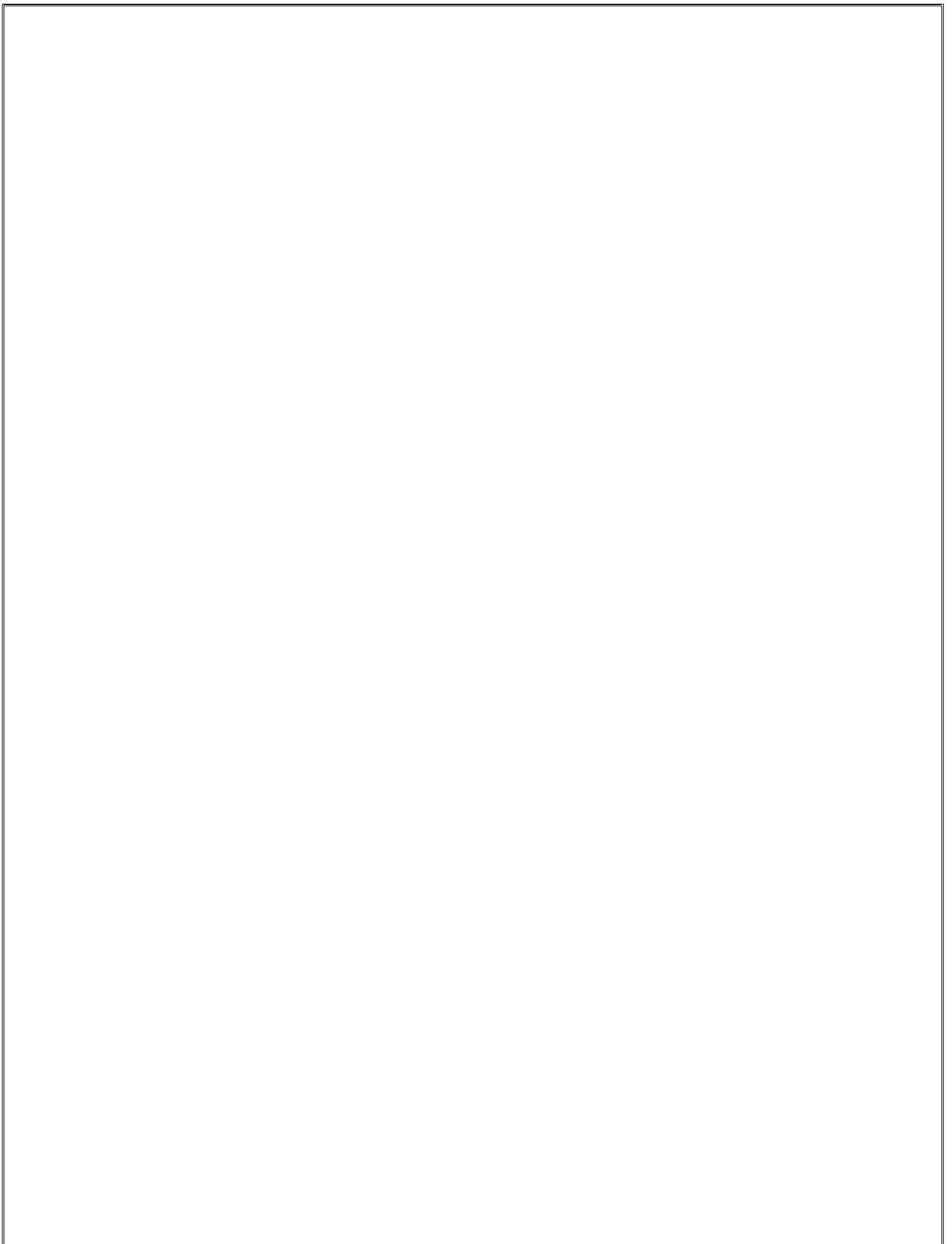
This unit explores the use of sustainable materials in green chemistry and their role in reducing environmental impact. It covers the development and use of biodegradable materials, renewable raw materials, and the role of green chemistry in waste minimization and recycling. Additionally, the unit investigates alternative energy sources, including solar, wind, and biofuels, and their integration into sustainable chemical practices.

### **Unit 4: Environmental Impact of Chemical Processes**

This unit focuses on assessing the environmental impact of chemical processes. Topics include life-cycle analysis, carbon footprint, green solvents, and the concept of "green engineering." The unit also discusses the importance of reducing the environmental footprint of chemical processes through cleaner production technologies, waste treatment methods, and pollution prevention techniques.

### **Unit 5: Green Synthesis and Industrial Applications**

This unit covers the principles and methods of green synthesis, focusing on the design of chemical reactions that minimize environmental and economic costs. Topics include catalytic processes, solvent-free reactions, biocatalysis, and the use of renewable feedstocks in industrial processes. The unit also explores real-world applications in pharmaceuticals, agrochemicals, and materials production, illustrating the integration of green chemistry into industrial practices.



## Presentation and communication skills

CPCN-101

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			0

### Unit – I

**Essential Grammar:** Basic Clause/Sentence Patterns, Correct Usage of Different Word-Classes, Articles, Tense, Syntactic Concord, Prepositions, Transformation, Synthesis, Graded Syntactic Structures.

### Unit – II

**Essential Vocabulary:** Basic words, Synonyms, Antonyms, Homophones, One-Word Substitutes, Idioms and Phrases, Word-formation, Technical Vocabulary.

**Linguistic Skills:** Listening, Speaking, Reading, and Writing (Activities to be Selected by the Teacher).

### Unit – III

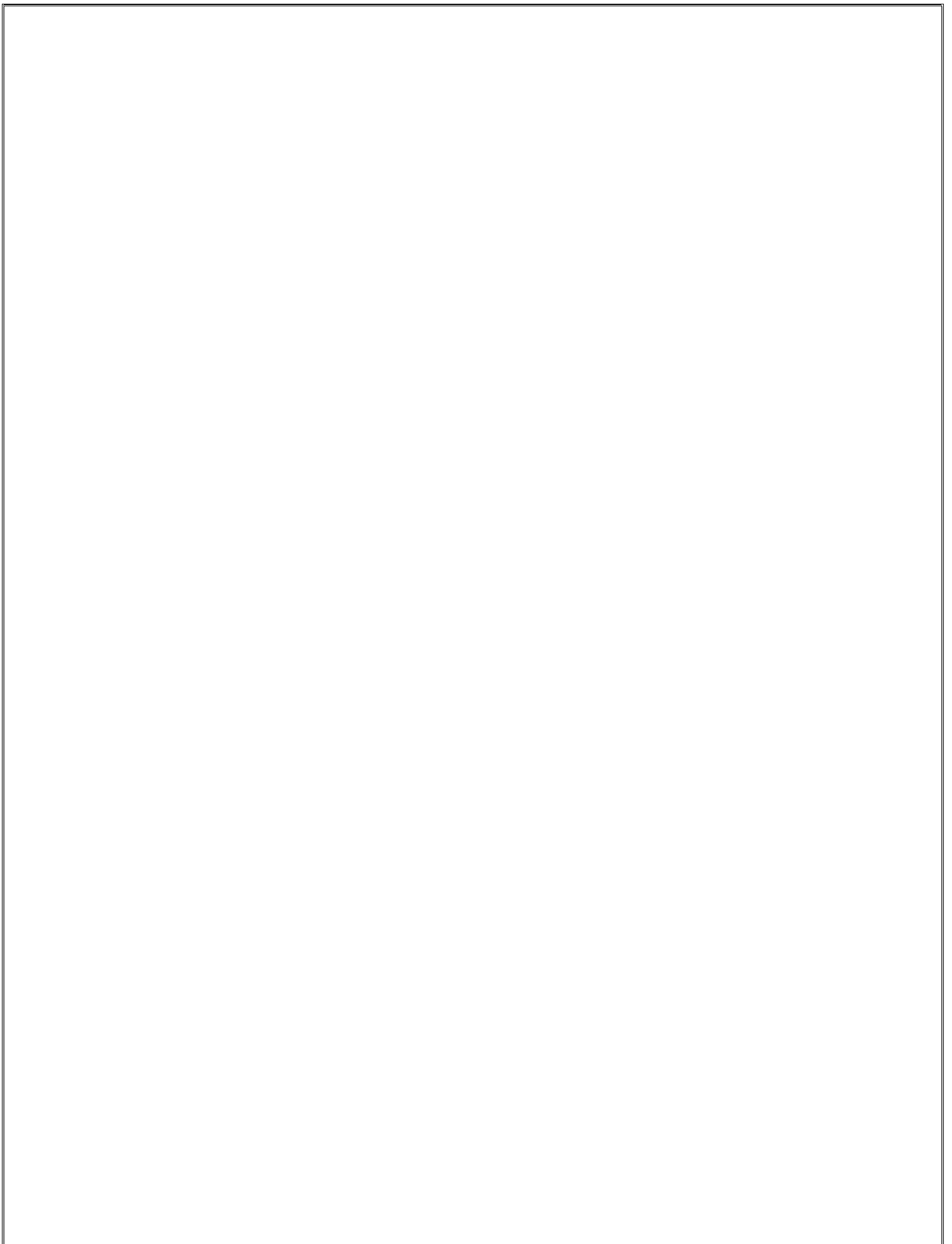
**Language Through Literature:** Non-Fiction &/or Fiction, Verse, and Play  
Bacon's *Essays* (Selection) and/or Lamb's *Tales from Shakespeare* (Selection)  
Keats' *The Eve of St Agnes*  
Tagore's *Chitra*

### Unit – IV

**Speaking Professionally:** Job Interviews, Group-Discussions, Public Speaking, Argumentative Skills, Role-Plays, Presentation Skill.

### Reference Books :

1. Hornby, A.S. *Guide to Patterns & Usage in English*. 2<sup>nd</sup>ed. New Delhi: Oxford University Press, 2002. Print.
2. Swan, Michael. *Practical English Usage*. 3<sup>rd</sup>ed. New Delhi: Oxford University Press, 2006. Print.
3. Carter, R. and M. McCarthy. *Cambridge Grammar of English*. New Delhi: Cambridge University Press, 2006. CD-ROM, Print.
4. McCarthy, M. and F. O'Dell. *English Vocabulary in Use*. New Delhi: Cambridge University Press, 2006. Print.
5. Kumar, E. Suresh and P. Sreehari. *A Handbook for English Language Laboratories*. New Delhi: Cambridge University Press, 2007. Print.



# INTRODUCTION TO COMMUNICATION SKILLS

## CPCN-101 A

### **Unit 1: Foundations of Communication**

This unit covers the fundamental concepts of communication, including the definition, importance, and types of communication. Students will explore verbal and non-verbal communication, the communication process, and barriers to effective communication.

### **Unit 2: Interpersonal Communication**

Focusing on one-on-one interactions, this unit emphasizes the skills needed for effective interpersonal communication. Topics include active listening, empathy, and building rapport. Students will practice techniques to enhance personal interactions in various contexts.

### **Unit 3: Group Communication**

In this unit, students will learn about communication dynamics within groups. It covers group roles, decision-making processes, and conflict resolution strategies. The importance of collaboration and teamwork in achieving common goals will also be highlighted.

### **Unit 4: Public Speaking**

This unit introduces the principles of public speaking. Students will learn how to prepare, structure, and deliver effective presentations. Techniques for engaging an audience, managing anxiety, and using visual aids will also be discussed.

### **Unit 5: Written Communication**

Focusing on written forms of communication, this unit covers various types of writing, including emails, reports, and proposals. Emphasis will be placed on clarity, conciseness, and appropriate tone. Students will practice drafting and revising written documents.

# INTERPERSONAL COMMUNICATION

## CPCN-101 B

### **Unit 1: Introduction to Interpersonal Communication**

This unit covers the foundational concepts of interpersonal communication, including definitions, significance, and the role it plays in personal and professional contexts. Students will explore the basic elements of communication, such as sender, message, channel, receiver, feedback, and noise.

### **Unit 2: Theories and Models of Communication**

This unit delves into various theories and models that explain interpersonal communication processes. Students will examine classical and contemporary theories, including the Shannon-Weaver model, Schramm's model, and Barnlund's transactional model, discussing their relevance and application in real-world scenarios.

### **Unit 3: Verbal and Nonverbal Communication**

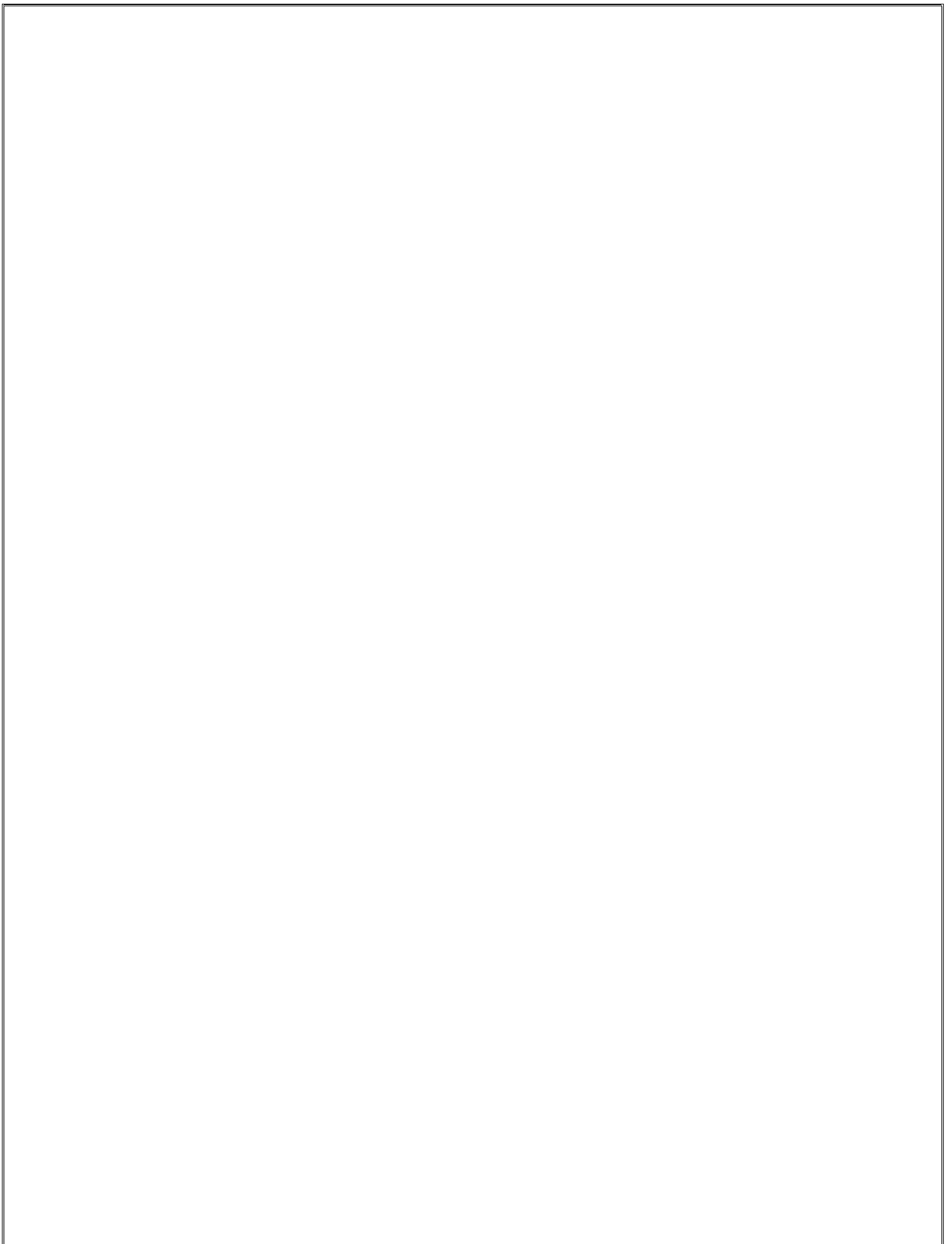
In this unit, students will explore the intricacies of verbal communication, including language use, tone, and context. The unit will also emphasize nonverbal communication, covering body language, facial expressions, eye contact, and other nonverbal cues, and how these elements influence interactions.

### **Unit 4: Listening Skills**

This unit focuses on the importance of listening as a key component of effective interpersonal communication. Students will learn different types of listening, barriers to effective listening, and strategies to enhance their listening skills, fostering better understanding and rapport in conversations.

### **Unit 5: Interpersonal Relationships**

Students will examine the dynamics of interpersonal relationships, including stages of relationship development, maintenance, and dissolution. The unit will explore concepts such as trust, intimacy, and conflict, emphasizing the role of communication in shaping and sustaining relationships.





# TECHNICAL WRITING

## CPCN-101 C

### **Unit 1: Introduction to Technical Writing**

This unit introduces the fundamentals of technical writing, focusing on its definition, purpose, and significance in various fields. Students will explore the characteristics of effective technical documents and the differences between technical writing and other forms of writing. Emphasis will be placed on understanding the audience and tailoring content to meet their needs.

### **Unit 2: Research and Information Gathering**

In this unit, students will learn methods for conducting effective research and gathering information relevant to their writing projects. Techniques for identifying credible sources, evaluating information, and organizing research will be covered. Students will practice synthesizing data and extracting key points to support their writing.

### **Unit 3: Document Design and Formatting**

This unit focuses on the principles of document design, including layout, typography, and visual elements. Students will learn how to create visually appealing and user-friendly documents. Topics such as the use of headings, lists, tables, and graphics will be discussed to enhance readability and comprehension.

### **Unit 4: Writing for Different Audiences**

Here, students will explore the importance of audience analysis in technical writing. They will learn how to adjust tone, style, and complexity based on the target audience, whether they are experts in the field or laypersons. Practical exercises will help students develop strategies for effective communication.

### **Unit 5: Technical Reports and Proposals**

This unit covers the structure and components of technical reports and proposals. Students will learn how to write clear and concise reports, including executive summaries, methodology, findings, and recommendations. The unit will also address the essential elements of proposals, focusing on persuasive writing techniques.

# COMMUNICATION IN DIGITAL MEDIA

## CPCN-101 D

### **Unit 1: Introduction to Digital Media and Communication**

This unit introduces the concept of digital media, exploring its evolution and impact on communication in the modern world. It covers the different forms of digital media, including social media, blogs, podcasts, websites, and online video platforms. The unit also discusses the role of digital communication in shaping public discourse, personal interactions, and professional practices.

### **Unit 2: Digital Communication Tools and Platforms**

This unit focuses on the various digital tools and platforms used for communication in the digital age. It covers the functionality, features, and best practices for using social media platforms, messaging apps, email, and collaborative tools. The unit also highlights emerging digital communication technologies such as virtual reality, augmented reality, and artificial intelligence in communication.

### **Unit 3: Content Creation and Digital Storytelling**

In this unit, students learn about creating engaging content for digital media, including text, images, audio, and video. Topics include writing for the web, designing multimedia presentations, and the principles of digital storytelling. The unit explores how to craft compelling narratives that resonate with online audiences and effectively convey messages across different digital platforms.

### **Unit 4: Digital Media Ethics and Online Behavior**

This unit addresses the ethical considerations of digital communication. It covers topics such as privacy, intellectual property, digital identity, and the challenges of misinformation and online security. The unit also discusses responsible online behavior, including the impact of digital media on mental health, cyberbullying, and the role of digital media in shaping societal norms and values.

### **Unit 5: Digital Media Strategy and Analytics**

This unit focuses on the strategic use of digital media for communication purposes. It covers the planning and execution of digital media campaigns, with an emphasis on targeting specific audiences and achieving measurable outcomes. The unit also explores digital media analytics, including data collection, interpretation, and the use of analytics tools to evaluate the effectiveness of digital communication strategies.

## ENGG. WORKSHOP PRACTICE

**CMEN-151**

**Cr. L T P**

**1 0 0 2**

### **Sr No. Experiment**

1. To obtain required diameters (steps) on a cylindrical work piece with the given lengths.
2. To perform tapering and knurling operation on a cylindrical work piece of given length.
3. To make a single v-butt joint, using the given mild steel pieces by arc welding.
4. To make a double lap joint, using the given mild steel pieces by arc welding.
5. To make a T-lap joint from the given reaper of size 50 x 35 x 250 mm.
6. To make a mortise and tenon joint from the given reaper of size 50 x 35 x 250 mm.
7. To file the given Mild Steel piece in to a square shape of 48 mm side from original dimension of 50 mm.
8. To make V- fit from the given two MS plates after drilling and Tapping operations.
9. To prepare a sheet metal tray using galvanized sheet.
10. To prepare lap and single cover butt joints using sheet and rivets.

**CMEM 153**

**ENGG. GRAPHICS LAB.**

Cr. L T P

1 0 02

1. Draw Basic Geometric Entities.
2. Draw complicated Drawings using basic geometric entities.
3. Drawing using Trim operation
4. Drawing using Pattern operation
5. Drawing using Chamfer and Fillet operation
6. Draw 3D model of a Table
7. Draw 3D model of a Chair

## COMMUNICATION LAB.

**CPCN-151**

**C-L-T-P**

**1- 0- 0-2**

1. Phonemes of English: Practising English Sounds
2. Stress in Speech: Practising the Accentual Patterns in English
3. Rhythm in Speech: Practising Strong and Weak-forms of Words
4. Intonation in Speech: Practising Patterns of Tones in English
5. Conversational Skills: Situational Dialogues, Telephonic Conversations
6. Reading Comprehension: Reading Newspapers/Magazines or Online/Offline Texts
7. Listening Comprehension: Comprehending Online/Offline Audio or Video

### **Reference Books :**

1. Sethi, J. and P.V. Dhamija. *A Course in Phonetics & Spoken English*. 2<sup>nd</sup>ed. New Delhi: Prentice Hall of India, 2008. Print
2. Roach, Peter. *English Phonetics & Phonology: A Practical Course*. 4<sup>th</sup>ed. New Delhi: Cambridge University Press, 2009. CD-ROM, Print
3. Hornby, A.S. *Oxford Advanced Learner's Dictionary*. 8<sup>th</sup>ed. New Delhi: Oxford University Press, 2010. CD-ROM, Print.
4. Dutt, P.K., G. Rajeevan and C.L.N. Prakash. *A Course in Communication Skills*. New Delhi: Cambridge University Press, 2008. CD-ROM, Print.
5. Kumar, E. Suresh and P. Sreehari. *A Handbook for English Language Laboratories*. New Delhi: Cambridge University Press, 2007. Print.
6. Sethi, J., K. Sadanand and D.V. Jindal. *A Practical Course in English Pronunciation*. New Delhi: Prentice Hall of India, 2004. CD-ROM, Print.

## **INTERPERSONAL COMMUNICATION**

### **CPCN-151 B**

1. Build comfort among participants through icebreaker games.
2. Practice clarity and expression in role-playing scenarios.
3. Engage in group discussions focusing on articulation and tone.
4. Develop awareness of non-verbal cues with charades.
5. Interpret body language in observational exercises using videos.
6. Conduct paired listening exercises with summarization.
7. Participate in listening circles to practice attentive listening.
8. Role-play emotional scenarios to discuss appropriate responses.
9. Reflect on personal emotional triggers and management techniques.
10. Simulate conflict scenarios to practice negotiation skills.
11. Analyze real-life conflicts and brainstorm resolutions in groups.
12. Engage in trust-building exercises, such as trust falls.
13. Practice introducing oneself in networking simulations.
14. Discuss cultural norms and their impact on communication.
15. Analyze case studies of communication breakdowns in diverse settings.
16. Provide constructive feedback in practice sessions.
17. Reflect on personal experiences with feedback through journaling.
18. Collaborate on group projects that require effective communication.
19. Simulate mock interviews or networking events for professional practice

## **TECHNICAL WRITING**

### **CPCN-151 C**

1. Understand the purpose and audience of technical documents.
2. Analyze examples of technical writing for clarity and structure.
3. Practice writing clear and concise instructions for a specific task.
4. Create a user manual for a hypothetical product.
5. Develop an informative report based on research findings.
6. Collaborate in groups to write and edit a project proposal.
7. Use visual aids (charts, graphs, diagrams) to enhance written content.
8. Conduct peer reviews of technical documents for feedback.
9. Practice writing executive summaries for longer reports.
10. Create and present a technical presentation based on written content.
11. Familiarize with citation styles and ethical considerations in technical writing.
12. Learn to format documents for consistency and professionalism.

13. Write a press release for a new product or service launch.
14. Create a troubleshooting guide for common technical issues.
15. Develop a technical specification document for a project.
16. Simulate real-world scenarios to practice writing under deadlines.
17. Engage in exercises on adapting content for different audiences and formats.

## **COMMUNICATION IN DIGITAL MEDIA**

### **CPCN-151 D**

1. Explore the role of digital media in modern communication.
2. Analyze different digital platforms and their unique communication styles.
3. Practice crafting effective messages for various social media channels.
4. Engage in discussions about digital etiquette and professionalism online.
5. Create and edit multimedia content (images, videos, infographics).
6. Experiment with storytelling techniques using digital formats.
7. Conduct a case study on successful digital communication campaigns.
8. Simulate crisis communication strategies using digital platforms.
9. Develop a personal brand strategy for online presence.
10. Practice writing clear and engaging blog posts or articles.
11. Analyze audience engagement metrics for digital content.
12. Create a podcast episode or audio content on a relevant topic.
13. Collaborate on a group project to develop a digital marketing plan.
14. Learn about SEO best practices and apply them to content creation.
15. Explore tools for visual communication (e.g., Canva, Adobe Spark).
16. Conduct peer reviews of digital content for clarity and impact.
17. Reflect on the challenges and opportunities of digital communication.

## MATHEMATICS-II

### CMAM-102

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**Unit-I** **10**

**Integral Calculus:** Double and triple integrals, Change of order of integration, Change of variables; Gamma, Beta functions, Dirichlet's integral; Applications (Evaluation of surface area, volume, centre of gravity, moment of inertia).

**Unit-II** **08**

**Vector Calculus:** Differentiation of vectors; Gradient, Divergence, Curl and their physical meaning; Differential operators and their identities; Line and surface integrals; Green's Theorem in a plane; Gauss's Divergence theorem and Stokes's theorem and their applications.

**Unit-III** **06**

**Fourier Series & Fourier Transform:** Trigonometric Fourier series, Half range series, Harmonic analysis; Fourier Transform: Definition, Fourier sine and cosine transforms, Fourier integral formula and applications.

**Unit-IV** **10**

**Laplace Transform:** Definition, Shifting theorems, Transform of derivatives, Differentiation and integration of transforms, Heaviside unit step function and Dirac delta function; Solution of ordinary differential equations in problems of mechanics, Electric circuits and bending of beams using Laplace transform.

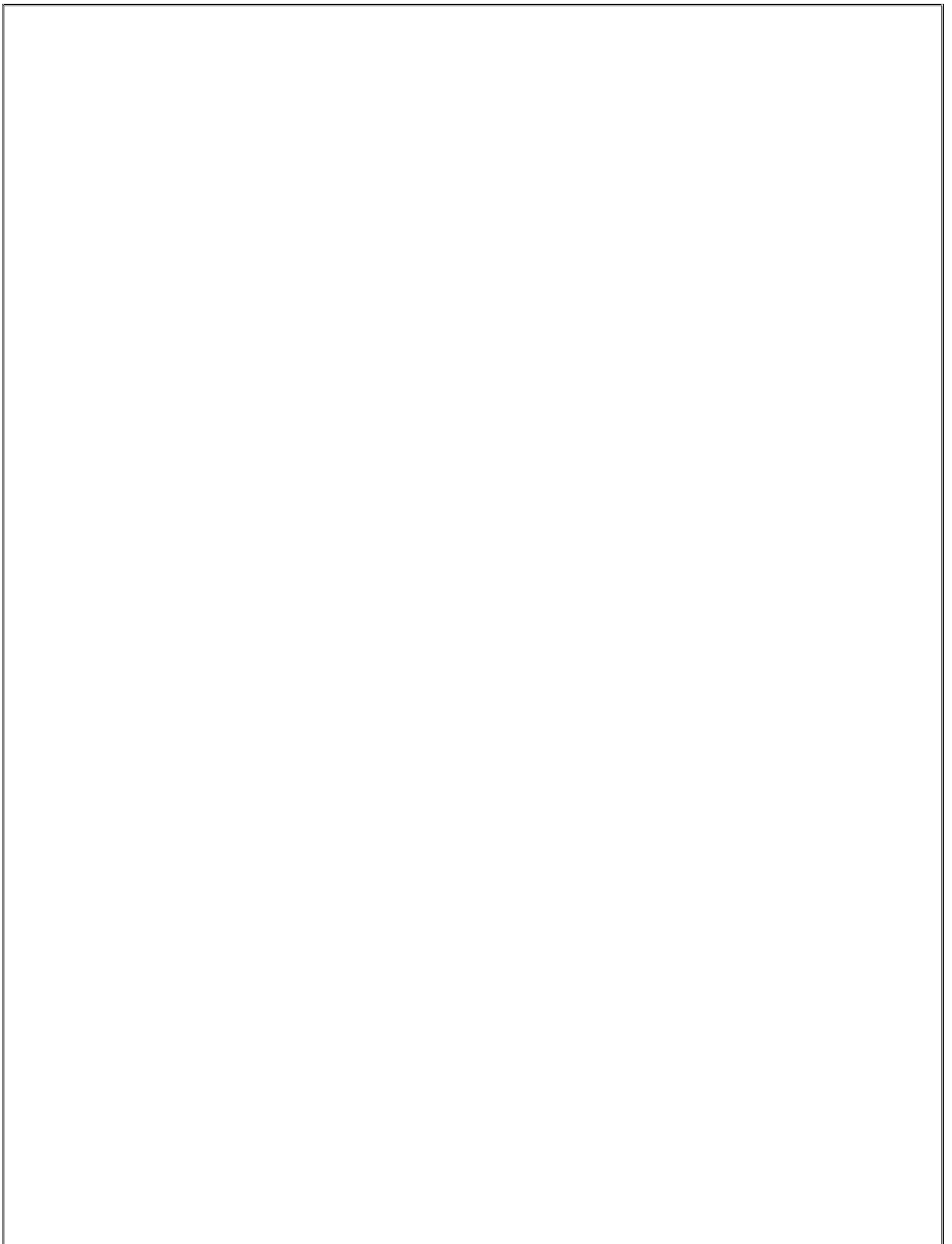
**Unit-V** **06**

**Z-Transform:** Definition of Z-transform of elementary functions; Shifting theorems, Convolution theorem, Initial and Final value theorems; Application to solution of difference equations.

**Reference Books :**

1. Thomas, G. and R.L. Finney. *Calculus and Analytical Geometry*. 6<sup>th</sup> Edition. Addison Wesley/Narosa, 1998.
2. Grewal, B.S. *Engineering Mathematics*. 39<sup>th</sup> Edition. Khanna Publishers, 2005.
3. Prasad, C. *Mathematics for Engineers*. 19<sup>th</sup> Edition. Prasad Mudralaya.





# STATISTICAL TECHNIQUES IN COMPUTER SCIENCE II

## CMAN-102 A

### **Unit 1: Introduction to Advanced Statistical Concepts**

An overview of foundational statistical concepts, including a review of probability distributions, random variables, and key theorems essential for advanced analysis.

### **Unit 2: Inferential Statistics and Hypothesis Testing**

Exploration of statistical inference techniques, focusing on hypothesis testing, confidence intervals, and the application of t-tests, chi-square tests, and z-tests.

### **Unit 3: Regression Analysis**

In-depth study of linear and multiple regression models, examining parameter estimation, diagnostics, and the interpretation of results. Introduction to regularization techniques such as Lasso and Ridge regression.

### **Unit 4: Analysis of Variance (ANOVA)**

Understanding the principles of ANOVA, including one-way and two-way ANOVA, and their applications in comparing multiple groups and experimental designs.

### **Unit 5: Non-Parametric Methods**

Exploration of non-parametric statistical methods, including the Wilcoxon rank-sum test, Kruskal-Wallis test, and their use in situations where traditional assumptions may not hold.

# MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE II

CMAN-102 B

## **Unit 1: Discrete Structures**

An exploration of discrete mathematics, focusing on topics such as sets, relations, functions, and combinatorial structures that form the basis of computer science.

## **Unit 2: Graph Theory**

Study of graph concepts, including types of graphs, graph traversal algorithms, connectivity, and applications of graphs in computer networks and data structures.

## **Unit 3: Logic and Proof Techniques**

Introduction to propositional and predicate logic, methods of proof including direct, indirect, and contradiction proofs, as well as mathematical induction.

## **Unit 4: Number Theory**

Examination of number theory concepts, including divisibility, prime numbers, modular arithmetic, and their applications in cryptography and algorithms.

## **Unit 5: Algebraic Structures**

Overview of algebraic systems such as groups, rings, and fields, emphasizing their relevance to coding theory and error detection.

# APPLIED MATHEMATICS II

CMAN-102 C

## **Unit 1: Differential Equations**

Introduction to ordinary differential equations, methods of solving first and second-order equations, and applications in modeling physical systems.

## **Unit 2: Partial Differential Equations**

Study of partial differential equations, their classification, and techniques for solving heat, wave, and Laplace equations, with real-world applications.

## **Unit 3: Linear Algebra**

Exploration of vector spaces, linear transformations, eigenvalues, eigenvectors, and matrix theory, emphasizing applications in computer graphics and engineering.

## **Unit 4: Numerical Methods**

Introduction to numerical analysis techniques, including numerical solutions of equations, interpolation, numerical integration, and error analysis.

## **Unit 5: Optimization Techniques**

Examination of optimization methods, including linear programming, the simplex method, and applications in resource allocation and decision-making.

## **ADVANCED APPLIED MATHEMATICS II**

### **CMAN-102 D**

#### **Unit 1: Advanced Linear Algebra and Matrix Theory**

This unit covers advanced topics in linear algebra, focusing on the theory and application of vector spaces, linear transformations, and advanced matrix techniques. Topics include spectral theory, the Jordan canonical form, singular value decomposition, and applications to solving large systems of equations. The unit also explores the use of matrix factorizations in computational methods and their importance in numerical analysis.

#### **Unit 2: Advanced Ordinary Differential Equations**

Focusing on higher-order ordinary differential equations, this unit examines methods for solving linear and nonlinear differential equations, including series solutions and special functions. Topics include boundary value problems, Sturm-Liouville theory, and the use of Green's functions in solving linear differential equations. The unit also discusses stability analysis, perturbation methods, and applications to mechanical and electrical systems.

#### **Unit 3: Partial Differential Equations and Fourier Analysis**

This unit introduces advanced techniques for solving partial differential equations, including the method of separation of variables, the Fourier transform, and the Laplace transform. Topics include the wave equation, heat equation, and Poisson's equation, along with their applications in physics and engineering. The unit also covers Fourier series and Fourier transforms, with an emphasis on their role in solving boundary value problems in various coordinate systems.

#### **Unit 4: Complex Analysis and Its Applications**

The focus of this unit is on advanced concepts in complex analysis, including the study of complex functions, analytic functions, and contour integration. Topics include residue theory, conformal mapping, and the use of the Cauchy-Riemann equations. The unit explores applications of complex analysis to potential theory, fluid dynamics, and electromagnetic theory, as well as its role in solving real-world engineering problems.

#### **Unit 5: Probability Theory, Stochastic Processes, and Statistical Modeling**

This unit delves into advanced probability theory, including random variables, expectation, variance, and covariance. It explores the theory of stochastic processes, including Markov chains, Poisson processes, and Brownian motion. The unit also includes an introduction to statistical modeling, hypothesis testing, regression analysis, and the use of probabilistic models in decision theory, reliability analysis, and machine learning.

CPHN-102

ENGINEERING PHYSICS

Cr. L T P

4 3 1 0

**UNIT-I :Relativistic Mechanics**

Inertial and non inertial frames, Galilean transformation equation, Einstein's postulates, Length contraction and time dilation, Lorentz transformation equation, Variation of mass with velocity.

**UNIT-II : Laser and Wave optics**

Spontaneous and stimulated emission of radiation, Einstein's coefficients, construction and working of Ruby, He- Ne lasers. Application of lasers.

Interference of light, Biprism experiment, Polarization, Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, specific rotation, Optical activity.

**-III : Wave Mechanics**

Introduction to wave particle duality, de Broglie matter waves, phase and group velocities, Heisenberg's uncertainty principle and its applications, Wave function characteristics and significance. Particle in one dimensional rigid box.

**UNIT- IV : Superconductivity and Nanomaterials**

Temperature dependence of resistivity, Effect of magnetic field (Meissner effect), isotope effect, London's equation, Temperature dependence of critical field, BCS theory, High temperature superconductors, Application of superconductors.

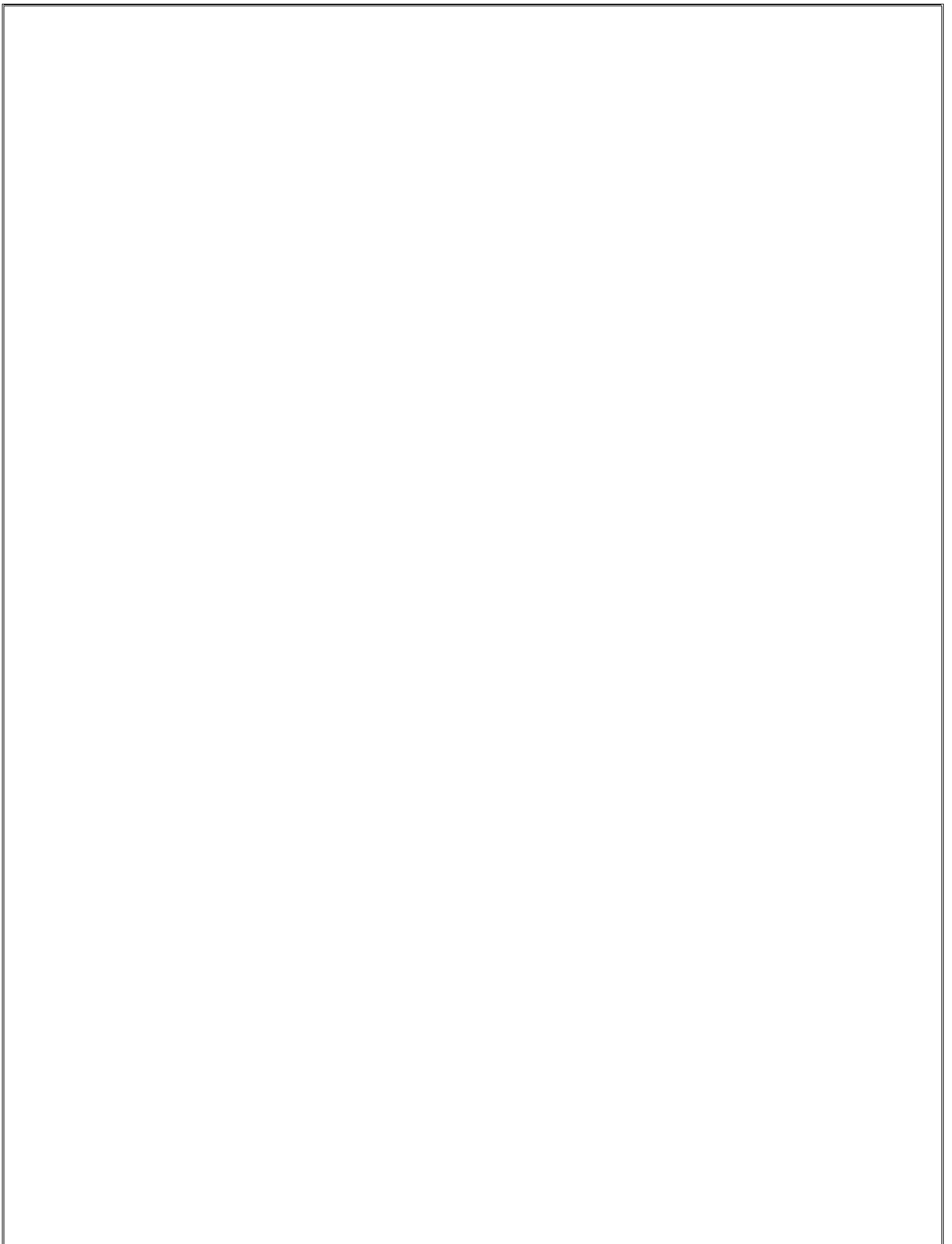
Introduction to nanomaterials,

**UNIT- V : Electromagnetics**

Maxwell's equations (integral and differential forms), Equation of continuity, Transverse nature of EM waves, EM- wave propagation and its propagation in free space, Poynting vector. Statement of Gauss divergence and Stokes theorems and useful vector identities.

**Reference Books :**

- 1.S.K.Gupta 'Engineering Physics-I' KrishnaPrakashan Media (P) Ltd. Meerut.
2. S.K.Gupta 'Engineering Physics-II' KrishnaPrakashan Media (P) Ltd. Meerut.
3. Avandhanulu, M.N. and P.G. Kshirsagar. A Text book of Engineering Physics. S. Chand Publication, New Delhi.
4. Subrahmanyam, N. and Brij Lal. A Textbook of Optics. S. Chand Publication, New Delhi.



# INTRODUCTION TO ENGINEERING PHYSICS

CPHN -102 A

## **Unit 1: Classical Mechanics**

This unit covers the fundamental principles of classical mechanics, including kinematics, dynamics, and the laws of motion. Students will explore concepts such as force, energy, work, and momentum, along with the application of Newton's laws in various physical scenarios.

## **Unit 2: Thermodynamics**

This unit introduces the principles of thermodynamics, focusing on the laws of thermodynamics, heat transfer, and the behavior of gases. Topics include thermal properties of matter, heat engines, refrigeration cycles, and entropy, emphasizing real-world applications in engineering.

## **Unit 3: Waves and Oscillations**

In this unit, students will study the nature of waves and oscillatory motion. Key topics include simple harmonic motion, wave properties, sound waves, and wave interference. The unit also explores practical applications of these concepts in engineering systems and technologies.

## **Unit 4: Optics**

This unit focuses on the behavior of light and its interaction with matter. Topics include reflection, refraction, lenses, optical instruments, and wave optics. Students will learn about the principles behind imaging systems and the application of optical technologies in engineering.

## **Unit 5: Electromagnetism**

This unit introduces the fundamental concepts of electromagnetism, covering electric fields, magnetic fields, and their interactions. Students will explore Maxwell's equations, electromagnetic waves, and applications in electrical engineering, including circuit analysis and electromagnetic devices.



# ELECTROMAGNETISM

CPHN -102 B

## **Unit 1: Introduction to Electromagnetism**

This unit provides an introduction to the fundamental concepts of electromagnetism, focusing on the relationship between electricity and magnetism. Topics include Coulomb's law, electric fields, electric potential, and the concept of the electrostatic force. The unit also introduces the basics of electric charge, electric flux, and Gauss's law, setting the stage for the study of electromagnetism in both static and dynamic contexts.

## **Unit 2: Electrostatics and Electric Fields**

In this unit, the theory of electrostatics is explored in greater detail. The unit covers the behavior of electric fields, electric potential, and their interaction with charged particles. It includes a deeper analysis of Gauss's law, capacitors and dielectric materials, and the concept of energy stored in electric fields.

## **Unit 3: Magnetostatics and Magnetic Fields**

This unit focuses on the study of magnetic fields and their interaction with electric currents. Topics include Biot-Savart law, Ampère's law, magnetic field due to steady currents, and the magnetic properties of materials.

## **Unit 4: Electromagnetic Induction and Maxwell's Equations**

In this unit, electromagnetic induction and its applications are studied in detail. Topics include Faraday's law of induction, Lenz's law, self-induction, and mutual induction. The unit also introduces Maxwell's equations, which describe the behavior of electric and magnetic fields in a unified framework.

## **Unit 5: Electromagnetic Waves and Radiation**

This unit covers the propagation of electromagnetic waves, focusing on wave equations, waveguides, and transmission lines. The unit examines the nature of electromagnetic radiation, including the characteristics of plane waves in free space, energy transfer, and Poynting's theorem.

# **MATERIALS SCIENCE AND ENGINEERING**

CPHN -102 C

## **Unit 1: Introduction to Materials Science**

This unit covers the fundamental concepts of materials science and engineering, including the classification of materials into metals, ceramics, polymers, and composites, as well as an overview of the relationships between structure and properties.

## **Unit 2: Atomic Structure and Bonding**

This unit focuses on the atomic structure of materials, the periodic table, and the various types of atomic bonding such as ionic, covalent, metallic, and van der Waals forces. It explores how these bonding types influence material properties.

## **Unit 3: Crystal Structure and Defects**

In this unit, students learn about different crystal systems, lattice structures, and unit cells, along with concepts of packing efficiency. The unit also examines defects in crystals, including point, line, and surface defects.

## **Unit 4: Mechanical Properties of Materials**

This unit addresses the mechanical properties of materials, including stress, strain, and the methods used for mechanical testing. Topics include elastic and plastic deformation, hardness, toughness, ductility, and brittleness.

## **Unit 5: Phase Diagrams and Phase Transformations**

Students will study phase diagrams, including the lever rule and phase equilibrium. This unit also covers processes such as solidification, diffusion, and phase transformations in solids.

# WAVES AND VIBRATIONS

## CPHN -102 D

### **Unit 1: Introduction to Waves and Vibrations**

This unit covers the basic principles of waves and vibrations, including wave properties like amplitude, frequency, and velocity. It introduces different types of waves—mechanical, electromagnetic, longitudinal, and transverse—and explores wave propagation and superposition.

### **Unit 2: Simple Harmonic Motion (SHM)**

Focusing on SHM, this unit examines oscillatory motion, the mathematical description of SHM, and its applications in systems like mass-spring and pendulum oscillators. It also discusses energy conservation in harmonic motion.

### **Unit 3: Wave Equations and Solutions**

This unit addresses the wave equation, its solutions, and wave behavior. It covers wave propagation, reflection, refraction, diffraction, and interference, along with standing and traveling waves and their normal modes.

### **Unit 4: Forced Oscillations and Resonance**

Exploring forced oscillations, this unit looks at the response of systems to external periodic forces, resonance phenomena, and damping. It also examines real-world applications of resonance in mechanical and electrical systems.

### **Unit 5: Nonlinear Waves and Solitons**

This unit introduces nonlinear wave phenomena, focusing on solitons and their mathematical description. It explores the stability of soliton solutions and their applications in various fields like fluid dynamics and optics.

# COMPUTER FUNDAMENTALS AND PROGRAMMING USING C

CCSN-102

Cr. L T P

4 3 1 0

## Unit-I

**Computer System:** Basics of computer systems, history, types, capability and limitations of computer systems, Concept of assembler, compiler, interpreter, loader and linker. Generation of Computers.

**Hardware Organization:** Anatomy of a digital computer, CPU, Memory, processor, I/O Devices. **Memory Units:** Hierarchy, primary memory, cache; Auxiliary storage

## Unit-II

**Number System:** Introduction to Number Systems-Types-Decimal, Binary, Octal, Hexadecimal; Conversion from one number system to other; Binary arithmetic operations; Representation of Negative Numbers.

**Computer Fundamentals-** Introduction of Operating system, Basics of computer networks, Introduction of software.

**Idea of Algorithm:** Representation of Algorithm, Flowchart, From algorithms to programs, source code.

## Unit-III

**Programming Basics:** Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Storage classes.

**Arithmetic expressions and precedence :** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

## Unit-IV

**Conditional Branching:** Applying if and switch statements, nesting if and else, use of break and default with switch.

**Iteration and loops:** use of while, do while and for loops.

**Functions:** Introduction, types of functions, Defining a Function, Function Declarations, Calling a Function , Passing parameters to functions, call by value, call by reference, recursive functions.

## Unit-V

**Arrays:** Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

**Pointers:** Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free)

**File handling:** File I/O functions

**TEXT & REFERENCE BOOKS:**

1. Fundamentals of computers and programming with C, A. K. Sharma, Dhanpat Rai Publications, Daryaganj New Delhi
2. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988, PHI.
3. C Programming – A modern approach by K.N. King, 1996, WW Norton & Co.
4. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998, TMH

# Basic Electrical Engineering

**CEEN-102**

**Cr. L T P**

**4 3 1 0**

## **Unit-I**

**Network Fundamentals:** Types of sources and elements. Kirchoff's laws, Mesh and node analysis of D.C. networks; Transient analysis: RL & RC circuits; Network theorems: Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power theorem, Star-delta transformation.

## **Unit-II**

**A.C. Fundamentals:** Concept of phasor, impedance and admittance mesh and node analysis of single phase ac networks; Network theorems in AC networks, Active and reactive power in AC circuits, Resonance in series AC circuits; Introduction to 3-phase A.C. Circuits, Analysis of 3-phase balanced star-delta circuits, Power in 3-phase circuits.

## **Unit-III**

**Magnetic Circuit Concepts:** Analogy with electrical circuits, Calculation for series, parallel and series parallel magnetic circuits, Eddy current and Hysteresis losses, Single Phase Transformer: Basic constructional features and operating principle.

## **Unit-IV**

**D.C. Machines:** Principle of operation, Basic constructional features, Emf and torques equation, Armature reaction, Types of D.C. motors starting and speed control of D.C. motors, Machines: Principle of operation of single phase motor and methods of starting of single phase motor, Three phase induction motor operating principle, Constructional features, Synchronous generator, Basic principle of operation, Emf equation, Constructional features.

## **Unit-V**

**Measurement of Electrical Quantities:** Measurement of voltage current power and energy moving iron instruments. Measurement of 3 phase power, Accuracy class of meters.

## **Reference Books :**

1. Kothari, D.P. and I.J. Nagrath. *Theory and Problems of Basic Electrical Engineering*. Prentice Hall of India, New Delhi 2000.
2. Mittle, V.N. and A. Mittle *Basic Electrical Engineering*. Tata McGraw Hill, New Delhi 2006.

# **INTRODUCTION TO ELECTRICAL ENGINEERING**

**CEEN-102 A**

## **Unit 1: Fundamentals of Electrical Engineering**

This unit covers the basic concepts of electrical engineering, including definitions of voltage, current, power, and energy. It introduces Ohm's Law, Kirchhoff's Laws, and the principles of series and parallel circuits. Students will learn about electrical units and measurements, circuit components, and basic electrical safety.

## **Unit 2: Circuit Analysis Techniques**

Students will explore various methods for analyzing electrical circuits, including mesh and nodal analysis. This unit also introduces theorems such as Thevenin's and Norton's theorems, and the concept of superposition in circuit analysis. Practical applications and problem-solving techniques will be emphasized.

## **Unit 3: AC and DC Circuit Theory**

This unit focuses on the differences between alternating current (AC) and direct current (DC) circuits. It includes the analysis of sinusoidal waveforms, phasors, and complex impedance. Students will also learn about AC power calculations, reactive components, and power factor correction.

## **Unit 4: Electrical Machines**

An overview of various electrical machines is provided in this unit, including transformers, DC motors, and AC motors. The principles of operation, efficiency, and applications of these machines will be discussed, along with introductory concepts of electromagnetic induction and magnetic circuits.

## **Unit 5: Control Systems**

This unit introduces the fundamentals of control systems, covering open-loop and closed-loop systems. Students will learn about system stability, transfer functions, and block diagrams. The unit will also touch on feedback control and its applications in electrical engineering.

# **ELECTRICAL MACHINES**

## **CEEN-102 B**

### **Unit 1: Introduction to Waves and Vibrations**

This unit covers the basic principles of waves and vibrations, including wave properties like amplitude, frequency, and velocity. It introduces different types of waves—mechanical, electromagnetic, longitudinal, and transverse—and explores wave propagation and superposition.

### **Unit 2: Simple Harmonic Motion (SHM)**

Focusing on SHM, this unit examines oscillatory motion, the mathematical description of SHM, and its applications in systems like mass-spring and pendulum oscillators. It also discusses energy conservation in harmonic motion.

### **Unit 3: Wave Equations and Solutions**

This unit addresses the wave equation, its solutions, and wave behavior. It covers wave propagation, reflection, refraction, diffraction, and interference, along with standing and traveling waves and their normal modes.

### **Unit 4: Forced Oscillations and Resonance**

Exploring forced oscillations, this unit looks at the response of systems to external periodic forces, resonance phenomena, and damping. It also examines real-world applications of resonance in mechanical and electrical systems.

### **Unit 5: Nonlinear Waves and Solitons**

This unit introduces nonlinear wave phenomena, focusing on solitons and their mathematical description. It explores the stability of soliton solutions and their applications in various fields like fluid dynamics and optics.



# **ELECTRICAL MEASUREMENTS AND INSTRUMENTATION**

**CEEN-102 C**

## **Unit 1: Introduction to Electrical Measurements**

This unit introduces the basic principles of electrical measurements, focusing on the need for accurate measurements in electrical systems. It covers the classification of electrical quantities, units of measurement, and the principles behind various types of electrical measuring instruments.

## **Unit 2: Measuring Instruments for Voltage, Current, and Resistance**

This unit explores the working principles and applications of instruments used to measure voltage, current, and resistance. It covers analog and digital voltmeters, ammeters, and ohmmeters, as well as their calibration, accuracy, and limitations in electrical circuits.

## **Unit 3: Power and Energy Measurement**

The unit focuses on the measurement of electrical power and energy. Topics include the operation of wattmeters, energy meters, and the measurement of both active and reactive power in AC circuits. It also discusses the methods for measuring power in three-phase systems.

## **Unit 4: Instrumentation for Frequency, Phase, and Power Factor Measurement**

This unit covers instruments used for measuring frequency, phase angle, and power factor in AC circuits. It includes the working principles and applications of frequency counters, phase meters, and power factor meters, along with methods for ensuring their accuracy.

## **Unit 5: Electrical Instrumentation in Industrial Applications**

The unit discusses advanced electrical instrumentation systems used in industrial settings, including transducers, data acquisition systems, and process control instrumentation. It explores the use of instruments for monitoring and controlling parameters such as temperature, pressure, flow, and level in industrial applications.

# **TRANSMISSION AND DISTRIBUTION SYSTEMS**

## **CEEN-102 D**

### **Unit 1: Introduction to Power Transmission and Distribution**

This unit introduces the basic concepts of power transmission and distribution systems, including their importance in delivering electrical power from generation sources to consumers. It covers the basic structure of transmission and distribution networks, the components involved, and the role of substations in power systems.

### **Unit 2: Transmission Lines and Their Performance**

This unit focuses on the design and performance of overhead transmission lines. Topics include the calculation of line parameters (resistance, inductance, and capacitance), line constants, and the effect of line length and load on voltage regulation and line losses. It also explores the types of transmission lines used and their practical considerations.

### **Unit 3: Power Flow and Voltage Control in Transmission Systems**

The unit covers the principles of power flow in transmission networks, including the factors that affect power transfer and voltage control. Topics include the calculation of power loss in transmission lines, voltage drop, and methods of controlling voltage through tap-changing transformers and reactive power compensation.

### **Unit 4: Substations and Distribution Systems**

This unit focuses on the role and design of substations in power systems, including the types of substations (e.g., step-up, step-down, and switching stations). It also covers the structure and operation of distribution systems, including the distribution of electrical power to residential, commercial, and industrial consumers, and discusses the types of distribution networks.

### **Unit 5: Protection and Maintenance of Transmission and Distribution Systems**

The unit addresses the protection and maintenance of transmission and distribution systems, focusing on the need for safety and reliability in power delivery. Topics include protective relays, circuit breakers, and fault detection methods. It also covers the maintenance practices for transmission lines and substations to ensure the uninterrupted flow of power.

# Technical Communication

## CPCN-102

Cr. L T P 3 2 1

### Unit – I

**Basics of Technical Communication:** Meaning, Elements, Process, Origin, Scope and Significance, Forms, Channels & Media of Communication, Barriers to Communication, Organisation and Style in Technical Communication, Non-Verbal Communication.

**Technical Reports:** Nature & Significance, Types, Formats of Reports, Structure of Formal Reports: Project Report, Dissertation and Thesis, Strategies for Writing.

**Technical Articles:** Nature & Significance, Types, Elements, Research Methods, Writing Strategies.

**Technical Proposals:** Nature & Significance, Types, Structure of a Formal Proposal, Tips for Writing.

### Unit – II

**Guidelines for Effective Writing:** Requisites of Good Sentence Writing; Elements of a Paragraph, Requisites of Impeccable Paragraph Writing: Unity, Coherence and Logical Order; Development of Paragraphs.

**Specific Writing:** Note-Making; Summarising & Paraphrasing; Referencing; Professional Memos; e-Mails; e-Writing.

### Unit – III

**Professional Correspondence:** Letter Writing Skills; Form & Structure; Writing Personal & Official Letters, Letters of Inquiry, Instruction Letters, Quotations, Supply Orders, Complaint and Adjustment Letters, Minutes for Meeting, Designing Resume/CV/Bio-Data, Job Application, Follow-up Letters.

### Unit – IV

**Basics of Phonetics:** International Phonetic Alphabet, Phonemes, Allophones, Phonetic Transcription, Organs of Speech, Places and Manners of Articulation, Syllable, Stress, Rhythm, Intonation.

### Reference Books :

1. Rizvi, M Ashraf. *Effective Technical Communication*. New Delhi: Tata McGraw-Hill, 2005. Print.
2. Raman, M. and S. Sharma. *Technical Communication: Principles and Practice*. New Delhi: Oxford University Press, 2004. Print.
3. Anderson, Paul V. *Technical Communication: A Reader-Centered Approach*. 6<sup>th</sup>ed. New Delhi: Cengage Learning, 2007. Print.
4. Taylor, Shirely. *Model Business Letters, E-mails and Other*

- Business Documents*. 6<sup>th</sup>ed. New Delhi: Pearson Education, 2004. Print.
5. Roach, Peter. *English Phonetics and Phonology: A Practical Course*. 4<sup>th</sup>ed. New Delhi: Cambridge University Press, 2009. CD-ROM, Print.

# INTRODUCTION TO TECHNICAL COMMUNICATION

## CPCN-102 A

### **Unit 1: Fundamentals of Technical Communication**

Explore the principles of technical communication, its significance in various fields, and the role of the technical communicator. Understand the key characteristics of effective communication, including clarity, conciseness, and audience awareness.

### **Unit 2: Understanding Audiences and Contexts**

Investigate different audience types and their needs. Learn to analyze contexts, including cultural and organizational factors that influence communication. Develop skills for tailoring messages to specific audiences.

### **Unit 3: Research and Information Gathering**

Focus on effective research methodologies, including identifying credible sources, conducting interviews, and gathering data. Emphasize the importance of organizing information logically for clear communication.

### **Unit 4: Writing Techniques for Technical Documents**

Examine various writing styles and formats used in technical documents. Cover techniques for drafting, revising, and editing, as well as the importance of incorporating visuals and design elements to enhance readability.

### **Unit 5: Visual Communication and Design**

Learn the principles of visual communication, including the effective use of graphics, charts, and diagrams. Explore design fundamentals and tools that aid in creating visually appealing and informative documents.

# TECHNICAL DOCUMENTATION

## CPCN-102 B

### **Unit 1: Introduction to Technical Documentation**

This unit covers the fundamentals of technical documentation, including its purpose and significance in various industries. It explores different types of documentation such as user manuals, system documentation, and online help. Emphasis is placed on the role of technical writers and the skills required for effective communication.

### **Unit 2: Documentation Planning and Management**

In this unit, the focus is on the planning stages of technical documentation. Key topics include audience analysis, defining documentation goals, and creating project timelines. It also covers documentation management practices, including version control and collaboration tools.

### **Unit 3: Research and Information Gathering**

This unit emphasizes the importance of thorough research in technical writing. It includes strategies for gathering information from subject matter experts, conducting interviews, and utilizing existing documentation. Participants learn how to validate and organize information for clarity and accuracy.

### **Unit 4: Writing Techniques for Technical Documentation**

Here, the syllabus delves into writing techniques specific to technical documentation. Topics include clarity, conciseness, and coherence in writing. The unit also addresses the use of active voice, proper terminology, and the importance of audience-centric language.

### **Unit 5: Visual Elements in Technical Documentation**

This unit focuses on incorporating visual elements to enhance understanding. It covers the use of diagrams, charts, screenshots, and other graphics. Participants learn best practices for visual design and how to create effective visuals that complement text.

# TECHNICAL EDITING AND PROOFREADING

CPCN-102 C

## **Unit 1: Introduction to Technical Editing and Proofreading**

Overview of technical communication, the role of editing and proofreading, and the differences between these processes.

## **Unit 2: Editing Fundamentals**

Principles of effective editing, types of editing (substantive, copy editing, line editing), and the editing process.

## **Unit 3: Understanding Technical Documents**

Types of technical documents, audience analysis, and the importance of context in editing.

## **Unit 4: Grammar and Style**

Key grammar rules relevant to technical writing, style guides (APA, MLA, Chicago), and consistency in terminology.

## **Unit 5: Proofreading Techniques**

Strategies for effective proofreading, common errors to watch for, and tools and resources for proofreading.

# TECHNICAL RESEARCH AND ANALYSIS

CPCN-102 D

## **Unit 1: Introduction to Technical Research**

This unit introduces the concept of technical research, its importance in advancing technology and innovation, and the various types of research methodologies. It covers the basics of formulating research questions, hypothesis development, and the steps involved in conducting research, including literature review and data collection techniques.

## **Unit 2: Research Methodology and Data Collection**

This unit focuses on the methods used in technical research, including qualitative and quantitative research methodologies. Topics include sampling techniques, survey design, experimentation, and data collection tools. The unit also covers data management and the ethical considerations in research data handling.

## **Unit 3: Data Analysis Techniques**

This unit explores various data analysis techniques used in technical research, including statistical methods, data visualization, and interpretation of results. Topics include descriptive statistics, inferential statistics, regression analysis, and the use of software tools like MATLAB, SPSS, or Python for data analysis.

## **Unit 4: Technical Writing and Reporting**

This unit emphasizes the principles of technical writing and how to effectively communicate research findings. It covers the structure of research papers, technical reports, and academic articles, including abstract writing, literature reviews, methodology, results, discussions, and citations.

## **Unit 5: Presentation and Publication of Research Findings**

This unit covers the techniques for presenting research findings to both technical and non-technical audiences. Topics include preparing effective research presentations, poster sessions, and oral defense of research. The unit also explores the process of publishing research in journals and conferences, including peer review, submission guidelines, and ethical issues in publication.



## Engg. Physics Lab.

### CPHM-152

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2

1. Measurement of wavelength of monochromatic light by Newton's rings
2. Measurement of the specific rotation of cane sugar solution using Biquartzpolarimeter
3. Measurement of wavelength of spectral lines using plane transmission grating
4. Measurement of the specific resistance of the material of a given wire using Carey Foster Bridge
5. Study of the variation of magnetic field along the axis of current carrying coil and then to estimate the radius of the coil
6. Calibration of the given voltmeter and ammeter with a potentiometer
7. Measurement of the resistivity and energy band gap of a semiconductor material (four probe)
8. Study of Hall effect and determination of Hall coefficient and carrier density of a given semiconductor material
9. Measurement of acceleration due to gravity by compound pendulum
10. Measurement of electro-chemical equivalent (ECE) of copper using Helmholtz galvanometer

#### Reference Books :

1. Jain, R.K., Darakhshan Sahar and D. Mishra. *Engineering Physics Practical Manual*. Shobhit University Publication, 2009.

# INTRODUCTION TO ENGINEERING PHYSICS LAB

CPHN-152A

1. Measurement of acceleration due to gravity using a simple pendulum.
2. Determination of Young's modulus using a cantilever beam.
3. Study of motion on an inclined plane.
4. Verification of the laws of reflection and refraction.
5. Measurement of wavelength using a diffraction grating.
6. Investigation of Hooke's Law with spring constant determination.
7. Analysis of LC circuits and resonance.
8. Measurement of thermal conductivity of a metal rod.
9. Study of charge and discharge in capacitors.
10. Exploration of the photoelectric effect.
11. Determination of the focal length of a lens using the lens formula.
12. Investigation of interference patterns using a double-slit experiment.
13. Measurement of the speed of sound in air.
14. Study of magnetic fields using a current-carrying coil.
15. Analysis of the Doppler effect with sound waves.
16. Measurement of the coefficient of friction on different surfaces.
17. Determination of specific heat capacity using a calorimeter.
18. Study of the behavior of waves in a stretched string.
19. Investigation of thermoelectric effects (Seebeck and Peltier).
20. Exploration of the behavior of light through optical fibers.

## ELECTROMAGNETISM LAB

CPHN-152B

1. Measurement of magnetic field strength using a Hall probe.
2. Investigation of Ampère's Law with current-carrying conductors.
3. Study of Faraday's Law of Electromagnetic Induction.
4. Determination of the resistance of a wire using Wheatstone bridge.
5. Analysis of magnetic field lines using iron filings and magnets.
6. Measurement of the inductance of coils using an LCR meter.
7. Study of the behavior of parallel plate capacitors.
8. Investigation of the force on a current-carrying conductor in a magnetic field.
9. Measurement of dielectric constants of various materials.
10. Analysis of electromagnetic waves using antennas.
11. Exploration of RLC circuit resonance and impedance.
12. Study of the magnetic hysteresis loop of materials.
13. Measurement of self-inductance using an RL circuit.
14. Investigation of the Biot-Savart Law with magnetic fields.
15. Study of capacitive reactance in AC circuits.
16. Analysis of the relationship between current and magnetic field in solenoids.
17. Measurement of electric field strength using a voltmeter.
18. Investigation of transformer operation and efficiency.
19. Study of electromagnetic interference (EMI) in circuits.
- 20.** Exploration of magnetic shielding using different materials.

## MATERIALS SCIENCE AND ENGINEERING LAB

### CPHN-152C

1. A program to input stress and strain values and calculate Young's Modulus.
2. A script to calculate thermal conductivity using Fourier's law based on temperature gradient and heat flow.
3. A program that takes in component compositions and temperature to plot a simple binary phase diagram.
4. A tool to compute the diffusion coefficient using Fick's laws based on concentration gradient.
5. A program to estimate the fatigue life of a material using S-N curves and input loading conditions.
6. A simulation of a tensile test where users can input material properties and loading rates to visualize stress-strain curves.
7. A program that suggests materials based on user-defined properties such as strength, weight, and corrosion resistance.
8. A tool to calculate the creep rate of materials at high temperatures and stresses over time.
9. A program that takes diameter of the indentation and applied load to calculate Brinell hardness number.
10. A script to calculate the corrosion rate based on weight loss and exposure time.
11. A program to calculate the effective modulus of a composite based on volume fractions and moduli of individual components.
12. A tool to compute the thermal expansion of materials based on temperature change and linear expansion coefficients.
13. A program to analyze impact test results and calculate the energy absorbed by a material during fracture.
14. A program that estimates recrystallization temperature based on grain size and deformation history.
15. A script to analyze XRD data and identify peaks corresponding to specific crystallographic planes.
16. A program to simulate the crack growth rate in materials under cyclic loading conditions.
17. A tool to calculate electrical conductivity based on resistivity and material dimensions.
18. A program that estimates the glass transition temperature of polymers based on molecular weight and structure.
19. A script that calculates thermal stresses in materials based on temperature changes and constraints.
20. A program to generate and plot load-deflection curves for beams under various loading conditions.

## WAVES AND VIBRATIONS LAB

### CPHN-152D

- 1) To study the motion of a simple pendulum and determine the acceleration due to gravity (g).
- 2) To determine the frequency of a tuning fork using a resonance tube.
- 3) To determine the speed of sound in air using the Doppler effect.
- 4) To study the vibration of a cantilever beam and calculate its natural frequency.
- 5) To observe the formation of standing waves on a string and determine the wavelength.
- 6) To study the longitudinal vibrations of a spring-mass system.
- 7) To determine the damping factor for a damped harmonic oscillator.
- 8) To investigate the relationship between frequency and amplitude in simple harmonic motion.
- 9) To study the superposition of waves using a ripple tank and observe interference patterns.
- 10) To determine the wave speed on a stretched string using a frequency generator.
- 11) To observe the phenomenon of resonance using a mechanical resonator.
- 12) To study the characteristics of forced oscillations and resonance in a spring-mass system.
- 13) To measure the time period of a simple pendulum for different lengths and plot the variation.
- 14) To calculate the speed of sound in a solid using the longitudinal wave method.
- 15) To study the vibration modes of a metal rod fixed at both ends.
- 16) To observe and measure the wave reflection and refraction using a slinky or spring.
- 17) To determine the frequency of a tuning fork by using a Helmholtz resonator.

- 18) To investigate the formation of beats in sound waves and calculate the beat frequency.
- 19) To determine the period of oscillation of a compound pendulum.
- 20) To study the motion of a driven damped harmonic oscillator and determine its quality factor.

## **COMPUTER PROGRAMMING USING C LAB.**

**CCSN 152**

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**2**

- 1) Write a program to find the factorial of a given number using recursion.
- 2) Write a program to check whether a number is prime or not.
- 3) Write a program to reverse a given number using a loop.
- 4) Write a program to find the largest of three numbers using if-else statements.
- 5) Write a program to calculate the sum of digits of a given number.
- 6) Write a program to print the Fibonacci series up to a given term using iteration.
- 7) Write a program to check if a given string is a palindrome.
- 8) Write a program to find the greatest common divisor (GCD) of two numbers using Euclidean algorithm.
- 9) Write a program to perform matrix multiplication.
- 10) Write a program to sort an array of integers using bubble sort.
- 11) Write a program to implement a simple calculator that performs addition, subtraction, multiplication, and division.
- 12) Write a program to convert a given decimal number to binary.
- 13) Write a program to count the number of vowels and consonants in a string.

14) Write a program to find the length of a string without using the built-in strlen function.

15) Write a program to implement a simple linear search on an array of integers.

**Reference Books :**

1. Sharma, A.K. *Fundamentals of Computers and Programming with C*. Dhanpat Rai

Publications, New Delhi, 2005.

2. Sharma, Divya. *Lab. Manual: Fundamentals of Computers and Programming with C*, Shobhit  
University Publication, Meerut.

## **BASIC ELECTRICAL ENGINEERING LAB**

**CEEN 152**

	<b>Cr.</b>	<b>L</b>	<b>T</b>
<b>P</b>	<b>1</b>	<b>00</b>	

**2**

- 2. Verify the KCL**
- 3. Verify the KVL**
- 4. Short Circuit and Open Circuit**
- 5. Study of Energy meter**
- 6. Verification Thevenin Theorem**
- 7. Verification of Norton theorem**
- 8. Verification of superposition theorem**



# INTRODUCTION TO ELECTRICAL ENGINEERING LAB

## CEEN-152A

1. A program to calculate the equivalent resistance of resistors in series and parallel configurations.
2. A script to analyze simple AC circuits using phasor representation and calculate voltage, current, and power.
3. A program that simulates the behavior of RC, RL, and RLC circuits under different frequency inputs.
4. A tool to perform node voltage analysis for a given electrical circuit and display results.
5. A program to calculate the power factor of an AC circuit based on voltage and current phase angles.
6. A script to design and simulate a basic operational amplifier circuit for inverting and non-inverting configurations.
7. A program that calculates the inductance of coils based on their physical dimensions and number of turns.
8. A tool to simulate a transformer and calculate turns ratio, voltage, and current on primary and secondary sides.
9. A program to determine the Thevenin equivalent circuit for a given linear circuit.
10. A script that performs load flow analysis for a simple electrical power system.
11. A program to simulate Kirchhoff's voltage and current laws in a network of resistors.
12. A tool to calculate the gain of a transistor amplifier circuit based on input and output voltages.
13. A program that analyzes a simple digital circuit and generates a truth table.
14. A script to calculate the energy consumption of electrical appliances over time based on power ratings.
15. A program that simulates the charging and discharging of a capacitor in an RC circuit.
16. A tool to design and analyze a basic filter circuit (low-pass, high-pass, band-pass).
17. A program that calculates the efficiency of a motor based on input and output power.
18. A script to visualize the waveform of a sinusoidal signal using Fourier series.

## **ELECTRICAL MACHINES LAB**

CEEN-152B

1. Write a program to calculate the efficiency of a transformer given input and output power.
2. Simulate the no-load test of a single-phase induction motor and calculate the power factor.
3. Create a program to determine the speed-torque characteristics of a DC motor.
4. Implement a function to analyze the performance of a squirrel-cage induction motor under varying load conditions.
5. Develop a program to perform the equivalent circuit analysis of a transformer.
6. Simulate the starting current of a three-phase induction motor.
7. Write a code to perform the speed control of a DC motor using PWM (Pulse Width Modulation).
8. Create a program to calculate the losses in a three-phase transformer under different loading conditions.
9. Simulate the vector control of an induction motor using MATLAB.
10. Implement a program to determine the slip of an induction motor at various load conditions.
11. Create a function to analyze the V-curves of a synchronous motor.
12. Write a program to perform load flow analysis in a power system.
13. Simulate the fault analysis of a synchronous generator during short-circuit conditions.
14. Develop a program to model the dynamics of a brushed DC motor.
15. Create a program to calculate the power factor correction required for a given load.
16. Simulate the effect of rotor resistance on the performance of an induction motor.
17. Write a code to perform the measurement of efficiency for different types of electrical machines.

18. Implement a program to analyze the thermal performance of electrical machines under steady-state conditions.
19. Create a function to simulate the harmonic analysis in a power system.
20. Develop a program to visualize the phasor diagrams of AC circuits with different loads

## **ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB**

CEEN-152C

1. Calculate resistance using Ohm's Law based on input voltage and current values.
2. Compute real, reactive, and apparent power in AC circuits given voltage and current.
3. Decode resistor color bands to determine resistance values.
4. Measure and display capacitance using a microcontroller setup.
5. Design a voltage divider calculator for output voltage based on input voltage and resistor values.
6. Implement a frequency counter to measure the frequency of an input waveform.
7. Simulate an LCR meter to measure inductance, capacitance, and resistance.
8. Create a data logger that records and stores voltage and current measurements over time.
9. Develop an oscilloscope simulation to visualize waveforms in real-time.
10. Convert temperature readings from a sensor into a corresponding voltage output.
11. Build a digital multimeter emulator to replicate basic multimeter functionalities.
12. Measure phase angle between voltage and current waveforms using timing functions.
13. Analyze a Wheatstone bridge circuit to find an unknown resistance value.
14. Generate various waveform signals (sine, square, triangular) at different frequencies.
15. Interface with transducers and display data from various sensors (e.g., temperature, pressure).

16. Calculate electric field strength based on point charge and distance from the charge.
17. Compute inductive reactance using inductance and frequency values.
18. Calculate capacitive reactance from capacitance and frequency inputs.
19. Measure and display AC voltage using a microcontroller setup.
20. Simulate the behavior of a current transformer in a circuit to analyze current ratios.

## TRANSMISSION AND DISTRIBUTION SYSTEMS LAB

CEEN-152D

1. Calculate the voltage drop in a transmission line given the length, current, and resistance.
2. Simulate a three-phase load flow analysis using the Gauss-Seidel method.
3. Model a basic transformer and calculate its efficiency based on input and output parameters.
4. Implement a fault analysis program to identify the type and location of faults in a distribution system.
5. Create a program to optimize the placement of capacitors in a distribution network to reduce losses.
6. Simulate the impact of different loading conditions on the thermal rating of transmission lines.
7. Develop a program to calculate short-circuit currents in a power system using the symmetrical component method.
8. Analyze the impact of renewable energy sources on a distribution network's voltage profile.
9. Create a visualization tool for real-time monitoring of a transmission system's parameters.
10. Implement a program to evaluate the reliability of a distribution system using Monte Carlo simulation.
11. Calculate the economic dispatch of generation units in a power system to minimize cost.
12. Simulate a grid with renewable energy integration and assess its stability under varying conditions.
13. Develop a program to perform harmonic analysis of a power system with non-linear loads.
14. Model and analyze a radial distribution system using the backward/forward sweep method.
15. Implement a program to assess power factor correction requirements for industrial loads.
16. Create a tool to perform load forecasting based on historical data and weather patterns.
17. Simulate the operation of a smart grid with automated demand response features.
18. Analyze the impact of cable insulation types on transmission line performance.
19. Develop a program to assess the impact of electric vehicle charging on distribution networks.
20. Create a user interface for managing and visualizing distribution network assets and their conditions.

**Unit - I**

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT), Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Operations on a Linked List. Insertion, Deletion, Traversal, Generalized Linked List.

**UNIT - II**

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C.

**UNIT – III**

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

**UNIT – IV**

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijkstra Algorithm, Introduction to Activity Networks.

**UNIT - V**

Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees.

Hashing Hash Function, Collision Resolution Strategies.

Storage Management: Garbage Collection and Compaction.

**Text Books:**

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
2. R. Kruse et al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi- 2002
3. A. M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
4. K Loudon, "Mastering Algorithms with C", Shroff Publisher & Distributors Pvt. Ltd.
5. Bruno R Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", Jhon Wiley & Sons, Inc.
6. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia Pvt. Ltd.(Singapore)

**Unit- I Introduction:**

An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and database language and interfaces, Data definitions language, DML, Overall Database Structure. Data Modeling using the Entity Relationship Model, extended ER model, relationships of higher degree.

**Unit- II Relational data Model and Language:**

Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus, Introduction to SQL: Characteristics of SQL. Advantage of SQL. SQL data types and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations. Joins, Unions, Intersection, Minus, Cursors in SQL.

**Unit- III Data Base Design & Normalization:**

Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

**Unit- IV Transaction Processing Concepts:**

Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

**Unit- V Concurrency Control Techniques:**

Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction.

**Text Books**

1. Date C J, "An Introduction To Database System", Addison Wesley
2. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley
4. Leon & Leon, "Database Management System", Vikas Publishing House.
5. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication
6. Majumdar & Bhattacharya, "Database Management System", TMH
7. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill
8. Kroenke, "Database Processing: Fundamentals, Design and Implementation", Pearson Education.
9. Maheshwari Jain, "DBMS: Complete Practical Approach", Firewall Media, New Delhi

**UNIT - I: Operating System Introduction:**

Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems, Operating System services, user OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure, Virtual machines.

**UNIT - II: Process and CPU Scheduling :-**

Process concepts - The Process, Process State, Process Control Block, Threads, Process Scheduling - Scheduling Queues, Schedulers, Context Switch, Preemptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread scheduling, Case studies: Linux, Windows. Process Coordination - Process Synchronization, The Critical section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization, Monitors, Case Studies: Linux, Windows.

**UNIT - III: Memory Management and Virtual Memory :**

Logical & physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table. Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demanding Paging, Page Replacement Page Replacement Algorithms, Allocation of Frames, Thrashing.

**UNIT - IV: File System Interface :-**

The Concept of a File, Access methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Implementation - File System Structure, File System Implementation, Allocation methods, Free-space Management, Directory Implementation, Efficiency and Performance.

Mass Storage Structure - Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap space Management.

**UNIT - V: Deadlocks -:**

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

Protection - System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

**TEXT BOOKS:**

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.

**REFERENCES BOOKS:**

1. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
2. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhare, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. Operating Systems, A. S. Godbole, 2nd Edition, TMH
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
6. Operating Systems, S, Haldar and A. A. Arvind, Pearson Education.
7. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
8. Operating Systems in depth, T. W. Doeppner, Wiley.



# JAVA PROGRAMMING

CCSN-207

Cr. L T P

4 3 1 0

## Unit – I

Introduction to Java: Importance and features of Java, Keywords, constants, variables and Data Types, Operators and Expressions, Decision Making, Branching and Looping: if..else, switch,?: operator, while, do, for statements, labeled loops, jump statements: break, continue, return. Introducing classes, objects and methods: defining a class, adding variables and methods, creating objects, constructors, class inheritance. Arrays and String: Creating an array, one and two dimensional arrays, string array and methods, Classes: String and String Buffer classes, Wrapper classes: Basics types, using super, Multilevel hierarchy abstract and final classes, Object class, Packages and interfaces, Access protection, Extending Interfaces, packages.

## Unit – II

Exception Handling: Fundamentals exception types, uncaught exceptions, throw, throw, final, built in exception, creating your own exceptions, Multithreaded Programming: Fundamentals, Java thread model: priorities, synchronization, messaging, thread classes, Run able interface, inter thread Communication, suspending, resuming and stopping threads.

## Unit - III

Input/Output Programming: Basics, Streams, Byte and Character Stream, predefined streams, Reading and writing from console and files. . Networking: Basics, networking classes and interfaces, using java.net package, doing TCP/IP and Data-gram Programming

## Unit – IV

The Collection Framework: collection interfaces, collection classes(ArrayList, LinkedList, Hash set), Accessing a Collection via an Iterator, Vector, More utility class: StringTokenizer, Date.

## Unit – V

Event Handling: Different Mechanism, the Delegation Event Model, Event Classes, Listener Interfaces, Adapter and Inner Classes, Working with windows, Graphics and Text, using AWT controls, Layout managers and menus, Java Applet. Beans: Introduction to Java Beans and Swings, Servlets

## Reference Books:

1. Patrick Naughton and Herbertz Schildt, “*Java-2 the Complete Reference*”, TMH, 7<sup>th</sup> Edition, 2006.
2. E. Balaguruswamy, “*Programming with Java: A Primer*”, TMH, First Reprint, 2007.
3. Horstmann, “*Computing Concepts with Java 2 Essentials*”, John Wiley and sons inc, Third Edition, 2003.
4. Kathy Sierra, “*Head First Java*”, O’Rielly, Second Edition, February 2005.

**Unit 1: Differential Calculus**

Exploration of functions, limits, continuity, and differentiability, with applications of Mean Value Theorems, Taylor and Maclaurin series, partial differentiation, and optimization of multivariable functions.

**Unit 2: Integral Calculus**

Study of integration, including definite and indefinite integrals, and applications in calculating areas, volumes, and surfaces. Introduction to improper integrals, Beta and Gamma functions.

**Unit 3: Matrices**

Comprehensive study of matrices, including their types, properties, and rank. Analysis of systems of linear equations, eigenvalues, eigenvectors, and diagonalization.

**Unit 4: Vector Calculus**

Concepts of scalar and vector fields, with operations including gradient, divergence, and curl. Application of line, surface, and volume integrals, along with Green's, Stokes', and Gauss' theorems.

**Unit 5: Differential Equations**

Focus on ordinary differential equations of the first order and higher-order linear differential equations. Applications of differential equations in engineering contexts, with an introduction to partial differential equations.

**CCSN 209 B**

**Basic Mathematics I**

**Unit 1: Algebra**

Covers fundamental concepts in algebra, including expressions, equations, polynomials, factorization, and quadratic equations. Introduces inequalities and basic concepts of logarithms and exponents.

**Unit 2: Trigonometry**

Explores trigonometric ratios, identities, and equations. Examines the properties and applications of angles, the unit circle, and trigonometric functions, including inverse functions and their graphs.

**Unit 3: Coordinate Geometry**

Introduction to the Cartesian coordinate system, distance formula, and the equation of a line. Covers the slope, intercepts, and different forms of line equations, with applications in solving geometric problems.

**Unit 4: Calculus Basics**

Foundational concepts in calculus, focusing on limits, continuity, and the basics of differentiation and integration. Includes basic applications of derivatives and integrals in solving practical problems.

**Unit 5: Statistics and Probability**

Introduction to data representation, measures of central tendency, and measures of dispersion. Covers basic probability concepts, including probability rules, simple events, and introduction to combinatorics.

## **CCSN 209 C            STATISTICAL TECHNIQUES IN COMPUTER SCIENCE**

### **Unit 1: Descriptive Statistics**

Overview of data types, data collection, and summarization. Techniques for organizing and visualizing data, including frequency distributions, histograms, and scatter plots. Measures of central tendency, variability, skewness, and kurtosis.

### **Unit 2: Probability Theory**

Basic concepts of probability, conditional probability, and Bayes' theorem. Random variables, probability distributions, and expectations. Introduction to discrete and continuous distributions, including the binomial, Poisson, and normal distributions.

### **Unit 3: Statistical Inference**

Fundamentals of estimation and hypothesis testing. Confidence intervals for means and proportions, t-tests, chi-square tests, and ANOVA. Introduction to p-values, statistical significance, and decision-making based on hypothesis testing.

### **Unit 4: Regression Analysis**

Simple and multiple linear regression models, least squares estimation, and interpretation of regression coefficients. Assumptions of regression, diagnostic checks, and introduction to logistic regression for binary outcomes.

### **Unit 5: Machine Learning and Data Mining Applications**

Application of statistical techniques in supervised and unsupervised learning, including classification and clustering. Evaluation metrics for models, cross-validation, and introduction to decision trees, k-means clustering, and support vector machines.

**Unit 1: Basic Arithmetic**

Focuses on fundamental arithmetic operations, including addition, subtraction, multiplication, and division. Covers concepts of fractions, decimals, percentages, ratios, and proportions.

**Unit 2: Algebraic Expressions and Equations**

Introduces basic algebraic expressions, simplification, and evaluation. Covers linear equations, inequalities, and problem-solving techniques using algebraic methods.

**Unit 3: Geometry**

Explores basic geometric shapes and properties, including points, lines, angles, triangles, circles, and polygons. Covers concepts of perimeter, area, and volume for various shapes.

**Unit 4: Trigonometry Basics**

Introduction to trigonometric ratios and basic identities. Covers angle measurements, right-angled triangle properties, and applications of trigonometry in simple geometric problems.

**Unit 5: Statistics and Data Interpretation**

Introduction to data collection, organization, and representation using tables, charts, and graphs. Covers measures of central tendency, such as mean, median, and mode.

# DISCRETE MATHEMATICS

CCSN-209

CR L-T-P

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## Unit-I

**Set :** Definition of sets, countable and uncountable sets, Venn Diagrams, Power set, Partition of sets, cardinality, inclusion-exclusion principles, proofs on some general identities on sets. **Relation**-Definition, types of relation, composition of relations, pictorial representation of relation, equivalence relation, partial ordering relation. **Function**-Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions. **Theorem Proving Techniques** mathematical induction, pigeonhole principle, proves by contradiction.

## Unit-II

**Algebraic Structures:** Definition, Properties, types: Semi Group, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, cosets, factor group, permutation groups, Normal subgroup, Homomorphism and isomorphism of groups, example and standard results, rings and fields.

## Unit-III

**Posets, Hasse Diagram and Lattices:** Introduction, ordered sets, Hasse diagram of partially ordered set, isomorphic ordered sets, well ordered set, properties of Lattices, bounded lattices and Complemented lattices. **Boolean Algebra** Basic definitions, sum of products and product of sums forms, Logic gates and Karnaugh maps.

## Unit-IV

**Propositional Logic:** Proposition, logic operators, first order predicate logic, truth tables, tautologies, arguments, contradictions, logical implications, logical equivalence, predicates, universal and existential quantifiers.

## Unit-V

**Graphs & Combinatorics:** Recurrence Relation, Generating function, simple graph, multi graph, graph terminology, representation of graphs, Bipartite, Regular, Planar and connected graphs, Euler graphs, Hamiltonian path and circuits, Adjacency and Incidence Matrices Graph coloring number, chromatic number, **Tree** Definition, Rooted tree, properties of trees, binary search tree, tree traversal.

## Reference Books:

1. Seymour Lipschutz & M.L. Lipson, *Discrete Mathematics*, Tata Mc Graw Hill, 2<sup>nd</sup> Edition, 1999.
2. Trembley, J.P & R. Manhor, *Discrete Mathematical Structure with Application to Computer Science*, McGraw Hill, 1997.
3. Kenneth H. Rosen, *Discrete Mathematical and its applications*, McGraw Hill, 4<sup>th</sup> Edition, 2002.
4. JL Morr, A Kandal and TP Baker, *Discrete Mathematics for Computer Scientists and Mathematics*, PHI, 1999.
5. Deo, Narsingh, *Graph Theory With application to Engineering and Computer Science*, PHI, 2007

## **VALUE EDUCATION,HUMAN RIGHTS AND LEGISLATIVE PROCEDURES**

**L T P 4 0 0**

### **CBSN-201**

#### **Unit-I: Course Introduction**

Need, Basic Guidelines, Content & Process for value education, Self-Exploration, Natural Acceptance & Experimental validation, Happiness & Prosperity.

#### **Unit-II:**

Understanding harmony in the human being, Understanding the need of self & Body (Sukh&Suvidha , Sanyam&Swasthya)

#### **Unit-III:**

Understanding harmony in the faculty & society, Harmony in human relationship

#### **Unit-IV:**

Understanding harmony in the nature and Existence

#### **Unit-V :**

Natural acceptance of human values, Definitiveness of ethical human conduct, Basis of human education.

#### **Text Books :**

1. B.P. Banerjee, 2005 Foundations of ethics and management.
2. B.L. Bajpai, 2004 Indian Ethos and modern management, New royal book co. Lucknow.  
Reprinted 2008

**Unit 1: Introduction to Personality Development** Understanding the concept and definition of personality, characteristics of a well-developed personality, factors influencing personality, and the importance of personality development in personal and professional life.

**Unit 2: Self-Awareness and Self-Analysis** Exploring self-awareness as a foundation for personality development, techniques for self-analysis, understanding strengths and weaknesses, and developing self-confidence and self-esteem.

**Unit 3: Communication Skills** Understanding effective communication, verbal and non-verbal communication, importance of active listening, barriers to communication, and building interpersonal communication skills.

**Unit 4: Goal Setting and Time Management** Introduction to goal setting, setting SMART goals, significance of time management in personality development, techniques to manage time effectively, and prioritization of tasks.

**Unit 5: Positive Thinking and Attitude Building** Understanding the power of positive thinking, building a positive attitude, overcoming negativity, strategies for developing an optimistic outlook, and how attitude impacts personal growth.



- Unit 1: Introduction to Behavioural Skills and Self-Perception** This unit introduces the concept of behavioural skills, the importance of developing such skills for personal and professional growth, and understanding self-perception. It explores how self-concept and perception influence behaviour and interaction with others.
- Unit 2: Emotional Intelligence and Self-Regulation** This unit covers the fundamentals of emotional intelligence, its components, and the role it plays in enhancing personal and social effectiveness. It includes self-regulation techniques, managing emotions in various situations, and the significance of empathy in building stronger relationships.
- Unit 3: Communication and Active Listening Skills** This unit focuses on developing strong communication skills, with an emphasis on active listening as a vital behavioural skill. It covers how to interpret non-verbal cues, understand communication barriers, and adapt communication styles to various social and professional settings.
- Unit 4: Conflict Resolution and Problem-Solving Techniques** This unit explores strategies for resolving conflicts in a constructive manner, understanding different conflict management styles, and effective problem-solving techniques. It highlights the importance of maintaining composure and logical thinking in difficult situations.
- Unit 5: Adaptability, Teamwork, and Leadership Behaviour** This unit emphasizes the importance of adaptability in dynamic environments, developing teamwork abilities, and understanding leadership behaviour. It covers how to foster collaboration, build trust among team members, and demonstrate leadership qualities in group settings to enhance collective performance.

**Unit 1: Basics of Grammar and Sentence Structure** This unit covers the foundational elements of English grammar, including parts of speech, sentence formation, subject-verb agreement, tenses, and basic punctuation. It emphasizes constructing correct and coherent sentences for effective communication.

**Unit 2: Vocabulary Building and Usage** This unit focuses on expanding vocabulary through synonyms, antonyms, idioms, and phrases. It includes practical exercises to enhance word usage, contextual understanding, and the application of new words in speaking and writing.

**Unit 3: Reading Comprehension and Analysis** This unit involves developing skills for reading and understanding various types of texts, such as passages, articles, and stories. It emphasizes techniques for skimming, scanning, and critical analysis, along with answering comprehension questions effectively.

**Unit 4: Writing Skills and Composition** This unit covers the basics of writing clear and coherent paragraphs, essays, and short compositions. It includes practices for writing formal and informal letters, emails, and other basic written communication, focusing on structure and clarity.

**Unit 5: Speaking and Listening Skills** This unit emphasizes improving pronunciation, fluency, and speaking confidence. It involves listening exercises for understanding spoken English in different contexts, building conversational skills, and participating in discussions, role-plays, and presentations to enhance oral communication proficiency.

**Unit 1: Introduction to Public Speaking**

This unit covers the fundamentals of public speaking, including its importance in personal and professional contexts. Students will explore different types of speeches, such as informative, persuasive, and special occasion speeches. The unit will also introduce key elements of effective communication, including audience analysis, purpose identification, and the role of ethics in public speaking.

**Unit 2: Speech Preparation**

In this unit, students will learn the process of preparing a speech. This includes selecting a topic, conducting research, organizing content logically, and crafting an outline. Emphasis will be placed on the importance of developing a strong thesis statement and using evidence effectively to support arguments. Additionally, students will practice writing introductions and conclusions that engage the audience.

**Unit 3: Delivery Techniques**

This unit focuses on the various delivery methods for speeches, including extemporaneous, memorized, and manuscript delivery. Students will learn about body language, vocal variety, and the use of pauses. Practical exercises will help students develop their delivery skills, emphasizing the importance of confidence, eye contact, and audience engagement.

**Unit 4: Use of Visual Aids**

Students will explore the role of visual aids in enhancing presentations. This unit will cover different types of visual aids, such as slides, charts, graphs, and props, and best practices for their effective use. Emphasis will be placed on how to create visually appealing slides that complement the spoken message rather than distract from it.

**Unit 5: Handling Questions and Feedback**

This unit addresses the importance of managing audience questions and feedback during and after a presentation. Students will learn strategies for anticipating questions, handling difficult audience members, and responding to feedback constructively. Role-playing exercises will allow students to practice these skills in a supportive environment.

1. Create, display, insert, delete, and search elements in an array.
2. Implement stack operations using arrays with push, pop, and display functions.
3. Create a stack using a linked list and perform push and pop operations.
4. Convert an infix expression to postfix using a stack.
5. Evaluate a given postfix expression using stack operations.
6. Implement queue operations using arrays including enqueue, dequeue, and display.
7. Create a dynamic queue using a linked list and implement enqueue and dequeue operations.
8. Implement a circular queue with functions for enqueue and dequeue.
9. Create and traverse a singly linked list with insert and delete operations.
10. Implement a doubly linked list with functions for inserting, deleting, and traversing nodes.
11. Create a circular linked list and perform insertion and deletion operations.
12. Search for an element using the binary search algorithm on a sorted array.
13. Search for an element using the linear search method in an array.
14. Create a binary tree and perform pre-order, in-order, and post-order traversals.
15. Implement a binary search tree (BST) with node insertion, searching, and tree traversal.
16. Represent a graph using an adjacency matrix and display the matrix.
17. Traverse a graph using the breadth-first search (BFS) algorithm.
18. Implement depth-first search (DFS) for graph traversal.
19. Use a linked list to represent and add two polynomials.
20. Sort an array using the merge sort algorithm.

1. HTML Basics
2. CSS Styling
3. JavaScript Basics
4. Responsive Web Design with Bootstrap
5. Creating a Simple Web Form
6. Validating Form Inputs with JavaScript
7. AJAX Requests with jQuery
8. Fetch API for Asynchronous Requests
9. JSON Data Handling
10. Introduction to PHP
11. Database Connectivity with MySQL
12. CRUD Operations in PHP
13. Using PHP Sessions
14. Implementing User Authentication
15. Creating RESTful APIs
16. Introduction to WordPress
17. Building a Simple Website with WordPress
18. Implementing Web Security Practices
19. Web Hosting and Deployment
- 20. Introduction to Content Management Systems (CMS)**

**CCSN-255****JAVA PROGRAMING LAB**

1. Hello World Program
2. Basic Calculator
3. Swap Two Numbers
4. Check Prime Number
5. Factorial of a Number
6. Fibonacci Series
7. Palindrome Checker
8. String Reversal
9. Array Sorting (Bubble Sort)
10. Linear Search in an Array
11. Binary Search in an Array
12. Implementing a Simple Class
13. Method Overloading
14. Exception Handling
15. File Handling (Read/Write)
16. Multi-threading Example
17. Creating a Simple GUI with Swing
18. Simple Java Swing Application
19. Database Connectivity (JDBC)
20. Building a Simple Web Application with Java Servlets

**UNIT I:**

**Introduction to C and C++:** History of C and C++, Overview of Procedural Programming and Object-Oriented Programming, Using main() function, Compiling and Executing Simple Programs in C++.

**Data Types, Variables, Constants, Operators and Basic I/O:** Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putchar), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.h).

**UNIT II:**

**Expressions, Conditional Statements and Iterative Statements:** Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

**UNIT III:**

**Functions:** Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

**Arrays:** Creating and Using One Dimensional Arrays- ( Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops, Use Various types of arrays (integer, float and character arrays / Strings).

Two-dimensional Arrays- (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays

**Derived Data Types (Structures and Unions), Pointers and References in C++,**

**Memory Allocation in C++ -** Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation.

**UNIT IV:**

**File I/O, Preprocessor Directives:** Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros. **Using Classes in C++:** Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables & Functions, Objects as parameters, Specifying the Protected and Private Access, Copy Constructors, Overview of Template classes and their use.

**UNIT V:**

**Overview of Function Overloading and Operator Overloading**

Need of Overloading functions and operators, Overloading functions by number and type of arguments, Looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators)

### **Inheritance, Polymorphism and Exception Handling**

Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

### **Reference Books**

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003
2. BjarneStroustrup, "The C++ Programming Language", 4<sup>th</sup> Edition, Addison-Wesley , 2013.
3. BjarneStroustrup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014.
4. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.
5. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.
5. John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.
6. Andrew Koeni, Barbara, E. Moo, "Accelerated C++", Published by Addison-Wesley , 2000.
7. Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.
8. Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.2014
9. Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.
10. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley, 5th Edition, 201



**Unit- I**

**Introduction:** Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

**Unit- II**

**Advanced Data Structures:** Red-Black Trees, B – trees, Binomial Heaps, Fibonacci Heaps.

**Unit- III**

**Divide and Conquer** with examples such as Sorting, Matrix Multiplication, Convex hull and Searching.

**Greedy methods** with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim’s and Kruskal’s algorithms, Single source shortest paths - Dijkstra’s and Bellman Ford algorithms.

**Unit- IV**

**Dynamic programming** with examples such as Knapsack. All pair shortest paths – Warshal’s and Floyd’s algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

**Unit- V**

Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

**Text books:**

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008.

**References:**

1. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
2. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
5. Harsh Bhasin, "Algorithm Design and Analysis", First Edition, Oxford University Press.
6. Gilles Brassard and Paul Bratley, Algorithmics: Theory and Practice, Prentice Hall, 1995

CCSN- 206

**Internet and Web Technology**

Cr	L	T	P
4	3	1	0

**Unit 1**

Introduction web: WWW, History, Protocols, Creating website for individual and corporate, Identification of objects, Cyber Laws, Web team, Communication, Quality assurance, Search Engine, Designing strategies, Database to web applications.

**Unit 2**

HTML: History of HTML, Structure of html, Switching between editor and browser, Header, body, list, tables, images, Forms, Frames. Cascade Style Sheets: Introduction, Style sheets, Embedding style sheets, grouping style sheets.

**Unit 3**

JavaScript: Introduction, Variables, Conditional statements, Operators, Popup box, Functions, Loops, Strings, Events, JavaScript and HTML, JavaScript Object Oriented Programming, Java beans: Introduction.

**Unit 4**

Java Server Pages: Introduction, Features of JSP, Working with JSP Technology, JSP Processing: JSP Architecture, JSP Application design, JSP Scripting elements, JSP Syntax basics, Background of web server, Web Server, Apache HTTP Server.

**Unit 5**

JSP Directives, Types of directives, JSP Actions, Component Object Model, JSP and Java Beans, JDBC, Database programming with JDBC, JDBC Drivers, JDBC Application Architecture, Steps to connect the application to database, Introduction to Struts and Swings.

**Reference Books:**

1. Ivan Bayross “ HTML, DHTML and JavaScript ”, Prentice Hall Inc., 3<sup>rd</sup> Edition, 2003.
2. Uttam K. Roy, “Web Technologies ”, Oxford, 1<sup>st</sup> Edition 2010.
3. Tanweer Alam, “Internet and Java Programming ”, Khanna Book Publication, 1st Edition, 2010.

**CCSN-208**

**COMPUTER NETWORKS**

**L T P Cr**  
**3 1 0 4**

**UNIT I**

Introduction - Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design – Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling

**UNIT II**

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer -Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

**UNIT III**

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

**UNIT IV**

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

**UNIT V**

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

**Text Books:**

- 1.Computer Networks, by Andrew S Tanenbaum, PHI. (2010)
- 2.Data and Computer Communications , by Walliam Stallings, PHI. (2002)

**Reference Books:**

- 1.Data Communications, Computer networking on OSI , by Fred Halsall, Addison Wesley Publishing Co.1998
- 2.Computer Networking -A Top-Down Approach Featuring the Internet , James F. Kurose and Keith W. Ross , Addison Wesley Publishing Co. 2004
- 3.Computer Networks: Protocols standards and interfaces , by Uyles Black, Prentice Hall.2002
- 4.Data communication & Networks , by Behrouz A. Forouzan, Tata McGraw Hill. 2002

**UNIT I:**

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

**UNIT II:**

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA, Pumping lemma.

**UNIT III:**

Context Free Languages – Leftmost and rightmost derivation, parsing and ambiguity, ambiguity in grammar and languages, normal forms

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF.

**UNIT IV:**

Pushdown Automata – NDPDA, DPDA, context free languages and PDA, comparison of deterministic and non-deterministic versions, closure properties, pumping lemma for CFL, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

**UNIT V:**

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Decidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory, Chomsky Hierarchy

**Textbooks:**

1. An Introduction to Formal Languages and Automata, by Peter Linz, Third Edition, Narosa Publishers (1998)
2. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
3. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
4. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
5. Y.N.Singh "Mathematical Foundation of Computer Science", New Age International.
6. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI Learning Private Limited, Delhi India.
7. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation, Pearson Education.

**Unit 1: Introduction to Nanosciences** This unit introduces the fundamental concepts of nanoscience, including definitions and significance of nanomaterials. It explores the historical development of nanotechnology, key terminology, and the differences between macro, micro, and nano scales. Students will also learn about the various classes of nanomaterials and their unique properties.

**Unit 2: Synthesis of Nanomaterials** In this unit, students will explore various methods for synthesizing nanomaterials, including top-down and bottom-up approaches. The unit will cover techniques such as chemical vapor deposition, sol-gel processes, electrospinning, and self-assembly. Emphasis will be placed on the advantages and limitations of each method, as well as their applications in different fields.

**Unit 3: Characterization Techniques** This unit focuses on the techniques used to characterize nanomaterials. Students will learn about methods such as transmission electron microscopy (TEM), scanning electron microscopy (SEM), atomic force microscopy (AFM), and X-ray diffraction (XRD). The unit will also cover spectroscopic techniques like Raman spectroscopy and UV-Vis spectroscopy, and their importance in analyzing the structural, chemical, and physical properties of nanomaterials.

**Unit 4: Properties of Nanomaterials** In this unit, students will investigate the unique properties of nanomaterials that differentiate them from bulk materials. This includes discussions on electrical, optical, thermal, and mechanical properties at the nanoscale. Students will explore phenomena such as quantum confinement and surface effects, as well as the implications of these properties for various applications.

**Unit 5: Applications of Nanotechnology** This unit covers the diverse applications of nanotechnology across various fields, including medicine, electronics, energy, and materials science. Students will study topics such as drug delivery systems, nanosensors, nanocomposites, and renewable energy solutions. Case studies highlighting current advancements and future trends in nanotechnology will be included.

**Unit 1: Fundamentals of Technical English**

This unit introduces the basic concepts of technical English, focusing on its significance in professional communication. It covers essential terminology, the role of technical English in various industries, and the differences between technical and general English.

**Unit 2: Reading and Comprehension Skills**

This unit emphasizes reading skills necessary for understanding technical documents. It includes strategies for skimming, scanning, and critical reading of technical texts, manuals, and reports. Students will practice comprehension exercises to enhance their ability to extract relevant information.

**Unit 3: Writing Technical Documents**

This unit focuses on the structure and format of various technical documents, such as reports, proposals, user manuals, and technical specifications. It covers the principles of clear and concise writing, the use of appropriate language, and the incorporation of visuals like charts and graphs to support written communication.

**Unit 4: Presentation and Speaking Skills**

This unit develops oral communication skills relevant to technical contexts. It includes techniques for effective presentations, including planning, organization, delivery, and the use of visual aids. Students will also practice public speaking and responding to questions in a professional setting.

**Unit 5: Collaborative Communication and Interpersonal Skills**

This unit addresses the importance of teamwork and interpersonal communication in technical fields. It covers skills for effective collaboration, including active listening, providing constructive feedback, and managing conflicts. It also explores the use of communication technologies for teamwork and project management.

**CBSN-202 A****Unit-1**

Communicative Grammar: Spotting the errors pertaining to parts of speech, nouns, pronouns, adjective, adverbs, preposition, conjunction, genders, infinitives, participles, form of tenses, use of articles ; Concord - grammatical concord, notional concord and the principle of proximity between subject and verb and other exceptional usages. Lexis: Idioms and phrases; Words often confused; One-Word Substitutes; Foreign Words (A selected list may be included for all the above components); Formation of words (suffixes, prefixes and derivatives).

**Unit-2**

Oral Communication:

Part-A: Introduction to principal components of spoken English – Word-stress patterns, Intonation, Weak forms in English

Part-B: Developing listening and speaking skills through various activities, such as (a) role play activities, (b) Practicing short dialogues (c) Group discussion (d) Debates (e) Speeches (f) Listening to news bulletins (g) Viewing and reviewing T.V. programs etc.

**Unit-3**

Written Communication: Developing reading and writing skills through such tasks/activities as developing outlines, key expressions, situations, slogan writing and theme building exercises Reading verbal and non-verbal texts-like cartoons, Graphs and tabulated data etc.

Technical Writing:

(a) Business Letters, Format of Business letters and Business letter writing-Fully-blocked layout may be used.

(b) E-mail writing

(c) Reports, Types of Reports and Format of Formal Reports

(d) Press Report Writing

**Unit-4**

(For Internal Evaluation Only):

Book Review – Herein the students will be required to read and submit a review of a book (Literary or non literary) of their own choice. This will be followed by a presentation of the same in the class

**Suggested Reading:**

Language in Use (Upper intermediate Level, Adrian Doff Christopher Jones, Cambridge University Press

Common Errors in English, Abul Hashem, Ramesh Publishing House, New Delhi.

Objective English, Tata Mc. Graw Hill Publishing Company Ltd., New Delhi.

Spoken English for India, R.K. Bansal & J.B. Harrison, Orient Longman, Delhi.

The sounds of English, Veena Kumar, Makaav Educational Software, New Delhi.

**CBSN-202 B****TECHNICAL PRESENTATION SKILLS****Unit 1: Introduction to Technical Presentations**

This unit provides an overview of technical presentations, emphasizing their purpose, importance, and key characteristics. It covers the components of an effective presentation and the role of technical communication in conveying complex information clearly and effectively.

**Unit 2: Planning and Structuring Presentations**

This unit focuses on the planning stage of presentations, including identifying the audience, defining objectives, and researching content. It addresses how to organize information logically, create outlines, and develop a clear structure that includes an introduction, body, and conclusion.

**Unit 3: Designing Visual Aids**

This unit explores the use of visual aids in presentations, such as slides, charts, graphs, and handouts. It discusses principles of effective design, including clarity, simplicity, and relevance. Students will learn how to create visually appealing materials that enhance understanding and retention.

**Unit 4: Delivery Techniques and Strategies**

This unit covers techniques for delivering technical presentations effectively. It includes vocal skills, body language, and engaging the audience. Strategies for managing anxiety and improving confidence in public speaking are also discussed, along with the importance of practice and feedback.

**Unit 5: Handling Questions and Feedback**

This unit focuses on interacting with the audience during and after a presentation. It addresses strategies for handling questions, managing discussions, and responding to feedback constructively. Students will learn techniques for maintaining control and fostering an interactive atmosphere during presentations.



**Unit 1: Introduction to User Manuals and Guides**

This unit provides an overview of user manuals and guides, their purpose, and significance in technical communication. It covers the different types of user documentation, the target audience, and the role of user manuals in enhancing user experience and product usability.

**Unit 2: Principles of User-Centered Design**

This unit focuses on the principles of user-centered design in the creation of manuals and guides. It discusses the importance of understanding user needs, preferences, and skills. Techniques for user research, persona development, and usability testing are explored to ensure documentation meets user expectations.

**Unit 3: Content Development and Organization**

This unit emphasizes the process of developing content for user manuals and guides. It covers techniques for gathering information, writing clear and concise instructions, and organizing content logically. It also addresses the importance of creating effective headings, subheadings, and lists to enhance readability.

**Unit 4: Visual Elements and Formatting**

This unit explores the use of visual elements in user manuals, including diagrams, screenshots, and illustrations. It discusses the principles of effective formatting, layout design, and the use of typography to improve the overall presentation of the document. Techniques for integrating visuals with text to enhance understanding are also covered.

**Unit 5: Review, Revision, and Maintenance**

This unit focuses on the importance of reviewing and revising user manuals and guides for accuracy and clarity. It discusses the processes for editing, proofreading, and incorporating user feedback. Additionally, it addresses strategies for maintaining and updating documentation to ensure it remains relevant and effective over time.

**Unit 1: Introduction to Business Communication**

In this unit, students will explore the significance of communication within the business environment. It will cover the various forms of communication, including verbal, non-verbal, written, and visual communication. The unit will address the barriers that can hinder effective communication and discuss strategies to overcome these obstacles. Additionally, the role of technology in facilitating business communication will be examined.

**Unit 2: Written Communication**

This unit focuses on the principles of written communication in a business context. Students will learn about the structure and format of essential business documents such as letters, emails, memos, and reports. The emphasis will be on techniques that promote clarity, conciseness, and coherence in writing. The importance of tone and style will also be highlighted, alongside guidelines for creating effective proposals and presentations.

**Unit 3: Oral Communication**

In this unit, students will gain insights into the fundamentals of effective speaking within a business setting. They will explore techniques for delivering engaging presentations and public speaking skills. The unit will address the significance of body language and voice modulation in communication, as well as strategies for conducting productive meetings and discussions.

**Unit 4: Interpersonal Communication**

This unit will delve into the nature of interpersonal communication and its critical role in business interactions. Students will develop skills in active listening and providing constructive feedback. The unit will also cover conflict resolution techniques and negotiation skills, emphasizing how to build and maintain professional relationships through effective communication.

**Unit 5: Business Communication in a Global Context**

Students will examine the challenges and strategies associated with cross-cultural communication in this unit. The importance of understanding diversity in communication styles and practices will be emphasized. The impact of globalization on business communication will also be discussed, along with ethical considerations and etiquette when communicating in an international business environment.

1. Class and Object Creation
2. Constructors and Destructors
3. Inheritance
4. Method Overriding
5. Abstract Classes and Pure Virtual Functions
6. Operator Overloading
7. Function Overloading
8. Friend Function
9. Static Members
10. Template Class
11. Exception Handling
12. File Handling
13. Virtual Destructors
14. Multiple Inheritance
15. Composition
16. Dynamic Memory Allocation
17. Linked List Implementation
18. Binary Tree Implementation
19. Polymorphism with Pointers
20. Real-World Example: Banking System

1. Bubble Sort
2. Selection Sort
3. Insertion Sort
4. Merge Sort
5. Quick Sort
6. Heap Sort
7. Counting Sort
8. Radix Sort
9. Binary Search
10. Linear Search
11. Depth-First Search (DFS)
12. Breadth-First Search (BFS)
13. Dijkstra's Algorithm
14. Prim's Algorithm
15. Kruskal's Algorithm
16. Floyd-Warshall Algorithm
17. Knapsack Problem (0/1 Knapsack)
18. Dynamic Programming - Longest Common Subsequence
19. Backtracking - N-Queens Problem
20. Greedy Algorithm - Activity Selection Problem

**CCSN-256****INTERNET AND WEB TECHNOLOGY LAB**

1. HTML Basics
2. CSS Styling
3. JavaScript Basics
4. Responsive Web Design with Bootstrap
5. Creating a Simple Web Form
6. Validating Form Inputs with JavaScript
7. AJAX Requests with jQuery
8. Fetch API for Asynchronous Requests
9. JSON Data Handling
10. Introduction to PHP
11. Database Connectivity with MySQL
12. CRUD Operations in PHP
13. Using PHP Sessions
14. Implementing User Authentication
15. Creating RESTful APIs
16. Introduction to WordPress
17. Building a Simple Website with WordPress
18. Implementing Web Security Practices
19. Web Hosting and Deployment
20. Introduction to Content Management Systems (CMS)

# SOFTWARE ENGINEERING

CCSN-301

Cr L-T-P  
4 3-1-0

## UNIT - I

**Introduction:** Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

## UNIT - II

**Software Requirement Specifications (SRS):** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

**Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

## UNIT - III

**Software Design:** Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

## UNIT - IV

**Software Testing:** Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.

Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

## UNIT - V

**Software Maintenance and Software Project Management:** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

## References:

1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

# COMPILER DESIGN

CCSN303

Cr L-T-P

4 3-1-0

## Unit - I

Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

## Unit – II

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

## Unit - III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions,

## Unit - IV

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

## Unit - V

Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

## Reference Books:

1. Alfred V. Aho, Jeffrey D. Ullman, “*Principles of Compiler Design*”, Narosa Publication, 2002
2. A.V. Aho, R. Sethi and J.D Ullman, “*Compiler: principle, Techniques and Tools*”, Addison Wesley, 2<sup>nd</sup> Edition, 2006.
3. H.C. Holub, “*Compiler Design in C*”, Prentice Hall Inc, Second Edition, Digitized Edition, 2010.
4. O.G. Kakde, “*Compiler Design*”, Laxmi Publication, Seventh Edition, 2007

## OBJECT ORIENTED ANALYSIS AND DESIGN

CCSN-305

Cr L-T-P

4 3-1-0

### Unit – I

Object Modeling: Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints.

### Unit – II

Dynamic Modeling: Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model.

### Unit – III

Functional Modeling: Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD.

### Unit – IV

Java Programming: Introduction, Operator, Data types, Variables, Methods & Classes, Multithread

Programming, I/O, Java Applet.

Java Library: String Handling, Input/Output exploring Java.io, Networking, Applets classes, Event

Handling, Introduction to AWT, Working with window, Graphics, AWT Controls, Layout Manager and

Menus, Images, Additional packages.

### Unit – V

Software Development using Java:

Java Beans, Java Swing, Java Servlets, Migrating from C++ to java, Application of java, Dynamic

Billboard Applet, Image Menu: An image based menu, Lavatron Applets, Scrabblets, JDBC, Brief

functioning of upper layer E-mail and their applications.

### Text Books:

1. James Rumbaugh et al, “Object Oriented Modeling and Design”, PHI
2. Herbert Schildt, “The Complete Reference: Java”, TMH.
3. E. Balagurusamy, “Programming in JAVA”, TMH.

References:

1. Booch Grady, “Object Oriented Analysis & Design with application 3/e”, Pearson Education, New Delhi.
2. Bjarne Stroustrup, “C++ Programming Language”, Addison Wesley
3. E. Balagurusamy, “Object Oriented Programming with C++”, TMH



## CRYPTOGRAPHY AND INFORMATION SECURITY

CCSN-307

Cr L-T-P

4 3-1-0

### Unit - I

**Introduction to the Concept of Security:** Introduction to Computer Security, Network Security, Cryptology & Cryptography, Introduction to Security attacks, Services and Mechanism. **Symmetric Key Encipherment:** Conventional encryption Model, Classical encryption techniques substitution ciphers & transposition ciphers, Cryptanalysis, Stereography, Stream & Block Ciphers

### Unit - II

**Block Ciphers:** Block Cipher Principals, Shannon's Theory of Confusion and Diffusion, Fiestal structure, DES, Strength of DES, Differential & Linear Cryptanalysis of DES, Block Cipher Modes of operation, Triple DES, IDEA encryption & Decryption, Strength of IDEA, Confidentiality using Conventional Encryption, Traffic confidentiality, key distribution, random number generation

### Unit - III

**Mathematics of Cryptography:** Introduction to Graph, Ring and Field, Prime and relative prime numbers, Modular Arithmetic, Fermat's & Euler's Theorem, Primality Testing, Euclid's Algorithm, Chinese remainder theorem, Discrete logarithms. **Asymmetric Key Encipherment:** Principals of public key cryptosystems, RSA Algorithms, Security of RSA, key management, Diffe- Hellman key exchange algorithm, Introductory idea if Elliptic curve Cryptography, Elganal Encryption.

### Unit - IV

**Integrity, Authentication & Hash Function:** Authentication requirements, Authentication functions, Message Authentication Codes. Hash functions, Birthday Attacks, Security of Hash function & MAC, MD5 Message Digest Algorithm, Secure Hash Algorithm. **Digital Signatures:** Digital Signature, Authentication Protocol, DSS, Proof of Digital Signature Algorithms.

### Unit - V

**Network Security Applications: Authentication Applications:** Kerberos & X.509, Directory Authentication Services **E-Mail Security:** PGP, S/MIME. **IP Security:** Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, key management. **Web Security:** Secure Socket Layer & Transport Layer Security , Secure electronic Transaction, **System Security:** Intruder, Intrusion Detection, Password Management. **Malicious Software:** Viruses and related threads. **Firewall:** Firewall design principles, trusted Systems

### Reference Books:

1. William Stallings," *Cryptography and Network Security: Principles and Practice*", Pearson Education, 5<sup>th</sup> edition, First impression 2011.
2. Forouzan A. Behrouz, "*Cryptography and Network Security* ", Tata McGraw Hill , 2<sup>nd</sup> Edition, 2008.

## **CCSN 309 INTERNET WEB PROGRAMMING**

### **Unit 1: Introduction to Web Technologies**

Overview of the internet and the World Wide Web, including the architecture of web applications. Exploration of client-server model, web servers, browsers, and the basics of web hosting.

### **Unit 2: HTML and CSS**

Fundamentals of HTML for structuring web content, including elements, attributes, and semantic HTML. Introduction to CSS for styling web pages, covering selectors, properties, layout techniques, and responsive design principles.

### **Unit 3: JavaScript and DOM Manipulation**

Introduction to JavaScript as a programming language for the web. Focus on syntax, data types, functions, and event handling. Exploration of the Document Object Model (DOM) for dynamic content manipulation and interaction with HTML elements.

### **Unit 4: Server-Side Programming**

Overview of server-side scripting languages, with an emphasis on PHP or Node.js. Topics include form handling, session management, and database connectivity using SQL. Introduction to RESTful services and API integration.

### **Unit 5: Web Development Frameworks**

Introduction to popular web development frameworks such as React, Angular, or Django. Focus on understanding framework architecture, component-based development, and best practices for building scalable web applications.

**Unit 1: Introduction to Graphs**

Overview of graph theory, including definitions and basic terminologies such as vertices, edges, and types of graphs. Exploration of directed and undirected graphs, simple graphs, and multigraphs, as well as graph representations like adjacency matrices and adjacency lists.

**Unit 2: Graph Traversal Algorithms**

Study of fundamental graph traversal methods, including depth-first search (DFS) and breadth-first search (BFS). Applications of these algorithms in solving problems related to connectivity and graph exploration.

**Unit 3: Connectivity and Components**

Examination of connected graphs, components, and the concepts of strong and weak connectivity in directed graphs. Discussion on cut vertices, bridges, and applications in network reliability.

**Unit 4: Trees and Their Properties**

Introduction to trees, properties of tree structures, and applications in various fields. Exploration of binary trees, spanning trees, and the concepts of minimum spanning trees, including algorithms such as Prim's and Kruskal's.

**Unit 5: Graph Coloring and Matching**

Study of graph coloring concepts, including applications in scheduling and resource allocation. Examination of matchings in graphs, including perfect matchings and applications of the Hall's marriage theorem.

**Unit 1: Introduction to Computer Vision**

Overview of the field of computer vision, its history, and applications. Discussion of the human visual system and the fundamentals of image formation, including image acquisition and representation.

**Unit 2: Image Processing Fundamentals**

Introduction to basic image processing techniques including image enhancement, filtering, and noise reduction. Exploration of color spaces, histogram equalization, and morphological operations.

**Unit 3: Feature Detection and Description**

Study of key concepts in feature detection, including edge detection, corner detection, and blob detection. Examination of feature descriptors such as SIFT, SURF, and ORB for image matching and recognition.

**Unit 4: Image Segmentation**

Overview of image segmentation techniques, including thresholding, clustering, region-based methods, and graph-based segmentation. Discussion of the challenges in segmentation and evaluation metrics.

**Unit 5: Object Detection and Recognition**

Exploration of object detection algorithms, including traditional methods and deep learning approaches. Discussion of techniques such as R-CNN, YOLO, and SSD, along with applications in real-world scenarios.

## **CUCS 343    ROBOTICS AND AUTOMATION**

### **Unit 1: Introduction to Robotics**

Overview of robotics, including definitions, history, and types of robots. Exploration of the applications of robotics in various industries and the fundamental components of robotic systems.

### **Unit 2: Kinematics of Robots**

Study of robot kinematics, focusing on forward and inverse kinematics. Analysis of the motion of robotic arms and end effectors, including transformations and the Denavit-Hartenberg convention.

### **Unit 3: Dynamics of Robots**

Introduction to the principles of dynamics as applied to robotic systems. Covers the concepts of forces, torques, and motion equations, including Newton's laws and Lagrangian mechanics.

### **Unit 4: Sensors and Actuators**

Examination of various sensors used in robotics, such as proximity sensors, cameras, and IMUs. Discussion of actuators, including motors and servos, and their roles in robot movement and control.

### **Unit 5: Robot Control Systems**

Overview of control strategies for robotic systems, including open-loop and closed-loop control. Exploration of PID control, adaptive control, and advanced techniques for motion control and trajectory planning.

## **CUCS-345 WEB SERVICE AND SERVICE ORIENTED ARCHITECTURE**

### **Unit 1: Introduction to Web Services**

This unit covers the fundamental concepts of web services, including their definition and purpose. It explores the evolution of web services, their significance in modern computing, and the various types of web services, such as SOAP and REST. Additionally, it examines the architecture of web services and the key components involved.

### **Unit 2: SOAP Web Services**

In this unit, students learn about Simple Object Access Protocol (SOAP), including its structure and messaging framework. It discusses the creation and consumption of SOAP web services, including the use of WSDL (Web Services Description Language) to describe service interfaces. The unit also covers error handling in SOAP and security measures.

### **Unit 3: RESTful Web Services**

This unit focuses on Representational State Transfer (REST) architecture and its principles. It explores how RESTful services differ from SOAP services, including the use of HTTP methods (GET, POST, PUT, DELETE) and status codes. The unit covers the design and implementation of RESTful APIs, including best practices for RESTful web service development.

### **Unit 4: Service-Oriented Architecture (SOA)**

This unit introduces the concept of Service-Oriented Architecture, explaining its principles and benefits. It discusses the role of services in SOA, including service design, service orchestration, and service composition. The unit also covers the importance of interoperability and loose coupling in SOA.

### **Unit 5: Web Service Security**

In this unit, students learn about the security concerns associated with web services. It covers security standards and protocols, such as WS-Security, OAuth, and OpenID. The unit also addresses authentication, authorization, and encryption methods to ensure secure communication between services.

## **HUMAN COMPUTER INTERACTION**

**CUCS-347**

**Cr L-T-P**

**4 3-1-0**

UNIT - I Introduction : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT - II Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT - III Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT - IV Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls, Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT – V Software tools – Specification methods, interface – Building Tools, Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS : 1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamaTech.

2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia.

3. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL BEALG, PEARSON.

4. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech, 3. User Interface Design, Soren Lauesen , Pearson Education

## ENERGY STUDIES

**CBSN-301**

**Cr L-T-P**

**4 3-1-0**

UNIT 1: Energy Sources - Fossil fuels, Nuclear fuels, hydel, solar, wind and bio fuels in India, Energy conservation, Nuclear energy through fission and fusion processes.

UNIT 2: Energy Conversion- Energy conversion from source to utility, Solar, Nuclear, Geothermal, Tide and Wind Energies.

UNIT 3: Global Energy Scenario- Role of energy in economic development and social transformation, Overall energy demand, availability and consumption, Depletion of energy resources and its impact on economy, Non proliferation of nuclear energy. International energy policies of G-8, G-20, OPEC and European Union countries.

UNIT 4: Indian Energy Scenario- Commercial and noncommercial forms of energy, Utilization pattern in the past, present and also future prediction, Sector wise energy consumption.

UNIT 5: Energy Policy: Energy policy issues at global level, national level and state level, Energy conservation act 2001, Electricity act 2003, Energy pricing and its impact on global variations.

Text Books:

1. Jose Goldenberg, Thomas Johanson, and Reddy, A.K.N., Energy for Sustainable World, WileyEastern, 2005.
2. Charles E. Brown, World Energy Resources, Springer Publication, New York, 2002.
3. Culp, A.W., Principles of Energy Conversion, McGraw Hill New York, 2004. 80

Reference Books:

1. Bukhoutsow, B., Energy Policy and Planning, Prentice Hall of India, New Delhi, 2003.
2. TEDDY Year Book, The Energy Research Institute (TERI), 2011



**Unit 1: Introduction to Software Engineering**

Overview of software engineering principles and methodologies, including the software development lifecycle, software process models, and the importance of requirements analysis. Introduction to software tools and environments.

**Unit 2: Requirements Analysis and Specification**

Hands-on practice in gathering and analyzing software requirements. Techniques for writing clear and concise requirements specifications using tools for requirements management. Emphasis on user stories and use case diagrams.

**Unit 3: Software Design**

Exploration of software design principles, patterns, and best practices. Implementation of design diagrams including class diagrams, sequence diagrams, and architecture design. Use of design tools for visual representation of software architecture.

**Unit 4: Software Development and Implementation**

Practical experience in coding and implementation of software solutions using a chosen programming language. Focus on version control systems, collaborative development tools, and coding standards. Emphasis on modular programming and unit testing.

**Unit 5: Software Testing and Quality Assurance**

Introduction to software testing methodologies and strategies. Practical exercises in writing test cases, conducting different types of testing (unit, integration, system, acceptance), and using automated testing tools. Concepts of software quality assurance and metrics.

**Unit 6: Project Management and Documentation**

Exploration of software project management concepts including planning, scheduling, and resource management. Hands-on experience with project management tools. Emphasis on documenting the software development process and maintaining project artifacts.

## **CCSN-353    COMPILER DESIGN LAB**

### **Unit 1: Introduction to Compilers**

Overview of the compiler design process, components of a compiler, and the phases of compilation. Study of the role of the compiler in programming languages and the importance of syntax and semantics.

### **Unit 2: Lexical Analysis**

Implementation of a lexical analyzer using regular expressions and finite automata. Development of tools like Lex or Flex for tokenizing input strings. Analysis of token representation and symbol tables.

### **Unit 3: Syntax Analysis**

Construction of a syntax analyzer or parser using context-free grammars. Implementation of parsing techniques such as LL(1) and LR(1) parsers. Development of a parser generator like Yacc or Bison.

### **Unit 4: Semantic Analysis**

Design of a semantic analyzer to check variable types, scope, and declarations. Implementation of symbol table management and type checking. Exploration of abstract syntax trees and their construction.

### **Unit 5: Intermediate Code Generation**

Generation of intermediate code representations such as three-address code or quadruples. Techniques for code optimization and analysis of control flow and data flow within programs.

## **CCSN-355 OBJECT ORIENTED ANALYSIS AND DESIGN LAB**

### **Unit 1: Introduction to Object-Oriented Concepts**

Overview of object-oriented programming principles including classes, objects, inheritance, encapsulation, and polymorphism. Discussion of the advantages of object-oriented design over procedural programming.

### **Unit 2: Unified Modeling Language (UML)**

Introduction to UML as a standard modeling language. Study of various UML diagrams such as class diagrams, use case diagrams, sequence diagrams, and activity diagrams. Practical exercises in creating UML diagrams to represent system designs.

### **Unit 3: Object-Oriented Analysis**

Techniques for requirements gathering and analysis using object-oriented methodologies. Focus on identifying use cases, actors, and system requirements. Development of use case diagrams and scenarios to model system functionality.

### **Unit 4: Object-Oriented Design**

Principles of designing software systems using object-oriented techniques. Emphasis on design patterns, system architecture, and the application of SOLID principles. Hands-on experience with designing class structures and interactions.

### **Unit 5: Implementation and Testing**

Transition from design to implementation using an object-oriented programming language. Practical coding sessions to develop, test, and debug applications. Focus on unit testing, integration testing, and validation of object-oriented systems.

**Unit- I**

**Transformation, Projections, and Clipping Algorithm:** Bresenham's Line Drawing Algorithm, Homogeneous Coordinates system for 2D AND 3D , Various 2D, 3D, Transformation matrices(Translation, Scaling, Rotation , Shear), Rotation about an arbitrary point(2D), Rotation about an arbitrary axis(3D), Computing location of V.P., Clipping algorithms, Sutherland-Cohen Clipping Algorithm, Bresenham's Circle Drawing Algorithm.

**Unit - II**

**Curves and Surfaces** Bezier Curves, 4 point and 5 point Bezier curves using Bernstein Polynomials , Conditions for smoothly joining curve segments, Bezier bi-cubic surface patch, B-Spline Curves, Cubic B-Spline curves using uniform knot vectors. Testing for first and second order continuities, Effect of multiple control points at same location, Geometrical Construction, Computing control points given end slopes for a specified curve segment.

**Unit - III**

**Projection and Solid Modeling** Parallel Projection, Oblique Projection on xy plane, Isometric Projection, Perspective Projection, One Vanishing Point(V.P.) projection from a point on z axis, Generation of 2 V.P. Projection , Solid Modeling, Sweeping a polygon or a surface patch along a path to form solids, Boundary Representations (B-Rep), octrees, CSG-Constructive Solid Geometry.

**Unit - IV**

**Shading** Illumination Model for diffused Reflection ,Effect of ambient lighting, distances, Specular Reflection Model, Computing Reflection Vector, Curved Surfaces, Polygonal Approximations, Gourard Shading, Phong Model.

**Unit-V**

**Hidden surface Removal** Floating Horizon Method, Back Face Detection , Depth Buffer(Z-Buffer, A-Buffer) Method, Scan Line Method, Depth Sorting Method, BSP-Tree Method, Area Subdivision Method.

**Reference Book:**

1. Donald Hearn and M. P. Baker, *Computer Graphics*, Prentice Hall Inc., 3<sup>rd</sup> Edition, 2003.
2. Foley, Van Dam, *Computer Graphics Principles & Practice*, Pearson Education, 2<sup>nd</sup>

**Unit – I**

Introduction: Data-ware housing: Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Stars, Snow Flakes, Fact Constellations, Data marts, 3 Tier Architecture of Data Warehouse, OLAP Servers: ROLAP, MOLAP, HOLAP.

Data Mining: Motivation (for Data Mining), Definition & Functionalities, knowledge discovery steps, Architecture, Statistical measures in large Databases. Measuring Central Tendency.

**Unit - II**

Data Processing: Requirement for preprocessing, Data Cleaning and its various techniques, Data Integration and Transformation, Data Reduction:- Data Cube Aggregation, attribute subset selection, Numerosity Reduction, Concept hierarchy generation. Attribute oriented induction Concept Description and Data Generalization, implementation of AOI, presentation of derived generalization and class description, Mining Class comparisons. Mining frequent patterns, A priori Algorithm, F P Growth, Mining various kind of Association rule: Multilevel, Multi-Dimensional, correlation analysis, constraints based mining.

**Unit - III**

Classification and Predictions:

Basics and issues regarding Classification & Prediction, Classification by Decision tree induction, Bayesian Classification, Rule-based Classification, Classification by Back propagation; Multilayer feed-forward Neural Network, Back-propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm, and regression based methods for prediction, accuracy and error measure.

**Unit - IV**

Cluster analysis: requirement of clustering in data mining, Data types in cluster analysis, Categories of clustering methods, Partitioning methods: K-mean and K-medoids. Hierarchical Clustering: agglomerative and divisive clustering, BIRCH, and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – expectation-maximization, Outlier Analysis: statistical distribution method, distance based method.

**Unit - V**

Applications and Trends in data mining: Data mining applications, themes on data mining, social impact on data mining, trends in data mining. Data mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

**Reference Books:**

1. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier, 2nd edition 2010.

2. M.H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 1st edition, 2007.

3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems", Pearson Education, 1st edition, 2008.

4. Pieter Adriaans, Dolf Zantinge, "Data Mining", Pearson Education, 4th edition, 2009.

## MOBILE COMPUTING

**CCSN-306**

**Cr. L T P**

**4 3 10**

### Unit – I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

### Unit - II

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

### Unit – III

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

### Unit - IV

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

### Unit – V

Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

### **Books:**

1. J. Schiller, Mobile Communications, Addison Wesley.
2. A. Mehrotra , GSM System Engineering.
3. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.
4. Charles Perkins, Mobile IP, Addison Wesley. 5. Charles Perkins, Ad hoc Networks, Addison Wesley.

# KNOWLEDGE MANAGEMENT& EXPERT SYSTEM

CCSN-308

Cr. L T P

4 3 1 0

## Unit - I

Introduction to knowledge Management Distinction between data , information & knowledge. Concept of knowledge creation, Intellectual Capital Creation, Human Capital, Customer Capital and Organizational Capital

## Unit-II

Socio-cultural aspects & organizational aspects Tacit & Explicit knowledge & Knowledge Organization . Knowledge Storage and Distribution, KM tools, Data warehouse, Data mining, knowledge management evaluation & Valuation of Knowledge.

## Unit-III

K- Sharing Practices and Barriers. K – culture, KM In Indian organizations and MNC. Learning Organizations & Organizational Learning

## Unit – IV

**Expert System** Existing Expert Systems (DENDRAL, MYCIN), Architecture of expert system, Features of Expert system, Genetic algorithm, Fuzzy logic, Neural Networks, Intelligent Agents, Meta Knowledge, Expertise Transfer, Self Explaining System, User and expert systems.

## Unit-V

K-Initiative, K-Strategic issues in knowledge management, K-Commerce

## Reference Books:

1. SudhirWarrier, “*Knowledge Management*”, Vikas publishing House, New Delhi, First edition, 2007.
2. Thotharti Raman, “*Knowledge Management*”, Excel Books ,New Delhi, First Edition,2004.
3. Stuart Barnes “*Knowledge Management Systems: Theory & Practice*”, Thomson Learning Press, New Delhi, First Edition, 2002.
4. Ronald Maier, “*Knowledge Management System*”, Springer, Germany, Second Edition,2002.
5. AmritTiwana, “*Knowledge Management Tool Kit*”, Pearson Education, New Delhi, First Edition, 2002.

### **Unit 1: Understanding Knowledge Management**

Introduction to the concepts of knowledge and knowledge management, exploring the types of knowledge, including tacit and explicit knowledge, and the importance of knowledge management in organizations.

### **Unit 2: Knowledge Creation and Sharing**

Examination of processes involved in knowledge creation, including socialization, externalization, combination, and internalization. Discussion on knowledge sharing practices, barriers to sharing, and strategies for fostering a knowledge-sharing culture.

### **Unit 3: Knowledge Storage and Retrieval**

Overview of methods for storing and organizing knowledge, including knowledge repositories, databases, and content management systems. Emphasis on techniques for effective knowledge retrieval and the role of technology in knowledge management.

### **Unit 4: Knowledge Management Systems and Tools**

Exploration of various knowledge management systems and tools, including collaborative platforms, decision support systems, and enterprise social networks. Discussion on selecting appropriate tools for different organizational needs.

### **Unit 5: Knowledge Management Strategies and Best Practices**

Analysis of knowledge management strategies and frameworks, including the role of leadership and organizational culture. Examination of best practices in implementing and sustaining knowledge management initiatives within organizations.



### **Unit 1: Introduction to Information Systems**

Exploration of the role and importance of information systems in organizations. Examination of various types of information systems, their components, and how they support decision-making processes.

### **Unit 2: Information Technology Fundamentals**

Overview of the fundamental concepts of information technology, including hardware, software, networking, and data management. Discussion of current technologies and trends shaping the IT landscape.

### **Unit 3: Database Management Systems**

Introduction to database concepts, including data modeling, database design, and the relational database model. Study of SQL and database management system functionalities, including data retrieval, manipulation, and integrity.

### **Unit 4: System Development Life Cycle**

Understanding the phases of the system development life cycle, including planning, analysis, design, implementation, and maintenance. Exploration of methodologies and tools used in system development.

### **Unit 5: Information Security and Ethics**

Examination of information security principles, threats, and risk management strategies. Discussion of ethical considerations in information systems, including privacy, intellectual property, and regulatory compliance.

**Unit 1: Introduction to Organizational Learning**

Overview of organizational learning concepts, definitions, and the importance of learning in organizations. Exploration of theories and models of learning within an organizational context.

**Unit 2: Learning Theories and Approaches**

Examination of key learning theories, including behaviorism, cognitivism, and constructivism. Discussion of experiential learning and the role of social learning in organizations.

**Unit 3: Knowledge Management**

Introduction to knowledge management concepts, including the types of knowledge (tacit and explicit) and the processes involved in capturing, sharing, and applying knowledge within organizations.

**Unit 4: Learning Culture and Environment**

Analysis of the role of organizational culture in fostering learning. Exploration of how leadership, communication, and trust contribute to a supportive learning environment.

**Unit 5: Learning Organizations**

Study of the characteristics and attributes of learning organizations. Examination of practices and strategies for promoting continuous learning and adaptability in organizations.

### **Unit 1: Introduction to Knowledge Management**

Overview of knowledge management concepts, definitions, and importance. Examination of the knowledge economy and the role of knowledge in organizational success. Introduction to key theories and models of knowledge management.

### **Unit 2: Knowledge Creation and Capture**

Exploration of knowledge creation processes, including tacit and explicit knowledge. Strategies for knowledge capture and documentation. Discussion on the role of communities of practice and collaborative technologies in knowledge creation.

### **Unit 3: Knowledge Sharing and Transfer**

Analysis of methods and tools for knowledge sharing within organizations. Examination of barriers to knowledge sharing and strategies to overcome them. Study of social networks and informal knowledge transfer mechanisms.

### **Unit 4: Technology in Knowledge Management**

Evaluation of emerging technologies that facilitate knowledge management, including artificial intelligence, machine learning, and big data analytics. Discussion on knowledge management systems, their architecture, and implementation.

### **Unit 5: Knowledge Management Strategies and Practices**

Development of knowledge management strategies aligned with organizational goals. Examination of best practices in knowledge management and case studies from various industries. Discussion on the measurement and assessment of knowledge management effectiveness.

**Unit 1: Introduction to Embedded Systems**

Overview of embedded systems, their characteristics, and applications. Discussion on the architecture of embedded systems, including hardware and software components, and comparison with general-purpose computing systems.

**Unit 2: Microcontrollers and Microprocessors**

Study of microcontrollers and microprocessors, including their architecture, operation, and programming. Exploration of popular microcontrollers and microprocessors used in embedded systems, along with their instruction sets and interfacing techniques.

**Unit 3: Embedded System Design**

Fundamentals of embedded system design, including design methodologies and processes. Discussion on system specification, modeling, and design tools. Consideration of hardware-software co-design and integration challenges.

**Unit 4: Real-Time Operating Systems**

Introduction to real-time operating systems (RTOS) and their importance in embedded systems. Exploration of task scheduling, synchronization, and inter-process communication. Discussion on different types of RTOS and their applications.

**Unit 5: Embedded System Applications**

Examination of various applications of embedded systems in different fields such as automotive, healthcare, industrial automation, and consumer electronics. Study of case studies showcasing the implementation of embedded systems in real-world scenarios.

**Unit 1: Introduction to Simulation**

Overview of simulation concepts, types of simulation, and the role of modeling in various applications. Discussion of the advantages and disadvantages of simulation as a problem-solving tool.

**Unit 2: Modeling Techniques**

Exploration of different modeling techniques, including mathematical, statistical, and graphical models. Introduction to system dynamics and discrete event simulation, along with model development processes.

**Unit 3: Simulation Process**

Detailed examination of the simulation process, including problem definition, model formulation, experimentation, and analysis of results. Emphasis on the validation and verification of models.

**Unit 4: Statistical Analysis of Simulation Output**

Introduction to statistical methods for analyzing simulation output. Topics include confidence intervals, hypothesis testing, and regression analysis. Techniques for sensitivity analysis and model calibration.

**Unit 5: Applications of Simulation**

Discussion of practical applications of simulation across various fields such as engineering, healthcare, finance, and manufacturing. Case studies demonstrating the use of simulation in real-world scenarios.

**Unit 1: Introduction to Approximation Algorithms**

Overview of algorithmic problem-solving and the necessity of approximation algorithms. Discussion on NP-hardness and the classification of problems based on their approximation characteristics.

**Unit 2: Performance Analysis of Approximation Algorithms**

Study of the concepts of approximation ratio and performance guarantees. Analysis of different approximation techniques and their effectiveness in various problem domains.

**Unit 3: Greedy Algorithms**

Exploration of greedy strategies for optimization problems. Examination of classic problems such as the Knapsack problem, Minimum Spanning Tree, and Huffman coding. Understanding when greedy algorithms yield optimal solutions.

**Unit 4: Dynamic Programming and Approximation**

Application of dynamic programming techniques in designing approximation algorithms. Discussion on problems such as the Traveling Salesman Problem and how dynamic programming approaches can be adapted for approximation.

**Unit 5: Linear Programming and Rounding Techniques**

Introduction to linear programming as a tool for approximation. Examination of rounding techniques and their application in creating approximation algorithms for various optimization problems.

## SOFTWARE PROJECT MANAGEMENT

CUCS-342

Cr. L T P  
4 3 10

### Unit – I

#### Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

### Unit – II

#### Project Organization and Scheduling

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

### Unit - III

#### Project Monitoring and Control

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Desk checks, Walkthroughs, Code Reviews, Pair Programming.

### Unit – IV

#### Software Quality Assurance and Testing

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

### Unit – V

#### Project Management and Project Management Tools

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

#### Reference Books:

1. Software Project Management by M. Cotterell
2. Information Technology Project Management
3. Management Information and Control by
4. Software Project Management by S. A. Kelkar

### **Unit 1: Introduction to Project Management**

Overview of project management concepts, terminology, and frameworks. Exploration of the project life cycle, project stakeholders, and the importance of project planning and scheduling in achieving project success.

### **Unit 2: Project Planning Techniques**

Examination of various project planning techniques, including project scope definition, work breakdown structures (WBS), and estimation of project activities. Discussion of resource allocation and budgeting in project planning.

### **Unit 3: Scheduling Methods**

Introduction to different scheduling methods, including Gantt charts, network diagrams, and critical path method (CPM). Analysis of program evaluation and review technique (PERT) and its applications in project scheduling.

### **Unit 4: Resource Management**

Focus on resource management in projects, including resource leveling and resource allocation strategies. Discussion of constraints, dependencies, and the impact of resource availability on project schedules.

### **Unit 5: Monitoring and Controlling Projects**

Techniques for monitoring and controlling project progress, including earned value management (EVM) and performance measurement. Examination of project risk management and its role in project planning and scheduling.



### **Unit 1: Introduction to Risk Management**

Overview of risk management principles and processes in software projects. Discussion on the importance of risk management and its impact on project success. Introduction to key terms and concepts related to risk.

### **Unit 2: Risk Identification**

Techniques and methods for identifying risks in software projects. Exploration of tools and frameworks for risk identification, including brainstorming, checklists, and interviews. Understanding the role of stakeholders in the identification process.

### **Unit 3: Risk Assessment and Analysis**

Methods for assessing and analyzing risks, including qualitative and quantitative approaches. Exploration of risk prioritization techniques and the use of risk matrices. Understanding the implications of risk assessment on project planning.

### **Unit 4: Risk Mitigation Strategies**

Development of risk response strategies and planning for risk mitigation. Discussion on various approaches to manage identified risks, including avoidance, transfer, acceptance, and reduction. Strategies for creating effective risk management plans.

### **Unit 5: Risk Monitoring and Control**

Techniques for monitoring and controlling risks throughout the software project lifecycle. Discussion on the role of continuous risk assessment, documentation, and reporting. Exploration of tools for tracking risks and measuring the effectiveness of mitigation strategies.

### **Unit 1: Introduction to Project Quality Management**

Overview of project quality management principles and its significance in project management. Discussion on quality concepts, definitions, and the role of quality management in achieving project objectives.

### **Unit 2: Quality Planning**

Exploration of quality planning processes, including defining quality standards and objectives for projects. Examination of tools and techniques used for quality planning, such as quality metrics and quality assurance plans.

### **Unit 3: Quality Assurance**

Study of quality assurance principles and practices in project management. Focus on the processes involved in ensuring that quality standards are met, including audits, process analysis, and continuous improvement strategies.

### **Unit 4: Quality Control**

Introduction to quality control methods and techniques used to monitor project performance and ensure quality requirements are fulfilled. Covers statistical quality control tools, inspection processes, and corrective actions.

### **Unit 5: Continuous Improvement and Quality Management Systems**

Examination of continuous improvement methodologies such as Six Sigma and Total Quality Management (TQM). Discussion on implementing quality management systems and standards, including ISO standards and their application in project management.

**Unit 1: Introduction to Stakeholder Management**

Overview of stakeholder management concepts, identification of stakeholders, and the importance of stakeholder engagement in project management. Exploration of the stakeholder management process and its relevance to organizational success.

**Unit 2: Stakeholder Identification and Analysis**

Techniques for identifying stakeholders and categorizing them based on their influence and interest. Examination of stakeholder mapping tools, analysis of stakeholder needs and expectations, and understanding their potential impact on projects.

**Unit 3: Stakeholder Engagement Strategies**

Development of effective engagement strategies for various stakeholder groups. Exploration of communication methods, relationship building, and negotiation techniques to ensure active stakeholder involvement and buy-in.

**Unit 4: Managing Stakeholder Expectations**

Understanding the dynamics of stakeholder expectations and the role of effective communication in managing them. Strategies for aligning stakeholder expectations with project objectives and handling conflicts that may arise.

**Unit 5: Evaluating Stakeholder Management Success**

Methods for assessing the effectiveness of stakeholder management efforts. Examination of key performance indicators, feedback mechanisms, and lessons learned to improve future stakeholder engagement processes.

**Unit 1: Introduction to Microwave Engineering**

Overview of microwave frequencies and applications. Discussion on the characteristics of microwave signals and their propagation in various media. Introduction to microwave components and systems.

**Unit 2: Microwave Transmission Lines**

Analysis of transmission line theory, including the concept of characteristic impedance and reflection coefficient. Examination of different types of transmission lines such as coaxial cables and microstrip lines, along with their applications in microwave circuits.

**Unit 3: Microwave Devices**

Study of various microwave devices such as waveguides, resonators, and filters. Exploration of solid-state devices including diodes and transistors used at microwave frequencies. Introduction to active and passive microwave components.

**Unit 4: Microwave Network Analysis**

Fundamentals of network parameters including S-parameters and their applications in microwave circuit design. Discussion on two-port networks, matching networks, and stability considerations in microwave circuits.

**Unit 5: Microwave Measurement Techniques**

Techniques and equipment used for measuring microwave signals, including power, frequency, and impedance. Introduction to microwave test equipment and methods for evaluating the performance of microwave components and systems.

**Unit 1: Introduction to Supply Chain Management**

Overview of supply chain management concepts, objectives, and the importance of effective supply chain planning. Discussion of supply chain components and relationships between suppliers, manufacturers, distributors, and customers.

**Unit 2: Demand Planning and Forecasting**

Examination of demand planning processes and techniques, including qualitative and quantitative forecasting methods. Analysis of demand variability, forecasting accuracy, and the impact of demand planning on supply chain performance.

**Unit 3: Inventory Management**

Study of inventory types, functions, and costs within the supply chain. Exploration of inventory management techniques, including Economic Order Quantity (EOQ), Just-In-Time (JIT), and safety stock management.

**Unit 4: Production Planning and Scheduling**

Discussion of production planning methodologies, including aggregate planning and master production scheduling. Analysis of scheduling techniques, resource allocation, and the role of production planning in meeting demand.

**Unit 5: Supply Chain Strategy and Network Design**

Evaluation of supply chain strategies and their alignment with business goals. Examination of network design principles, including facility location, capacity planning, and transportation considerations.

**Unit 1: Introduction to Software Testing**

Basics of software testing, importance, and objectives. Overview of testing processes, principles, and the role of testing in the software development lifecycle. Types of software testing and their classifications.

**Unit 2: Test Planning and Documentation**

Creating a test plan, defining test objectives, and scope. Developing test cases and test scripts. Importance of test documentation and test data preparation. Test management and tracking tools.

**Unit 3: Testing Techniques and Strategies**

Black-box and white-box testing techniques. Equivalence partitioning, boundary value analysis, decision table testing, and path testing. Overview of testing strategies like unit testing, integration testing, system testing, and acceptance testing.

**Unit 4: Test Automation**

Introduction to test automation and its benefits. Overview of test automation tools and frameworks. Criteria for selecting test tools, creating automated test scripts, and maintaining automated test suites. Challenges in test automation.

**Unit 5: Debugging and Defect Management**

Understanding the debugging process and identifying root causes of defects. Defect lifecycle and defect tracking systems. Tools for defect management and best practices for logging and resolving defects.

## ENVIRONMENTAL STUDIES

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**CBSN-302**

### **Unit I**

**Atmosphere:** The Earth's Natural Greenhouse Effect: Greenhouse Gases, Global Warming, Ozone depletion, Acid rain, El Nina and La Nina Phenomenon.

### **Unit-II**

**Pollution:** Air, Water, Noise and Soil pollutions and their quality parameters

### **Unit-III**

**Waste Management:** Agricultural waste, Industrial waste and Other hazardous waste, Environment Impact Assessment.

### **Unit-IV**

**Sustainable Development:** Conservation of natural resources watershed management, Rain water harvesting and storage; Application of Remote Sensing and GIS

### **Unit-V**

**Environmental Management Systems:** ISO certification control policies, International and National legislations and acts related to environment.

### **Reference:**

1. Miller, T.G. Jr. *Environmental Science*. Wadsworth Publishing Co.
2. Liu, David H.F. and Béla G. Lipták. *Environmental Engineers' Handbook*. 2<sup>nd</sup> edition. Lewis Publishers, New York, 199F.
3. Jadhav, H. and V.M. Bhosale. *Environmental Protection and Laws*. Himalaya Publishing House, Delhi. 1995.
4. Rajagopalan, R. *Environmental Studies: From Crisis to Cure*. Oxford University Press, New Delhi.
5. Joseph, B. *Environmental Studies*. Tata McGraw-Hill, New Delhi.

## **CCSN-352    COMPUTER GRAPHICS LAB**

### **Unit 1: Introduction to Computer Graphics**

Overview of computer graphics fundamentals, including the graphics pipeline, types of graphics, and applications. Introduction to graphics programming environments and tools.

### **Unit 2: Basic Drawing Algorithms**

Implementation of fundamental drawing algorithms such as line drawing, circle drawing, and polygon filling. Exploration of rasterization techniques and pixel manipulation.

### **Unit 3: 2D Transformations**

Study of geometric transformations including translation, rotation, scaling, and reflection in 2D space. Implementation of transformation matrices and their applications in graphics.

### **Unit 4: 3D Graphics and Transformations**

Introduction to 3D graphics concepts, including 3D modeling, viewing transformations, and projection techniques. Implementation of basic 3D transformations and manipulation of 3D objects.

### **Unit 5: Animation Techniques**

Exploration of animation principles and techniques. Implementation of basic animation methods, including keyframe animation and motion interpolation. Introduction to time-based animation and its applications.



**Unit 1: Introduction to Data Mining Tools**

Overview of popular data mining tools and software, including installation and setup procedures. Introduction to the user interface and basic functionalities of tools such as Weka, RapidMiner, and Python libraries for data mining.

**Unit 2: Data Preprocessing**

Techniques for data cleaning, transformation, and normalization. Exploration of methods for handling missing values, outliers, and categorical data. Application of data reduction techniques to enhance efficiency in data analysis.

**Unit 3: Data Exploration and Visualization**

Methods for exploring datasets through descriptive statistics. Visualization techniques using tools like Matplotlib, Seaborn, or Tableau to represent data insights effectively. Emphasis on graphical representation of data patterns and trends.

**Unit 4: Classification Techniques**

Implementation of classification algorithms such as Decision Trees, k-Nearest Neighbors, and Support Vector Machines. Evaluation of classification models using metrics like accuracy, precision, recall, and F1-score.

**Unit 5: Clustering Techniques**

Exploration of clustering methods such as k-Means, Hierarchical clustering, and DBSCAN. Practical applications of clustering techniques in real-world scenarios and evaluation of clustering results through internal and external validation metrics.

### **Unit 1: Project Introduction**

Overview of the mini project concept, objectives, and significance in practical learning. Exploration of the project lifecycle, including planning, execution, and evaluation.

### **Unit 2: Topic Selection and Proposal**

Guidance on selecting relevant topics based on interest and feasibility. Development of a project proposal, including defining project scope, objectives, and expected outcomes.

### **Unit 3: Literature Review and Research Methodology**

Conducting a literature review to gather existing knowledge related to the chosen topic. Understanding research methodologies and techniques for data collection and analysis.

### **Unit 4: Project Implementation**

Hands-on execution of the project, including practical application of theoretical concepts. Development of the project deliverable, whether it be a report, prototype, or presentation.

### **Unit 5: Project Presentation and Evaluation**

Preparation for presenting project findings to an audience. Techniques for effective communication and presentation skills. Evaluation of the project based on set criteria, including originality, methodology, and results.

# DISTRIBUTED COMPUTING SYSTEMS

CCSN-401

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## Unit-I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks ,Lamport's& vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

## Unit-II

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlockprevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

## Unit-III

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems, Mechanism for buildingdistributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

## Unit-IV

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recoveryin Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamicvotingprotocols.

## Unit -V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit

protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

**REFERENCES:**

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Computing , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education

## ADVANCED COMPUTER SYSTEM ARCHITECTURE

CCSN-403

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### Unit - I

Parallel computer model: Evolution of computer architecture, system performance attributes, Multiprocessors and Multicomputer: shared memory multiprocessors and distributed memory multicomputer, Vector supercomputers, Program and network properties: conditions of parallelism, program partitioning and scheduling, program flow mechanism, Dynamic interconnection network.

**Unit - II**Principles of scalable performance: Performance metrics and measures: parallelism profile in programs, harmonic mean performance, efficiency utilization and quality, standard performance measure, scalability of parallel algorithms, Speedup performance laws: Amdahl's law for fixed workload, Gustafson's law for scaled problems, Memory bounded speedup model.

**Unit - III**Processor and Memory hierarchy: Advanced processor technology, superscalar and vector processor, memory hierarchy technology, virtual memory technology, Bus, cache and shared memory: Backplane bus system: bus specification, addressing and timing protocol, arbitration, transaction, and interrupt, cache memory organization: addressing model, direct and associative mapping, set associative and sector cache, shared memory organization: Interleaved memory organization.

**Unit – IV**Pipelining: Linear and non linear pipeline processors, Multiprocessors: Multiprocessor system interconnects, cache coherence and synchronization mechanism, Scalable and multithreaded architectures: Principles of multithreading, scalable and multithreaded architectures.

**Unit - V**Parallel models, languages and compilers: Parallel programming models, parallel languages and compiler, dependence analysis of data arrays, code optimization and scheduling loop parallelization and pipelining.

### Reference Books:

1. Kai Hwang, "Advanced Computer Architecture", McGraw-Hill, Revised Edition, 01/Feb/2003

2. Hwang and Briggs, "Computer Architecture and Parallel Processing", McGraw Hill, International Edition, 1986.
3. Moreshwar R. Bhujade, "*Parallel Computing*", New Age International(P) Ltd, Publishers, First Edition Reprint, 2004.
4. John L. Hennessy, David A. Patterson, "*Computer Architecture: A Quantitative Approach*", Elsevier Inc., Fifth Edition, 2011
5. Sima, Terence Fountain, Péter Kacsuk, "*Advanced Computer Architecture*", Pearson Education, Seventh Impression, 2009.
6. Michael J. Quinn, "*Parallel Computing: Theory And Practice*", Tata McHill-Edition, Twelfth Reprint, Second Edition, 2008.
7. Michael Jay Quinn, "*Parallel Programming in C with MPI and Open MP*", McGraw-Hill Higher Education, 2004.

# ARTIFICIAL INTELLIGENCE

CCSN-405

Cr L-T-P

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## Unit - I

**Introduction:** Introduction to Artificial Intelligence, History, What is AI, Importance of AI, Issues, Simulation of sophisticated & Intelligent Behaviors in different area, problem solving in games, natural language, automated reasoning, visual perception, Search algorithms: Informed search, Uninformed search, Hill Climbing, Depth first search, Best first search, And or graph.

## Unit - II

**Processing and understanding Natural Languages:** Understanding Natural Languages: Applications of Natural Languages, Natural Language processing, Parsing techniques: Rules of parsing, Top down parsing, Bottom up parsing, Transformational grammars, Context free grammar, Transition networks, Fillmore's grammars, Shanks Conceptual Dependency.

## Unit - III

**Knowledge Representation:** Graphs, Frames structures and related structures, Semantic Nets and Partitioned Nets, Scripts, Introduction to PROLOG, Production Rules, Knowledge Based systems, Inference engine, Forward deductions and backward deductions, Matching production rules against working memory.

## Unit - IV

**Expert System** Existing Expert Systems (DENDRAL, MYCIN), Architecture of expert system, Features of Expert system, Genetic algorithm, Fuzzy logic, Neural Networks, Intelligent Agents, Meta Knowledge, Expertise Transfer, Self Explaining System, User and expert systems.

## Unit - V

**Pattern Recognition** Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine perception, Line Finding, Interception, Semantic & Model, Object Identification, Speech Recognition. **Programming Language** Introduction to programming Language, LISP, PROLOG.

## Reference Books :

1. Char Nick, "*Introduction to Artificial Intelligence*", Addison Wesley, 2007.
2. Stuart Russell and Peter Norvig, "*Artificial Intelligence: A Modern Approach.*", Prentice Hall, Third Edition, 2010.

3. Elaine Rich, Kevin Knight and Shivashankar B.Nair, "*Artificial Intelligence*", Tata McGraw-Hill, Third edition, 2009.



**Unit 1: Introduction to Digital Image Processing**

Overview of digital image processing, applications, basic concepts of image formation, and the human visual system. Understanding image sampling and quantization processes.

**Unit 2: Image Enhancement Techniques**

Spatial domain methods for image enhancement, histogram processing, contrast manipulation, and image smoothing and sharpening filters. Frequency domain techniques for enhancement using Fourier transforms.

**Unit 3: Image Restoration and Reconstruction**

Concepts of image degradation, noise models, restoration using inverse filtering, Wiener filtering, and image reconstruction methods. Techniques for dealing with motion blur and other degradation effects.

**Unit 4: Color Image Processing**

Color models and spaces (RGB, CMY, HSI), color transformations, and processing color images. Techniques for color enhancement and the use of pseudo-color and full-color image processing.

**Unit 5: Image Segmentation**

Segmentation techniques including edge detection, thresholding, region-based methods, and morphological processing. Advanced methods such as active contours, watershed, and segmentation using machine learning.

**Unit 1: Introduction to Multimedia Computing**

Fundamentals of multimedia, components, and applications. Understanding multimedia systems, characteristics, and the importance of multimedia in different fields. Overview of multimedia hardware and software.

**Unit 2: Text and Image Processing**

Text representation and formats, text compression techniques, and standards. Image fundamentals, graphics, color models, and image formats. Image compression and processing techniques for effective storage and transmission.

**Unit 3: Audio Processing**

Basics of digital audio, audio sampling, and representation. Audio formats, compression techniques, and standards for efficient storage and streaming. Overview of audio editing and sound synthesis methods.

**Unit 4: Video Processing**

Fundamentals of digital video, video standards, and formats. Video compression techniques, including temporal and spatial redundancy reduction. Introduction to video streaming and real-time video transmission.

**Unit 5: Animation Techniques**

Principles of animation, types of animation (2D and 3D), animation tools, and software. Keyframing, tweening, and morphing. The use of animation in multimedia projects and real-world applications.

# PATTERN RECOGNITION

CCSN-411

Cr L-T-P

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## Unit – I

Introduction : Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation. Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces.

## Unit – II

Normal density :Univariate and multivariate density, discriminant functions for the normal density different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context. Maximum likelihood and Bayesian parameter estimation : Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case.

**Unit – III** Un-supervised learning and clustering: Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Data description and clustering – similarity measures, criteria function for clustering.

## Unit - IV

Linear discriminant function based classifiers : Perceptron, Support Vector Machines. Component analyses : Principal component analysis, non-linear component analysis; Low dimensional representations and multi dimensional scaling.

**Unit - V** Discrete Hidden Markov Models : Introduction, Discrete–time markov process, extensions to hidden Markov models, three basic problems for HMMs. Continuous hidden Markov models : Observation densities, training and testing with continuous HMMs, types of HMMs.

Applications: Data mining, web searching, handwriting recognition, multimedia data retrieval, speech recognition, network traffic analysis

## Reference Books:

1. Earl Gose, Richard John baugh, "*Pattern Recognition and Image Analysis*", Steve JostPHI, 2004.
2. Richard O. Duda, Peter E. Hart, David G. Stroke, "*Pattern classifications*", Wiley , Second Edition, 2006.
- 3.C.M.Bishop, "*Pattern Recognition and Machine Learning*", Springer, Second Edition, 2009.
- 4.S.Theodoridis and K.Koutrombar, "*Pattern recognition*", Academic press, Fourth Edition, 2009.

**Unit 1: Introduction to VLSI Design**

Basics of Very Large Scale Integration (VLSI), the evolution of VLSI technology, and design hierarchy. Overview of VLSI design flow, design styles, and types of VLSI circuits including ASICs and FPGAs.

**Unit 2: CMOS Technology and Fabrication**

CMOS logic, fabrication processes, and the layout design rules. Concepts of nMOS and pMOS transistors, CMOS inverter characteristics, and design considerations for CMOS circuits. Fabrication techniques and process steps.

**Unit 3: Digital VLSI Design**

Designing combinational and sequential logic circuits using CMOS. Implementation of logic gates, flip-flops, and registers. Circuit characterization and performance metrics including power, area, and timing analysis.

**Unit 4: VLSI Design Methodologies**

Hierarchical design, full-custom, semi-custom, and programmable logic design. Introduction to hardware description languages (HDLs) like Verilog and VHDL. Techniques for design verification and simulation.

**Unit 5: VLSI Algorithms**

Algorithms for circuit partitioning, floorplanning, and placement. Algorithms for routing, including global and detailed routing techniques. Introduction to graph algorithms and optimization techniques for VLSI design.

**Unit 1: Introduction to Client-Server Computing**

Fundamentals of client-server architecture, characteristics, and evolution of client-server models. Overview of distributed systems and comparison with peer-to-peer networks. Benefits and challenges of client-server computing.

**Unit 2: Client-Server Architecture and Models**

Detailed study of client-server architecture including 2-tier, 3-tier, and n-tier models. Components of client-server systems and roles of clients and servers. Thin clients, thick clients, and hybrid models.

**Unit 3: Networking and Communication Protocols**

Overview of network protocols used in client-server systems, including TCP/IP, HTTP, and FTP. Communication mechanisms and techniques for data transfer. Concepts of sockets, ports, and connection handling.

**Unit 4: Middleware and Application Servers**

Introduction to middleware technologies and their role in client-server communication. Overview of application servers, database connectivity, and middleware services such as message brokers and RPC (Remote Procedure Call).

**Unit 5: Database Management in Client-Server Systems**

Client-server database management, database access mechanisms, and SQL query processing. Concepts of database connectivity using JDBC/ODBC, data consistency, and transaction management.

# NEURAL NETWORK

**CUCS-443**

**Cr L-T-P**

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## **UNIT – I INTRODUCTION TO NEURAL NETWORKS**

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

## **UNIT – II ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS**

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

## **UNIT – III SINGLE LAYER FEED FORWARD NETWORKS**

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

## **UNIT – IV MULTI- LAYER FEED FORWARD NETWORKS**

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

## **UNIT - V ASSOCIATIVE MEMORIES**

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis. Neural network applications: Process identification, control, fault diagnosis.

## **REFERENCES**

1. Laurene Fausett, "Fundamentals of Neural Networks" , Pearson Education, 2004..
2. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003.
3. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TATA Mc Graw Hill, 2006.
4. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004.
4. Timothy J. Ross, " Fuzzy Logic With Engineering Applications", Tata McGraw- Hill Inc. 2000

**Unit 1: Introduction to System Modeling and Simulation**

Overview of system modeling and the purpose of simulation in engineering. Types of models including physical, mathematical, and computational models. Applications of modeling and simulation in various engineering fields.

**Unit 2: Mathematical Modeling Techniques**

Basic concepts of differential equations, state-space representation, and transfer functions. Techniques for modeling mechanical, electrical, and other dynamic systems. Linear and non-linear system modeling approaches.

**Unit 3: Simulation Techniques and Tools**

Classification of simulation methods, including continuous and discrete event simulation. Overview of simulation software tools and environments. Introduction to Monte Carlo simulation and its applications.

**Unit 4: System Dynamics and Feedback Control**

Concepts of system dynamics, feedback loops, and their role in system behavior. Analysis of open-loop and closed-loop systems. Basics of control system design and its integration with simulation models.

**Unit 5: Modeling of Complex Systems**

Approaches to modeling multi-domain and complex systems using modular techniques. Methods for simulating interactions within complex systems. Use of block diagrams and flowcharts for system representation.



**Unit 1: Introduction to Law and Legal Systems**

This unit introduces the basic concepts of law, the sources of law, and the structure of the legal system. Students will explore different branches of law, including civil, criminal, administrative, and constitutional law. The unit will emphasize the importance of law in engineering practice and the implications of legal decisions in the engineering field.

**Unit 2: Contract Law**

In this unit, students will study the principles of contract law, focusing on the formation, enforcement, and breach of contracts. Topics will include elements of a valid contract, types of contracts, and remedies for breach. The unit will also cover specific contracts relevant to engineering, such as construction contracts and service agreements.

**Unit 3: Intellectual Property Rights (IPR)**

This unit covers the various forms of intellectual property protection, including patents, copyrights, trademarks, and trade secrets. Students will learn about the importance of IPR in engineering and innovation, the process of obtaining patents, and the implications of infringement. Case studies will illustrate the application of IPR in engineering projects.

**Unit 4: Liability and Professional Ethics**

This unit focuses on legal liability, including torts and negligence, as they relate to engineering practice. Students will explore the concepts of professional liability, duty of care, and the consequences of professional misconduct. Ethical considerations and professional standards will also be discussed, highlighting the role of ethics in engineering decisions.

**Unit 5: Regulatory Frameworks and Compliance**

In this unit, students will study the regulatory frameworks governing engineering practices, including environmental laws, safety regulations, and industry standards. The unit will emphasize the importance of compliance and the consequences of violations. Topics may include occupational safety, environmental protection, and building codes.

**Unit 1: Overview of Law and Legal Systems**

This unit introduces the fundamental concepts of law, the structure of the legal system, and the role of law in society. Students will explore the different branches of law, such as civil law, criminal law, and administrative law, as well as the sources of law including statutes, regulations, and case law. The unit will emphasize the importance of understanding legal principles in the context of engineering practice.

**Unit 2: Contracts in Engineering**

In this unit, students will study the principles of contract law as they apply to engineering. Key topics will include the elements of a valid contract, types of contracts commonly used in engineering projects, and the processes for contract negotiation and enforcement. The unit will also cover the implications of breach of contract and available remedies.

**Unit 3: Intellectual Property Rights**

This unit focuses on the significance of intellectual property rights in engineering and innovation. Students will learn about the different forms of intellectual property protection, including patents, copyrights, trademarks, and trade secrets. The unit will cover the process of obtaining these protections, the importance of safeguarding innovations, and the consequences of infringement.

**Unit 4: Professional Liability and Ethics**

In this unit, students will explore the concepts of professional liability, negligence, and ethical standards in engineering practice. Topics will include the duty of care engineers owe to clients and the public, the implications of professional misconduct, and the importance of adhering to ethical codes and standards within the profession.

**Unit 5: Regulatory Frameworks in Engineering**

This unit examines the various regulatory frameworks that govern engineering practices. Students will learn about environmental regulations, safety standards, zoning laws, and building codes. The unit will highlight the importance of compliance with these regulations and the role of engineers in ensuring adherence to legal requirements.

**Unit 1: Introduction to Intellectual Property**

This unit provides an overview of intellectual property (IP), including its definition, significance, and historical development. Students will explore the different types of intellectual property, including patents, copyrights, trademarks, and trade secrets. The unit will emphasize the role of IP in innovation and economic development.

**Unit 2: Patents**

In this unit, students will learn about patent law, including the requirements for patentability, the types of patents (utility, design, and plant patents), and the application process. The unit will cover the rights granted by a patent, the duration of protection, and the limitations of patent rights. Case studies will illustrate the impact of patents on technology and industry.

**Unit 3: Copyrights**

This unit focuses on copyright law, covering the protection of original works of authorship, including literary, artistic, and musical works. Students will explore the requirements for copyright protection, the rights of copyright holders, and the duration of copyright protection. The unit will also address issues related to fair use, infringement, and the impact of digital technology on copyright.

**Unit 4: Trademarks**

In this unit, students will study trademark law, including the importance of trademarks in branding and consumer protection. Topics will include the types of trademarks, the process of registering a trademark, and the rights conferred by trademark registration. The unit will also cover issues related to trademark infringement, dilution, and fair use.

**Unit 5: Trade Secrets and Confidentiality**

This unit examines the concept of trade secrets and the legal protections available for confidential information. Students will learn about the criteria for trade secret protection, the legal remedies for misappropriation, and the importance of maintaining confidentiality in business practices. Case studies will illustrate the significance of trade secrets in various industries.

**Unit 1: Introduction to Ethics**

This unit introduces the fundamental concepts of ethics, including definitions, the importance of ethical behavior, and the relationship between ethics and law. Students will explore different ethical theories, such as utilitarianism, deontology, and virtue ethics, and discuss the role of ethics in personal and professional decision-making.

**Unit 2: Professional Ethics**

In this unit, students will examine the concept of professional ethics, focusing on the specific ethical standards and codes of conduct that govern various professions. The unit will cover the importance of integrity, accountability, and transparency in professional practice, as well as the consequences of unethical behavior.

**Unit 3: Ethical Decision-Making Frameworks**

This unit focuses on the frameworks and models for ethical decision-making. Students will learn about systematic approaches to identify ethical dilemmas, analyze options, and make informed decisions. Case studies will be used to illustrate practical applications of these frameworks in real-world scenarios.

**Unit 4: Responsibility to Stakeholders**

In this unit, students will explore the concept of stakeholder theory and the responsibilities professionals have towards various stakeholders, including clients, employers, colleagues, and the community. The unit will discuss the implications of ethical conduct on stakeholder relationships and the importance of balancing competing interests.

**Unit 5: Legal and Regulatory Frameworks**

This unit examines the legal and regulatory context in which professionals operate. Students will learn about the laws and regulations relevant to their field, including compliance issues, risk management, and the role of regulatory bodies. The unit will emphasize the importance of understanding legal obligations as part of professional responsibility.

# **CBSN-401 D                    LEGAL ASPECTS OF INTELLECTUAL PROPERTY IN ENGINEERING**

## **Unit 1: Introduction to Intellectual Property**

This unit provides an overview of intellectual property, its significance in engineering, and its impact on innovation. Students will learn about the different types of intellectual property, including patents, copyrights, trademarks, and trade secrets. The unit will emphasize the role of IP in protecting inventions and fostering technological advancement.

## **Unit 2: Patent Law Fundamentals**

In this unit, students will explore the fundamentals of patent law, including the requirements for patentability, types of patents, and the patent application process. Key topics will include novelty, non-obviousness, and utility, as well as the rights conferred by patents. The unit will also cover patent infringement and enforcement issues relevant to engineers.

## **Unit 3: Copyrights and Engineering Works**

This unit focuses on copyright law as it applies to engineering-related works, such as software, designs, and technical documents. Students will learn about the scope of copyright protection, the rights of authors, and the duration of copyright. The unit will also discuss fair use, copyright infringement, and the impact of digital technology on copyright law.

## **Unit 4: Trademarks in Engineering**

In this unit, students will study trademark law, emphasizing its importance in branding and marketing engineering products and services. Topics will include the definition and types of trademarks, the process of trademark registration, and the legal rights associated with trademarks. The unit will cover trademark infringement and the significance of protecting brand identity.

## **Unit 5: Trade Secrets and Confidentiality**

This unit examines the concept of trade secrets and the legal protections available for confidential information in engineering contexts. Students will learn about the criteria for trade secret protection, the legal remedies for misappropriation, and strategies for maintaining confidentiality. The unit will highlight the importance of trade secrets in competitive advantage.

1. Implement a client-server model using sockets for communication between a server and multiple clients.
2. Create a distributed file system where files can be stored and retrieved from multiple nodes in a network.
3. Develop a simple chat application that allows multiple clients to communicate through a central server.
4. Implement a distributed banking system that supports transactions from multiple clients, ensuring data consistency.
5. Design a distributed mutual exclusion algorithm using token-based or voting-based methods.
6. Build a peer-to-peer file sharing application that allows users to upload and download files from each other.
7. Create a distributed sensor network that collects and aggregates data from multiple sensor nodes.
8. Implement a distributed scheduling system that manages tasks across multiple nodes.
9. Design a distributed online voting system that ensures security and integrity of votes.
10. Create a load balancer that distributes incoming requests across multiple servers to optimize resource usage.
11. Develop a replicated database system that maintains consistency among replicas across different nodes.
12. Implement a distributed hash table (DHT) for efficient data retrieval in a peer-to-peer network.
13. Build a distributed logging system that aggregates logs from multiple applications into a central repository.
14. Create a microservices architecture where different services communicate over a network using REST APIs.
15. Implement a distributed version control system that allows collaborative development of software projects.

16. Design a fault-tolerant distributed system that can handle node failures without losing data or functionality.
17. Create a real-time distributed data processing system using a stream processing framework.
18. Develop a distributed machine learning application that trains a model using data from multiple sources.
19. Implement a blockchain-based system for secure and transparent transactions across a network.
20. Build a distributed monitoring system that tracks the performance and health of multiple services and nodes.

1. Implement a simple chatbot using rule-based techniques to respond to user queries.
2. Develop a decision tree classifier for a dataset and visualize the tree structure.
3. Create a program that uses k-nearest neighbors (KNN) to classify handwritten digits from the MNIST dataset.
4. Build a linear regression model to predict house prices based on various features.
5. Implement a basic neural network from scratch to solve a binary classification problem.
6. Develop a program that uses natural language processing (NLP) to perform sentiment analysis on movie reviews.
7. Create a program that utilizes reinforcement learning to train an agent to play a simple game like Tic-Tac-Toe.
8. Build a recommendation system using collaborative filtering techniques for movie recommendations.
9. Implement the A\* search algorithm to find the shortest path in a maze.
10. Develop a program that uses support vector machines (SVM) for classifying data points.
11. Create a simple image recognition system using convolutional neural networks (CNNs) with a popular dataset.
12. Implement a program that uses genetic algorithms to solve optimization problems.
13. Build a program that performs clustering on a dataset using k-means clustering algorithm.
14. Develop a facial recognition system using OpenCV and machine learning techniques.
15. Create a program that uses the Long Short-Term Memory (LSTM) network for time series prediction.
16. Implement a text summarization tool using NLP techniques to summarize articles or documents.
17. Develop an anomaly detection system using unsupervised learning techniques.
18. Create a program that uses transfer learning to fine-tune a pre-trained model for image classification.
19. Build a program that utilizes the Monte Carlo method for simulating random processes.
20. Implement a speech recognition system using machine learning techniques to transcribe audio to text.



**Unit 1: Introduction and Project Planning**

Understanding project objectives, scope definition, project selection criteria, and planning methodologies. Developing timelines, work breakdown structures, and resource allocation plans.

**Unit 2: Literature Review and Research Methodology**

Conducting a comprehensive literature review relevant to the project topic. Establishing research methodologies, data collection techniques, and analysis frameworks to guide the project.

**Unit 3: Project Development and Execution**

Implementing project plans, applying technical skills, and developing prototypes or project components. Ensuring adherence to quality standards and project timelines during development.

**Unit 4: Data Collection and Analysis**

Collecting relevant data through surveys, experiments, or fieldwork. Analyzing data using appropriate tools and methods, interpreting findings, and deriving insights that align with project objectives.

**Unit 5: Progress Monitoring and Reporting**

Tracking project progress, preparing status reports, identifying potential challenges, and implementing solutions. Documenting findings and maintaining clear communication with project mentors or supervisors.

**Unit 1: Fundamentals of Presentations**

Understanding the purpose and importance of presentations, types of presentations, analyzing the audience, and structuring a presentation effectively.

**Unit 2: Presentation Design and Tools**

Designing impactful presentation slides, utilizing multimedia, applying best practices for visual content, and exploring various software and tools for creating presentations.

**Unit 3: Communication Skills**

Developing verbal and non-verbal communication, improving speech clarity and tone, using effective body language, and engaging with the audience.

**Unit 4: Delivery Techniques**

Preparing for confident delivery, managing presentation anxiety, incorporating storytelling, and handling audience interactions seamlessly.

**Unit 5: Evaluation and Feedback**

Practicing self-evaluation, receiving constructive feedback, using peer review, and understanding key criteria for assessing presentations and vivas.



# **Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

## **School of School of Engineering and Technology**

### **Ordinances, Regulations & Syllabus**

For

### **Bachelor of Computer Application (BCA) Three Year Programme**

#### **Semester System**

(w.e.f. session 2013-14)

**Revised and approved in the year 2021 (17<sup>th</sup> Meeting, Board of  
Studies)**

## **Programme Educational Objectives (PEOs)**

**PEO1:** To facilitate in development of strong basic fundamentals of Computer Applications that fit as a perfect foundation towards a beginning a professional career in industry.

**PEO2:** To develop programming skills in learners by using fundamental knowledge of computer Science.

**PEO3:** To apply new designs and solutions to complex real life problems using existing and/or novel technologies.

**PEO4:** To play a creative role during professional life through turning problems to opportunities and foster personal and organizational growth

**PEO5:** To inculcate comprehensive communication ability that is useful during professional communication and leading of teams in future

## **Programme Specific Objectives (PSO's)**

**PSO 1** Students will able to understand, analyze and develop computer programs in the areas related to algorithm, web design and networking for efficient design of computer based system.

**PSO 2** Apply standard software engineering practices and strategies in software project development using open source programming environment to deliver a quality of product for business success.

**PSO 3** Student will able to know various issues, latest trends in technology development and thereby innovate new ideas and solutions to existing problems.

**PSO 4** Analyze and design solutions for real-world problems using computational techniques.

**PSO 5** Explore trends in AI, Machine Learning, Cloud Computing, and Big Data.

## Programme Outcome Objectives (POO's)

- PO1:** Understand the concepts of key areas in computer science.
- PO2:** Analyze and apply latest technologies to solve problems in the areas of computer applications.
- PO3:** Analyze and synthesis computing systems through quantitative and qualitative techniques
- PO4:** Apply technical and professional skills to excel in business.
- PO5:** Communicate effectively in both verbal and written form.
- PO6:** Develop practical skills to provide solutions to industry, society and business.
- PO7:** Acquire Knowledge of mathematical foundations, computer application theory and algorithm principles in the design and modeling of computer based system.
- PO8:** Earn caliber to design, analyze and development principles in the construction of complex hardware and software computer systems.

**Shobhit University, Gangoh (Saharanpur)**  
**Teaching Scheme**  
**Effective from 2021**

**BCA**  
**I Semester**

Subject Code	Subject	L	P	Cr.
BCA-101	Fundamental of Computer and C Programming	4		4
BCA-102	Problem Solving using Computer	4		4
BCA-103 BCA-103 A / BCA-103 B / BCA-103 C	Professional Communication / English / Technical Communication / Human Values, Deaddiction and Traffic Rules	4		4
BCA-104 BCA-104 A / BCA-104 B / BCA-104 C	Mathematics / Basic Mathematics / Mathematics-I / Advanced Applied Mathematics	4		4
BCA-151	Fundamental of Computer and C Programming Lab		2	2
BCA-152	Software Lab using Python		2	2
BCA-153 / BCA-153 A / BCA-153 B / BCA-153 C	English Communication Lab / English / Technical Communication / Human Values, Deaddiction and Traffic Rules (Lab)		2	2
BCA-154	Seminar Based on Learning		2	2
<b>Total Credits (4 Theory + 3 Lab)</b>		<b>16</b>	<b>8</b>	<b>24</b>

**II Semester**

Subject Code	Subject	L	P	Cr.
BCA-201	OOPS Using C++	4		4
BCA-202	Database Management Systems	4		4
BCA-203	Web & E-Commerce Technologies	4		4
BCA-204 / BCA-204 A / BCA-204 B / BCA-204 C	Discrete Structures / Set Theory / Graph Theory / Discrete Probability	4		4
BCA-205 / BCA-205 A / BCA-205 B / BCA-205 C	Environmental Studies / Environmental Science / Natural Resource Management / Pollution Control	4		4
BCA-251	OOPS Using C++ Lab		2	2
BCA-252	Database Management Systems Lab		2	2
BCA-253	Seminar Based on Learning		2	2
<b>Total Credits (5 Theory + 2 Lab)</b>		<b>20</b>	<b>6</b>	<b>26</b>

**Shobhit University, Gangoh (Saharanpur)**  
**Teaching Scheme**  
**Effective from 2021**

**BCA**  
**III Semester**

<b>Subject Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>BCA-301</b>	Operating Systems	4			4
<b>BCA-302</b>	HTML, DHTML and CSS Programming	4			4
<b>BCA-303</b>	Theory of Computation	4			4
<b>BCA-304</b>	Multimedia and Applications	4			4
<b>BCA-305 /</b> <b>BCA-305 A /</b> <b>BCA-305 B /</b> <b>BCA-305 C /</b> <b>BCA-305 D</b>	Optimization Techniques / Elements of Statistics / Combinatorial Optimization Multi-objective Optimization Biostatistics	4			4
<b>BCA-351</b>	Operating Systems Lab			2	2
<b>BCA-352</b>	HTML Programming Lab			2	2
<b>BCA-353</b>	Seminar Based on Learning			2	2
<b>Total Credits (5 Theory + 2 Lab)</b>		<b>20</b>		<b>6</b>	<b>26</b>

**IV Semester**

<b>Subject Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>BCA-401</b>	Data Structures	4			4
<b>BCA-402</b>	Java Programming	4			4
<b>BCA-403</b>	Computer System Architecture	4			4
<b>BCA-404</b> <b>BCA-404 A/</b> <b>BCA-404 B/</b> <b>BCA-404 C/</b> <b>BCA-404 D</b>	Knowledge Management / Knowledge Transfer / Knowledge Mapping/ Knowledge Management Systems/ Information Systems for KM	4			4
<b>BCA-451</b>	Data Structures Lab			2	2
<b>BCA-452</b>	Java Programming Lab			2	2
<b>BCA-453</b>	Computer System Architecture Lab			2	2
<b>BCA-454</b>	Seminar Based on Learning			2	2
<b>Total Credits (4 Theory + 3 Lab)</b>		<b>16</b>		<b>8</b>	<b>24</b>

**Shobhit University, Gangoh (Saharanpur)**  
**Teaching Scheme**  
**Effective from 2021**

**BCA**  
**V Semester**

<b>Subject Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>BCA-501</b>	Software Engineering	4			4
<b>BCA-502</b>	Analysis of Algorithms & Data Structures	4			4
<b>BCA-503</b>	Mobile Computing	4			4
<b>BCA-504</b>	Big Data and Machine Learning	4			4
<b>BCA-551</b>	Software Engineering Lab			2	2
<b>BCA-552</b>	Algorithms and Data Structures with C++ Lab			2	2
<b>BCA-558</b>	Research Project-I			2	2
<b>Total Credits (5 Theory + 2 Lab)</b>		<b>16</b>		<b>6</b>	<b>22</b>

**VI Semester**

<b>Subject Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>BCA-601</b>	Data Communication and Computer Networks	4			4
<b>BCA-602</b>	Artificial Intelligence	4			4
<b>BCA-603</b>	Cyber Security & Cyber Laws	4			4
<b>BCA-604</b>	Software Project management	4			4
<b>BCA-651</b>	Computer Networks Lab			2	2
<b>BCA-656</b>	Seminar and Group Discussion			2	2
<b>BCA-658</b>	Research Project-II			2	2
<b>Total Credits (4 Theory + 3 Lab)</b>		<b>16</b>		<b>6</b>	<b>22</b>



# FUNDAMENTAL OF COMPUTER AND PROGRAMMING IN C

BCA-101

L T P 3 1

2

## Unit-I

**Introduction to computer System:** Definition of a Computer, Characteristics and Limitations of computer, Block diagram of computer, Types of computers Types of Software: system software, Application software, Commercial, Open source, Domain and Freeware software.

**Types of programming languages:** Assembler, Compiler, Interpreter, Linker, Loader (Definitions only), **Number system:** Decimal, Binary Octal and Hexadecimal number ,Interconversion of decimal to binary and vice-versa, ASCII codes, Flowchart-definition, Symbols used in writing the flow-chart Writing an algorithm and flow-chart of simple problems.

## Unit-II

**Fundamentals of 'C':** Features of C language, Structure of C program, Writing the first C Program, Comments, Header files, Data types, Constants and Variables, Operators, Expressions, Evaluation of expressions, Type conversion and Type casting, Precedence and Associativity, I/O functions, Definition of Macro and Pre-Processor Directives.

## Unit-III

**Decision Control and Looping Statements:** Introduction to Decision Control Statements, Conditional Branching Statements, Iterative Statements, Nested Loops, Break and Continue Statement, Goto Statement, **Array & String:** Concept of array, One and Two-dimensional arrays, declaration and initialization of arrays, String, String storage, Built-in string functions

## Unit-IV

**Functions:** Concept of user defined functions, prototype, definition of function, parameters, parameter passing, calling a function, Macros, Pre-processing, **Recursion:** Definitions, recursive function, Examples, Applications, **Pointers:** Basics of pointers, pointer to pointer, pointer and array, pointer to array, array of pointers, function returning a pointer.

## Unit-V

**Structure and Union:** Basics of structure, structure members, accessing structure members, nested structures, array of structures, structure and functions, structures and pointers, unions, bit-fields, **File Management:** Introduction to file management, Simple file management functions for text files, Reading from and writing to files.

## Reference:

1. Fundamentals of Computers, V. Rajaraman.
2. Computer Concepts and C Programming, P.B. Kotur
3. Let us C, Yashwanth Kanetkar
4. ANSI C, Balagurusamy

## PROBLEM SOLVING USING COMPUTER

BCA-102

L T P 3 1 2

### Unit-I

**Computer Fundamentals:** Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers. **Basic Computer Organization** - Units of a computer, CPU, ALU, memory hierarchy, registers, I/O devices. **Planning the Computer Program:** Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.

### Unit-II

**Techniques of Problem Solving:** Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming. **Overview of Programming:** Structure of a Python Program, Elements of Python, IDEs for python, Python Interpreter, Using Python as calculator, Python shell, Indentation.

### Unit-III

**Introduction to Python:** Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

**Creating Python Programs:** Input and Output Statements, Control statements (Looping- while Loop, for Loop, Loop Control, Conditional Statement- if...else, Difference between break, continue and pass).

### Unit-IV

**Structures:** Numbers, Strings, Lists, Tuples, Dictionary, Date & Time, Modules, Defining Functions, Exit function, default arguments. File handling in python.

### Unit-V

**Introduction to Advanced Python:** Objects and Classes, Inheritance, Regular Expressions, Event Driven Programming, GUI Programming. Basic concepts of concepts of Package and modules

### References:

1. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
3. T. Budd, Exploring Python, TMH, 1st Ed, 2011
4. Python Tutorial/Documentation [www.python.org](http://www.python.org) 2010
5. Allen Downey, Jeffrey Elkner, Chris Meyers, how to think like a computer scientist: learning with Python, Freely available online.2012
6. Rober Sedgewick, K Wayne -Introduction to Programming in Python: An interdisciplinary Approach" Pearson India

## PROFESSIONAL COMMUNICATION

BCA-103

L T P 31 2

### UNIT 1

**Effective communication:** Meaning, Barriers, Types of communication and Essentials. Interpersonal Communication skills. Effective Spoken Communication: Understanding essentials of spoken communication, Public speaking, Discussion Techniques, Presentation strategies.

### UNIT 2

**Effective Professional and Technical writing:** Paragraph development, Forms of writing, Abstraction and Summarization of a text; Technicalities of letter writing, internal and external organizational communication. Technical reports, proposals and papers.

### UNIT 3

**Effective non-verbal communication:** Knowledge and adoption of the right non-verbal cues of body language, interpretation of the body language in professional context. Understanding Proxemics and other forms of non-verbal communication.

### UNIT 4

**Communicating for Employment:** Designing Effective Job Application letter and resumes; Success strategies for Group discussions and Interviews

### UNIT 5

**Communication Networks in organizations:** Types, barriers and overcoming the barriers.

#### Laboratory work:

- Needs-assessment of spoken and written communication and feedback.
- Training for Group Discussions through simulations and role plays.
- Training for effective presentations.
- Project based team presentations.
- Proposals and papers-review and suggestions

#### Text Books:

1. Lesikar V. R. and Flatley M. E., Basic Business Communication Skills for the Empowering the Internet Generation, Tata Mc Graw Hill, New Delhi (2006).
2. Raman M & Sharma S., Technical Communication Principles and Practice, Oxford University Press, New Delhi (2015) 3rd ed.
3. Mukherjee S. H., Business Communication-Connecting at Work, Oxford University Press, New Delhi (2013).

# ENGLISH

## English BCA-103 A

### **Unit 1: Grammar**

Expressing in Style; Words often confused; One-word substitution; Phrases; Idioms.

### **Unit II: Advanced Reading**

Paraphrasing; Interpreting visual information: Tables, Graphs, Charts; Speed Reading. Comprehension and Analysis of the book, "Who Moved My Cheese."

### **Unit III: Effective Writing**

Business Correspondences: Fax, Email; Taking Notes; Making Inquiries; Placing Orders; Asking

Giving Information; Registering Complaints; Handling Complaints; Drafting Notices; Job Applications; Expository Composition; Argumentative Composition; Techniques of Argument;

Logical Presentation; Descriptive Composition; Narrative Composition; Summary Writing, Proposal; Abstract, Agenda, Minutes.

### **Unit IV: Speaking**

Business Etiquettes; Impromptu Speech; Debate; Role Play; Presentations.

### **Unit V: Listening**

Business-related Conversation Exercises.

### **Reference Books:**

1. Spencer Johnson; Who Moved My Cheese; Vermilion; (2009).
2. Balasubramanian, T., A Textbook of English Phonetics for Indian Students; Macmillan India, Delhi (1998).
3. McLearn, Stephen., Writing Essays and Report: A Student's Guide; Viva Books, New Delhi (2011).
4. Burton Roberts, N., Analysing Sentences; Longman, London (1986).
5. Wekker, H. And Haegeman, L., A Modern Course in English Syntax; Croom Helm, London (1985).

**UNIT: 1**

Technical Documentation Presentation :Accuracy and Conciseness in Technical English, Structure Format etc. for Technical Reports & Thesis, Comparing and Contractive other aspects of short reports and long dissertations.

**UNIT: 2**

Communication Skills: Communication Process: Concept & importance, System of communication: Formal & internal. Barrier to effective communication.

**UNIT: 3**

Principles of Business Communication: Planning and conduction conversations, interviews and Discussion. The preparation of oral statements, effective listening, telephonic communication.

**UNIT: 4**

Written Communication: Guides to effective writing for business correspondence including letter and job application Memorandum, Office orders, Reports.

**UNIT: 5**

Non-Verbal Communication: Importance and Type-Cluster and congruency. Kinetics VoalCUES. Modern Forms of Communication: Telex, Fax, Telegram & Teleconferencing & E-mail.

**SUGGESTED READINGS:-**

1. Lesikar “ Business Communication” AITBC
2. S. M. Ray “Business Communication” HP

**Module 1:** Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

**Module 2:** Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
  8. Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha
  9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
  10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
  11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
  12. Programs to ensure Sanyam and Swasthya
- Practice Exercises and Case Studies will be taken up in Practice Sessions.

**Module 3:** Understanding Harmony in the Family and Society- Harmony in HumanHuman Relationship

13. Understanding harmony in the Family- the basic unit of human interaction

14. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti;

Trust (Vishwas) and Respect (Samman) as the foundational values of relationship

15. Understanding the meaning of Vishwas; Difference between intention and competence

16. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship

17. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals

18. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (SarvabhaumVyawastha )- from family to world family!

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

**Module 4:** Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

19. Understanding the harmony in the Nature

20. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature

21. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space

22. Holistic perception of harmony at all levels of existence

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

**Module 5:** Implications of the above Holistic Understanding of Harmony on Professional Ethics

23. Natural acceptance of human values

24. Definitiveness of Ethical Human Conduct

25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal

### **Text Book**

R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.

### **Reference Books**

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, JeevanVidyaekParichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
6. A.N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) KrishiTantra Shodh, Amravati.



## MATHEMATICS

BCA-104

L T P 310

### UNIT-I

**DETERMINANTS:** Definition, Minors, Cofactors, Properties of Determinants **MATRICES:** Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramers Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix, Caley-Hamilton Theorem (without proof).

### UNIT-II

**LIMITS & CONTINUITY:** Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities

### UNIT-III

**DIFFERENTIATION:** Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation, Rolle's Theorem, Mean Value Theorem, Expansion of Functions (Maclaurin's & Taylor's), Indeterminate Forms, L' Hospitals Rule, Maxima & Minima, Curve Tracing, Successive Differentiation & Leibnitz Theorem.

### UNIT-IV

**INTEGRATION:** Integral as Limit of Sum, Fundamental Theorem of Calculus (without proof.), Indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions, Reduction Formulae for Trigonometric Functions, Gamma and Beta Functions(definition).

### UNIT-V

**VECTOR ALGEBRA:** Definition of a vector in 2 and 3 Dimensions; Double and Triple Scalar and Vector Product and physical interpretation of area and volume. **Matrices:** Matrix, sub matrix, types of matrices, such as symmetric, square, diagonal Matrices, singular and non-singular matrices. Addition, subtraction, multiplication of matrices. Rank of a matrix, Matrix equation, solution by Cramer's rule and Gauss elimination method.

### Referential Books:

1. B.S. Grewal, "Elementary Engineering Mathematics", 34th Ed., 1998.
2. Shanti Narayan, "Integral Calculus", S. Chand & Company, 1999
3. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Comp
4. J.P. Chauhan "BCA Mathematics Volume -1", Krishna Publications.

## **BCA-104 A BASIC MATHEMATICS**

### **MODULE I : SYMBOLIC LOGIC & SET THEORY :**

Proposition, Logical operators, conjunction, disjunction, negation, conditional and bi-conditional operators, converse, Inverse, Contra Positive, logically equivalent, tautology and contradiction. Arguments and validity of arguments. Set operations, Venn diagram, Properties of sets, number of elements in a set, Cartesian product, relations & functions, Relations : Equivalence relation. Equivalence class, Partially and Totally Ordered sets, Functions: Types of Functions, Composition of Functions.

### **MODULE II : DIFFERENTIAL CALCULUS**

Differentiation, successive differentiation, Leibnitz theorem, partial differentiation, Applications of differentiation, Tangent and normal, angle between two curves, Maximum and Minimum values (Second derivative test), Curvature and radius of Curvature (Cartesian coordinates), Envelopes.

### **MODULE III : INTEGRAL CALCULUS**

Definite Integral and its application for area, length and volume. Multiple Integrals. Change of order of Integration. Transformation of integral from Cartesian to polar. Applications in Areas, volume and surfaces.

### **MODULE IV : TWO DIMENSIONAL ANALYTICAL GEOMETRY**

Straight Lines .Pair Straight Lines .Circles.

**MODULE V : FUNCTION AND RELATION :** Injective and surjective functions, composition of function, Inverse function, Use of function in coding theory, Relation composition of relation, Equivalence relation.

#### **Text Books:**

1. Das BC and Mukherjee, Differential Calculus, Calcutta, U.N. Dhar Publishers
2. Das BC and Mukherjee, Integral Calculus, Calcutta, U.N. Dhar Publishers
3. Grewal B.S., Higher Engineering Mathematics, Delhi Khanna Publishers.

## BCA - 104 B

### MATHEMATICS – 1

#### UNIT : 1

BASIC CONCEPTS: Definition of Sets, Number systems, Relations Functions.

LIMIT CONTINUITY: Definition of limit, Limit of a function, Right and Left hand Limits, Algebra of limits, General principle for existence of limit, limit of inequalities, Method of finding limits, Continuity of functions, Cauchy's definition, graphical meaning of continuity, Kinds of discontinuities.

DIFFERENTIAL CALCULUS: Successive differentiation, Leibnitz theorem, Partial differentiation, Euler's Theorem, change of variables, Jacobian theorem.

#### UNIT : 2

INTEGRAL CALCULUS: Integration of rational and Irrational functions, Reduction Formulae, Definite Integral, Rectification; Quadrature, volumes and surfaces of Revolution, Simple applications of integration & simple problems of double and triple integrals.

#### UNIT : 3

DIFFERENTIAL EQUATION: Differential equations of first order, Differential equations of 2nd order, Differential of 2nd order with constant coefficients.

#### UNIT : 4

VECTOR CALCULUS AND ALGEBRA: Vectors, Differentiation and partial differentiation of vector functions, derivative of sum, Dot product and cross product of two vectors, gradient, divergence and curl.

#### UNIT : 5

COORDINATE GEOMETRY: Straight lines, Circles and the system of circles; standard equations and properties of Parabola. Ellipse and Hyperbolas, General equation of second degree in two variables, tracing of simple conic section.

#### Suggested Readings :

1. E. Kreyzig, "Engineering Mathematics".
2. B.S. Grewal, "Higher Engineering Mathematics"
3. Shanti Narayan, "Differential Calculus"
4. K.P. Gupta. "Vector Calculus"

**Unit 1: Advanced Calculus and Analysis**

Multivariable calculus: gradients, divergence, and curl Theorems of Green, Stokes, and Gauss Metric spaces and Convergence, Functions of several variables: continuity, differentiability, Optimization techniques: Lagrange multipliers

**Unit 2: Differential Equations**

Ordinary differential equations (ODEs): existence and uniqueness, Systems of ODEs and stability analysis, Partial differential equations (PDEs): classification and methods of solution, Fourier series and transforms, Numerical methods for ODEs and PDEs

**Unit 3: Linear Algebra and Matrix Theory**

Vector spaces and subspaces, Linear transformations and their properties, Eigenvalues and eigenvectors, Diagonalization and spectral theorem, Applications to systems of equations and optimization problems

**Unit 4: Numerical Methods and Computational Mathematics**

Numerical analysis: error analysis and convergence, Root-finding algorithms (Newton's method, bisection), Numerical integration and differentiation, Finite difference methods for PDEs, Introduction to MATLAB/Python for mathematical modeling

**Unit 5: Probability, Statistics, and Stochastic Processes:**

Probability theory: distributions, expected values, and variance, Statistical inference: hypothesis testing, confidence intervals, Regression analysis and time series forecasting, Markov chains and stochastic processes, Applications in finance, engineering, and science

S.N	PRACTICAL PROGRAMS FILE
1	Write a program to print "hello world" in C.
2	Write a program to insert a new line using \n.
3	Write a program to make a line Single-line comment.
4	Write a program to make a line multi-line comment.
5	Write a program to create a variable and assign values to variables.
6	Write a program to create a variable and assign values to variables using scanf() function.
7	Write a program to print other types, use %c for char and %f for float.
8	Write a program to declare more than one variable of the same type.
9	Write a program to calculate the area of a rectangle.
10	Write a program to perform operations on variables and values (+, -, *, /, %).
11	Write a program to perform addition assignment operator (+=) adds a value to a variable
12	Write a program to find out if a person is old enough to vote using scanf() function using if-else.
13	Write a program to check even or odd no using while loop in C.
14	Write a program to print 1 to 50 using do while loop in C.
15	Write a program to print 5 to 10 using for loop in C.
16	Write a program to print 1 to 5 using array in C.
17	Write a program to create structure in C.
18	Write a program to create union in C.
19	Write a program to using pointer in C.
20	Write a program to create user define function in C.

1. Write a program to demonstrate basic data type in python.
2. Demonstrate the working of following functions in Python.  
i) id( ) ii) type( ) iii) range( )
3. Create a list and perform the following methods  
(a) Insert (b) remove (c) append (d) pop (e) clear
4. Write a Python program to demonstrate various ways of accessing the string.  
i) By using Indexing (Both Positive and Negative)  
ii) By using Slice Operator
5. Create a tuple and perform the following methods.  
(a) Add items (b) len (c) Check for item in tuple (d) Access items
6. Demonstrate the following functions/methods which operates on dictionary in Python  
i) print dictionary items ii) len( ) iii) clear( ) iv) get( ) v) pop( ) vi) change values
7. Demonstrate the following Conditional statements in Python with suitable examples.  
i) if statement ii) if else statement iii) if – elif – else statement
8. write a program to print a number is positive/negative using while loop.
9. Write a program to demonstrate for loop in python.
10. Write Python program to demonstrate use of nested loop statements: print the following pattern  
\*  
\* \*  
\* \* \*  
\* \* \* \*  
\* \* \* \* \*
11. Demonstrate the following control transfer statements in Python with suitable examples.  
i) Break ii) continue iii) pass
12. Write a Python program to perform read and write operations on a file.
13. Demonstrate the following kinds of Parameters used while writing functions in Python.  
i) Positional Parameters ii) Default Parameters iii) Keyword Parameters iv) Variable length Parameters
14. Write a python program to demonstrate inheritance.

**BCA 153****English Communication lab**

1	Self-Introduction and Group Interaction
2	Role Play: Telephone Etiquette
3	Debate: Discussing Current Issues
4	Storytelling Skills Development
5	Persuasive Speech Practice
6	Listening Comprehension: News Analysis
7	Group Discussion: Analyzing Advertisements
8	Job Interview Simulation
9	Film Scene Analysis and Discussion
10	Pronunciation Practice and Phonetics
11	Formal and Informal Letter Writing
12	Creative Writing: Dialogue Creation

## **BCA 153 A**

## **English lab**

### Practicals

#### 1. Listening Skills

- The student should be able to listen to a text read aloud in normal speed with focus on intonation.
- After listening the student can fill-in-blanks, choose a suitable title, make a summary, supply required information and be able to answer comprehension questions from the passage read aloud.

#### 2. Speaking Skill

- Reading aloud of dialogues, texts, poems, speeches focusing on intonation.
- Self-introduction • Role plays on any two-situations.
- Telephonic Conversations.

#### 3. Personality Development

- Initiation
- Physical Appearance
- Audience Purpose

#### 4. Interpersonal Skills

- Appropriate use of non-verbal skills in face to face communication [i.e. Viva –Voce, group –interviews, GDs and seminars.]

#### 5. Presenting in GD, Seminars and Conferences.

- Leadership Quality
- Time Management
- Achieving the target



Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

**LIST OF PRACTICALS**

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferencing with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model AudioVisual Usage.

**Reference Books**

1. Bansal R.K. & Harrison: A manual of Speech & Phonetics, Orient Black Swan Pvt. Ltd. New Delhi, 2010.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi, 2011.
3. L.U.B.Pandey: Practical Communication-Process & Practice, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi, 2013.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press. 2007.

## **BCA 153 C Human Values, Deaddiction and Traffic Rules (Lab)**

### **Course Objectives:**

- To instill human values and ethics.
- To understand the impact of addiction and methods for deaddiction.
- To educate students on traffic rules and safe driving practices.

### **Module 1: Human Values**

1. **Introduction to Human Values**
  - Definition and importance
  - Types of human values (e.g., honesty, respect, empathy)
2. **Ethics in Everyday Life**
  - Decision-making and moral dilemmas
  - Case studies and discussions
3. **Community Service**
  - Organizing and participating in community outreach programs
  - Reflective practices on service experiences

### **Module 2: Deaddiction**

1. **Understanding Addiction**
  - Definition and types of addiction (substance and behavioral)
  - Psychological and social impacts of addiction
2. **Deaddiction Strategies**
  - Methods and approaches to deaddiction
  - Role of family and community support
3. **Workshops and Guest Lectures**
  - Inviting health professionals and recovering individuals
  - Interactive sessions on coping strategies

### **Module 3: Traffic Rules**

1. **Introduction to Traffic Rules**
  - Importance of traffic regulations
  - Basic traffic signs and signals
2. **Road Safety Practices**
  - Safe driving techniques
  - Pedestrian safety and awareness
3. **Practical Lab Sessions**
  - Simulated driving scenarios (using simulators or practical demonstrations)
  - Role-playing exercises for emergency situations

### **Assessment and Evaluation**

- Participation in discussions and activities
- Practical assessments (lab performance)
- Group projects or presentations on chosen topics

### **Additional Resources**

- Recommended readings and online resources
- Community organizations related to deaddiction and road safety

- **Educational technology**

A common topic at EdCamps, this includes practical examples of using modern tools in the classroom and how to solve problems that technology can cause.

- **Current events**

Students can track current events and create a news show or podcast about them.

- **Artificial intelligence**

Seminars can help you learn about responsible AI development and deployment, and build a professional network.

- **Case studies and debates**

These activities can help students engage with the material and develop communication, critical analysis, and teamwork skills.

- **Classroom management**

This includes strategies and techniques for creating a learning environment that reduces disruptions.

- **Global issues in education and research**

This can include topics such as the impact of crisis on education, ethical issues in education, and technology in teaching and learning.

- **Psychology**

This includes core areas such as biological, cognitive, developmental, social, and individual differences.

# OBJECT ORIENTED PROGRAMMING SYSTEM USING C++

BCA-201

L T P 3 1 2

## UNIT 1

**Introduction to Object Oriented Programming:** Basic concept of OOP, Comparison of Procedural Programming and OOP, Benefits of OOP, C++ compilation, Difference between C and C++, **Tokens and identifiers:** Character set and symbols, Keywords, C++ identifiers, Variables and Constants, Integer, character and symbolic constants; Dynamic initialization of variables, Reference variables, Basic data types in C++, Streams in C++, Operators, Types of operators in C++, Precedence and associativity of operators, Manipulators.

## UNIT 2

**Decision and Control Structures:** if statement, if-else statement, switch statement, Loop: while, do-while, for; Jump statements: break, continue, go to, Array, Pointer and Structure Arrays, pointers, structures, unions; Functions, main() function, components of function: prototype, function call, definition, parameter; passing arguments; types of function, inline function, function overloading. **Classes and Objects:** Classes in C++, class declaration, declaring objects, Defining Member functions, Inlinemember function, Array of objects, Objects as function argument, Static data member and member function, Friend function and friend class.

## UNIT 3

**Constructors and Destructors:** Constructors, Instantiation of objects, Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, Constraints on constructors and destructors, Dynamic initialization of objects. **Operator Overloading:** Overloading unary operators: Operator keyword, arguments and return value; overload in unary and binary operators: arithmetic operators, manipulation of strings using operators; Type conversions.

## UNIT 4

**Inheritance and Polymorphism :** Derived class and base class, Defining a derived class, Accessing the base class member, **Inheritance:** multilevel, multiple, hierarchical, hybrid; Virtual base class, Abstract class, Virtual Functions and Polymorphism, Virtual functions, pure virtual functions; **Polymorphism:** Categorization of polymorphism techniques: Compile time polymorphism, Run time polymorphism

## UNIT 5

**File Handling:** File classes, Opening and Closing a file, File modes, Manipulation of file pointers, Functions for I/O operations.

## BOOKS SUGGESTED

- 1) E. Balaguruswami – Object Oriented programming with C++
- 2) Kris James – Success with C++
- 3) David Parsons – Object Oriented programming with C++

# DATABASE MANAGEMENT SYSTEMS

BCA-202

L T P 31 2

## UNIT-I

### Database Concepts:

Data, Database and DBMS, Comparison between traditional file V/s DBMS, Characteristics of datain database, Components of database system environment, Functions of DBMS, Advantagesand disadvantages of the DBMS, DBMS users, Database administrator, Role of DBA, 3-schema architecture, Database development process - conceptual data modelling, logical database design, physical database design, database implementation, database maintenance.

## UNIT-II

**Database Analysis:** Conceptual data modelling using E-R data model -entities, attributes,relationships, generalization, specialization, specifying constraints, 5-6 practical problems basedon E-R data model.

## UNIT-III

**Relational Database:** Relational data model: Introduction to relational database theory: definitionof relation, relational model integrity rules, relational algebra and relational calculus.

**Relational Database Design:** Normalization- 1NF, 2NF, 3NF, BCNF, 4NF and 5NF. Concept of De-normalization and practical problems based on these forms.

## UNIT-IV

**Indexing of Data:** Impact of indices on query performance, basic structure of an index, creating indexes with SQL, Types of Indexing and its data structures.

**Transaction Management and Concurrency Control:** Transaction, Concurrency control, Concurrency control with locking Methods, Concurrency control with time stamping methods, Concurrency control with optimistic methods, database recovery management.

## UNIT-V

**Database Implementation:** Introduction to SQL, DDL aspect of SQL, DML aspect of SQL – update, insert, delete & various form of SELECT- simple, using special operators, aggregate functions, group by clause, sub query, joins, co-related sub query, union clause, exist operator. PL/SQL - cursor, stored function, stored procedure, triggers, error handling, and package.

### Text Books:

1. Silverschatz A., Korth F. H. and Sudarshan S., Database System Concepts, Tata McGrawHill (2010) 6th ed.
2. Elmasri R. and Navathe B. S., Fundamentals of Database Systems, Pearson (2016) 7th ed.

### Reference Books:

1. Bayross I., SQL, PL/SQL the Programming Language of Oracle, BPB Publications (2009)4th ed.
2. Hoffer J., Venkataraman, R. and Topi, H., Modern Database Management, Pearson (2016)12th ed.

## WEB AND E-COMMERCE TECHNOLOGIES

BCA-203

L T P 3 1 0

### UNIT-I

**An introduction to Electronic commerce:** What is E-Commerce (Introduction and Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications, Electronic Commerce and Electronic Business (C2C) (2G, G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C)

### UNIT-II

**Building Own Website:** Reasons for building own website, Benefits of Website, Cost, Time, Reach, Registering a Domain Name, Web promotion, Target email, Banner Exchange, Shopping Bots

### UNIT-III

**Internet Security:** Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime (Laws, Types of Crimes), Threats, Attack on Computer System, Software Packages for privacy, Hacking, Computer Virus (How it spreads, Virus problem, virus protection, Encryption and Decryption, Secret key Cryptography, DES, Public Key Encryption, RSA, Authorisation and Authentication, Firewall, Digital Signature (How it Works))

### UNIT-IV

**Electronic Data Exchange:** Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model, Electronic Payment System, Types of Electronic Payment System, Payment Types, Traditional Payment, Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash

### UNIT-V

**Planning for Electronic Commerce:** Planning Electronic Commerce initiatives, Linking objectives to business strategies, Measuring cost objectives, Comparing benefits to Costs, Strategies for developing electronic commerce web sites, Internet Marketing, The PROS and CONS of online shopping, The cons of online shopping, Justify an Internet business, Internet marketing techniques, The E-cycle of Internet marketing, Personalisation e-commerce.

**E – Governance for India:** Governance of India, Indian customer EDI System, Service centre, Imports, Exports.

### Recommended Books :

1. E-Commerce Concepts, Models, Strategies- :- G.S.V. Murthy Himalaya Publishing House
2. E- Commerce :- Kamlesh K Bajaj and Debjani Nag
3. Electronic commerce :- Gray P. Schneider
4. E-Commerce, Fundamentals & Applications : Chand (Wiley)

## DISCRETE STRUCTURES

BCA-204

L T P 3 10

### UNIT-I

**Propositional logic:** Logical connectives, Truth tables, Normal forms, Proof Techniques: Notions of implication, equivalence converse, inverse, contra positive, negation, and contradiction.

### UNIT-II

**Set Theory:** Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. **Relations:** Definition, Operations on relations, Properties of relations, Composite Relations, Order of relations. **Functions:** Definition, Classification of functions, Operations on functions, Partially Ordered Set, Totally Ordered Set, Hasse Diagram, Minimal and Maximal Elements, Upper Bound and Lower Bound, Infimum & Suprimum

### UNIT-III

**Graphs Theory:** Representation, Type of Graphs, Paths and Circuits: Euler Graphs, Hamiltonian Paths & Circuits; Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs.

### UNIT-IV

**Trees:** Definition, Binary tree, Binary tree traversal, Binary search tree, Cut-sets, Connectivity and Separability, Isomorphism.

### UNIT-V

**Lattice:** Lattice as a poset, Bounded Lattice, Lattice as algebraic system, Dual of a lattice, Complete Lattice

**Text Books:** 1. Rosen, K.H., Discrete Mathematics and its Applications, McGraw Hill (2011), 7th ed. 2. Tremblay, J.P. and Manohar R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill (2007), 1st ed.

**Reference Books:** 1. Haggard G., Schlipf J. and Whitesides, Sue, Discrete Mathematics for Computer Science, Cengage Learning, (2008), 2nd ed. 2. Johnsonbaugh R., Discrete Mathematics, Pearson Education, (2007), 7th ed

**Unit 1: Introduction to Set Theory**

Definition of sets and elements, Notation and terminology (subsets, proper subsets), Venn diagrams and visual representations of sets, Operations on sets (union, intersection, difference, complement), Cartesian products

**Unit 2: Types of Sets and Functions**

Finite vs. infinite sets, Countable and uncountable sets, Power sets, Introduction to functions (one-to-one, onto, bisections), Relationships between sets and functions

**Unit 3: Relations and Cardinality**

Definitions and examples of relations, Properties of relations (reflexivity, symmetry, transitivity), Equivalence relations and partitions, Cardinality: comparing sizes of sets, Cantor's theorem and the concept of infinity

**Unit 4: Axiomatic Set Theory**

Introduction to axiomatic systems, Zermelo-Fraenkel set theory (ZF) and the Axiom of Choice (AC), Basic axioms and their implications, Alternative set theories (e.g., Von Neumann-Bernays-Gödel set theory), Paradoxes in set theory (Russell's paradox, Burali-Forti paradox)

**Unit 5: Applications and Advanced Topics**

Applications of set theory in mathematics and computer science, Fuzzy sets and their applications, Set theory in probability and statistics, Introduction to ordinal and cardinal numbers, Discussion of open problems and recent developments in set theory



**Course Code:-BCA-204 B**

**L T P C**

**Course Name :-Graph Theory**

**4 0 0 4**

**UNIT-I** what is graph Application of graphs, Finite and Infinite graphs, Incidence & Degree, Isolated vertex, Pendant Vertex, and Null Graph.

**UNIT-II** Isomorphism, Sub graphs, A puzzle with multicolored Cubes, walks, Path, and circuits connected graph, Disconnected graphs and Components, Euler graphs, Operations on graphs more on Euler Graphs, Hamiltonian paths and circles.

**UNIT-III** Tree, some properties of trees, pendant Vertices in a tree, Distance and centers in a tree Rooted and Binary trees, Spanning trees, fundamental circuits, Finding all spanning tree of a graph.

**UNIT-IV** Cut-Sete, Some Properties of Cut-Set, All Cut-Sets in a graph, Path-Sets, some properties of paths sets in a graph, fundamental Circuits & Cut-Set, Connectively and separability. Directed graph, undirected graph. Matrix representation of graph.

Text Books:

1. NarsinghDeo, "Graph Theory", Prentice Hall of India

**UNIT 1:- PROBABILITY;** Introduction to Probability, Terms Used in Probability Random Experiment Sample Space Event and Definition of Various Events, Mathematical, Statistical and Axiomatic Definitions of Probability, Addition Rule, Multiplication Rule and Sub Rules of the Probability (Without Proof), Conditional Probability, Bayes' theorem (without proof) and its application up to three events, Simple numerical examples based on the above concepts 25%

**UNIT 2:- MATHEMATICAL EXPECTATION** (For Discrete Random Variable), Meaning of Discrete Random variable, Meaning of Probability Distribution, Meaning of Mathematical Expectation Properties of Mathematical Expectation (Without Proof), Variance of a Discrete Random Variable Properties of Variance (without proof), Mean and Variance of Linear Combination of Two Independent Variables, Examples based on the above Concepts 25%

**UNIT 3:- DISCRETE DISTRIBUTIONS -I ;** Concept of Probability Mass Function , Introduction to Poisson Distribution Properties and Uses of Poisson Distribution , Introduction to Hyper geometric Distribution Properties and Uses of Hyper geometric Distribution , Examples Related to these Distributions 25%

**UNIT 4 :- DISCRETE DISTRIBUTIONS -II ;** Introduction to Negative Binomial Distribution Properties and Uses of Negative Binomial Distribution 25% , Geometric Distribution Properties and Uses of Geometric Distribution , Examples Related to these Distributions

**REFERENCE BOOKS** 1. "Introduction to Probability and Mathematical Statistics" by PrasannaSahoo (published by CRC Press) 2. "Probability and Statistics" by T.K. V. Iyengar (published by S. Chand Publishing) 3. "Fundamentals of Probability, with Stochastic Processes" by Saeed Ghahramani (published by PHI Learning Private Limited) 4. "Probability and Random Processes" by S.V. Prabhu and P.G. Sankaran (published by John Wiley & Sons India Pvt. Ltd.) 5. "A First Course in Probability and Statistics" by B.L.S. Prakasa Rao (published by Universities Press)

## ENVIRONMENTAL STUDIES

BCA-205

L T P 3 10

### UNIT-I

**Environment pollution, global warming and climate change:** Air pollution (local, regional and global); Water pollution problems; Land pollution and food chain contaminations; Carbon cycle, greenhouse gases and global warming; Climate change – causes and consequences; Carbon footprint; Management of greenhouse gases at the source and at the sinks.

### UNIT-II

**Ecology, Structure and functioning of natural ecosystems:** Ecology, ecosystems and their structure, functioning and dynamics; Energy flow in ecosystems; Biogeochemical cycles and climate; Population and communities.

### UNIT-III

**Natural resources:** Human settlements and resource consumption; Biological, mineral and energy resources; Land, water and air; Natural resources vis-à-vis human resources and technological resources; Concept of sustainability; Sustainable use of natural resources.

### UNIT-IV

**Agricultural, industrial systems and environment:** Agricultural and industrial systems vis-à-vis natural ecosystems; Agricultural systems, and environment and natural resources; Industrial systems and environment.

### UNIT-V

**Energy technologies and environment:** Electrical energy and steam energy; Fossil fuels, hydropower and nuclear energy; Solar energy, wind energy and biofuels; Wave, ocean thermal, tidal energy and ocean currents; Geothermal energy; Future energy sources; Hydrogen fuels; Sustainable energy.

**Text Books:** Bharucha, E., Textbook of Environmental Studies, Universities Press (2005). Chapman, J.L. and Reiss, M.J., Ecology-Principles and Application, Cambridge University Press (LPE) (1999). Joseph, B., Environmental Studies, Tata McGraw-Hill (2006).

**Reference Books:** Miller, G.T., Environmental Science- Working with Earth, Thomson (2006). Wright, R.T., Environmental Science-Towards a sustainable Future, Prentice Hall (2008) 9<sup>th</sup> ed.

**UNIT-1: THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**

Definition, Scope and Importance, Need for Public Awareness.

**UNIT-2: NATURAL RESOURCES:** - Renewable and Non-renewable Resources:

Natural resources and associated problems: - a) **FOREST RESOURCES:** use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) **WATER RESOURCES:** use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

**UNIT-3: ECOSYSTEMS:-** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: - a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**UNIT-4: BIODIVERSITY AND ITS CONSERVATION :-**Introduction – Definition: genetic, species and ecosystem diversity, Bio geographical classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, and aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation ,Hot-spots of biodiversity, Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT-5: ENVIRONMENTAL POLLUTION DEFINITION:** Causes, effects and control measures of: - a) Air pollution b) Water pollution c) Soil pollution d) Marine pollution e) Noise pollution f) Thermal pollution g) Nuclear pollution, Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster Management: Floods, earthquake, cyclone and landslides.

**TEXT BOOKS:-**

- 1."Environmental Studies: From Crisis to Cure":- Author: R. Rajagopalan, Publisher: Oxford University Press
- 2."Environmental Studies":- Author: ErachBharucha, Publisher: University Grants Commission (UGC)
3. "Textbook of Environmental Studies for Undergraduate Courses":- Authors: Benny Joseph, Publisher: McGraw Hill Education
4. "Environmental Science: A Global Concern":- Authors: William P. Cunningham, Mary Ann Cunningham, Publisher: McGraw-Hill

**Natural Resource Management****3 0 1**

**UNIT 1: Resources:** Types, Renewable & non-renewable resources; resource degradation and conservation; Human impact on natural resources.

Land resources: Land degradation and desertification; Soil erosion and control; reclamation & management of waste lands with special reference to India.

Water resources: Pools of water and hydrological cycle; Surface water, ground water, Human use of freshwater. Rain water harvesting; watershed management

**UNIT 2:- Energy resources:** Fossil fuels, nuclear energy, solar energy, wind energy, tidal energy, geothermal energy, hydropower. Global energy consumption; Environmental impacts of various forms of energy use.

Hydrogen as a source of energy, energy from biomass, bioconversion technology, energy plantations and petro-crops. Bioenergy-Prospects in India.

Mineral resource conservation & recycling, bacterial leaching of metals from low grade ores.

**UNIT 3:- Forest resources:** Forests, their importance, types, global distribution; primary and secondary products, forest resources of India. Impact of deforestation; Sustainable forest Forest Management.

Range lands: Types, uses, grassland types and management in India.

Medicinal plant resources and bioprospecting-a brief account.

Fisheries and Marine resources- a general account; aquaculture

**UNIT 4:** Economics, environment and development: Economic categories of resources; the market, environment and natural resources; the economics theory- market, demand and supply relationships.

The limit of growth; cost benefit ratio; natural resources accounting; market based mechanisms for environmental protection.

Economically sustainable forest management designs- green certification, resource conservation, community forest management; ecotourism.

Economic efficient model of sustainable fisheries; designs for renewable energy resources.

**TEXT BOOKS:-**

1. "Natural Resource Management for Sustainable Development": -Author: B.D. Dhawan, Focus: Sustainable development and conservation strategies in natural resource management.
2. "Integrated Watershed Management: Principles and Practice":- Authors: Isobel W. Heathcote
3. "Natural Resource and Environmental Economics":-Authors: Roger Perman, Yue Ma, Michael Common, David Maddison, James McGilvray
- 4."Principles of Environmental and Resource Economics":-Authors: HenkFolmer, Landis Gabel, Shelby Gerking, Adam Rose
5. "Natural Resource Management: The Human Dimensions":- Authors: Alan W. Ewert, Deborah J. Chavez, Arthur W. Magill

**Unit 1: Introduction to Pollution and Environmental Issues**

Definition and Types of Pollution:-Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Thermal Pollution

Sources and Causes of Pollution:-Natural vs. Anthropogenic sources

Impacts of Pollution on Environment and Human Health

Global Environmental Issues:-Ozone depletion, Global warming, Acid rain, Eutrophication

**Unit 2: Air Pollution Control**

Air Pollutants:-Types (Particulate matter, gases, etc.), Primary vs. Secondary pollutants

Sources and Health Effects of Air Pollutants

Air Quality Standards: -WHO and National Standards, Monitoring Air Quality

Air Pollution Control Technologies:-Filtration (Cyclones, bag filters), Electrostatic precipitators, Scrubbers (Wet and dry), Catalytic converters

**Unit 3: Water and Wastewater Treatment**

Water Pollution:-Sources (Industrial, domestic, agricultural), Types of water pollutants (Physical, chemical, biological)

Water Quality Standards and Monitoring

Water Treatment Processes:-Coagulation and flocculation, Filtration

Sedimentation, Disinfection methods (Chlorination, UV, ozone)

Wastewater Treatment Techniques:-Primary, Secondary, and Tertiary treatments,

Biological processes (Activated sludge, trickling filters), Advanced treatment (Membrane filtration, adsorption)

**Unit 4: Solid Waste Management and Noise Pollution Control**

Solid Waste Management:-Types of Solid Waste (Municipal, Industrial, Hazardous), Collection, transportation, and disposal of solid waste, Waste reduction and recycling, Landfills and composting, Incineration and waste-to-energy technologies

Noise Pollution:- Sources of Noise Pollution, Effects on Human Health and Environment, Noise Measurement and Control Methods, Soundproofing, barriers, and zoning

**Unit 5: Environmental Policies and Sustainable Development**

Environmental Legislation and Policies:-National Environmental Policies, International Conventions and Protocols (Kyoto Protocol, Paris Agreement)

Environmental Impact Assessment (EIA):- Process and Importance, Case Studies

Sustainable Development:-Principles of sustainability, Role of renewable energy in pollution control, Green technologies and innovations, Circular Economy concepts (Reduce, Reuse, Recycle)

**TEXT BOOKS:-**

1. Air Pollution Control Engineering:-Author: Noel De Nevers,Publisher: McGraw-Hill
2. Wastewater Engineering: Treatment and Reuse:-Authors: Metcalf & Eddy, George,Chobanoglous,Publisher: McGraw-Hill
3. Environmental Pollution Control Engineering:-Author: C.S. Rao, Publisher: New Age International Publishers
4. Solid Waste Management:-Authors: K. Sasikumar, SanoopGopiKrishna,Publisher: PHI Learning Pvt. Ltd.

S.N	PRACTICAL PROGRAMS FILE
1	Write a program to print "HELLO" in C++.
2	Write a program to addition of two numbers using C++.
3	Write a program to find factorial number of 5 in C++.
4	Write a program to Find Simple Interest in C++.
5	Write a program to Check Even or Odd Integers using if and else in C++.
6	Write a program to print 1 to 10 using array in C++.
7	Write a program to create function overloading in C++.
8	Write a program to print 20 to 1 using while loop in C++.
9	Write a program to using single inheritance in ++.
10	Write a program to create private function and call using C++.
11	Write a program to create default constructor in C++.
12	Write a program to using friend function in C++.
13	Write a program to create function overriding in C++.
14	Write a program to print matrix in C++.
15	Write a program to print addition of a single dimensional array in C++
16	Write a program to check even or odd using for loop in C++.
17	Write a program to print 1 to 20 using do while loop in C++
18	Write a program to using switch case in C++;
19	Write a program to find multilevel inheritance in C++.
20	Write a program to create operator overloading in C++.

**List of Experiments:**

1. Introduction SQL-SQL\*Plus
2. Road way travels E-R Diagrams
3. Various Data Types
4. Tables
5. My SQL Installation
6. DDL and DML Commands with Examples
7. Key Constrains-Normalization
8. Aggregate functions
9. Joins
10. Views
11. Index
12. PL/ SQL
13. Exception handling
14. Triggers
15. Cursors
16. Subprograms-procedure PL/ SQL
17. Functions of PL/ SQL



- **Educational technology**

A common topic at EdCamps, this includes practical examples of using modern tools in the classroom and how to solve problems that technology can cause.

- **Current events**

Students can track current events and create a news show or podcast about them.

- **Artificial intelligence**

Seminars can help you learn about responsible AI development and deployment, and build a professional network.

- **Case studies and debates**

These activities can help students engage with the material and develop communication, critical analysis, and teamwork skills.

- **Classroom management**

This includes strategies and techniques for creating a learning environment that reduces disruptions.

## OPERATING SYSTEMS

**BCA-301**

**L T P 31 2**

### **UNIT-I**

Introduction to the Operating System (OS), Types of Operating System: Batch System, Time Sharing System, Real Time System. Multi Programming, Distributed System, Functions and Services of OS.

### **UNIT - II**

Process Management: Process Concept, Process State, Process Control Block, Process Scheduling, CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Pre-emptive & Non-Preemptive Scheduling.

### **UNIT - III**

Deadlocks-System model, Characterization, Deadlock Prevention, Deadlock Avoidance and Detection, Recovery from deadlock.

### **UNIT - IV**

Memory Management: Logical Address, Physical Address, External and Internal Fragmentation. Concept of paging, Page table structure - Hierarchical Paging, Hashed Page Tables, Inverted Page Table.

### **UNIT -V**

Information Management: File Concept, Access Methods, Directory Structure. Device Management: Disk Structure, Disk Scheduling Algorithms.

### **Text Books:**

1. Silbershatz and Galvin, "Operating System Concept", Addison Wesley, 2002.
2. Nutt, G., "Operating Systems", Addison-Wesley.
3. Godbole Ahyut, "Operating System", PHI, 2003.

### **Reference Books:**

1. Flynn, Mchoes, "Understanding Operating System", Thomson Press, Third Edition, 2003
2. Tannenbaum, "Operating System Concept", Addison Wesley, 2002.
3. Joshi, R. C. and Tapaswi, S., "Operating Systems", Wiley Dreamtech.

## HTML, DHTML AND CSS PROGRAMMING

BCA-302

L T P 3 1 2

### UNIT-I

**Introduction:** Overview of HTML, need of HTML, Use of it, HTML Tags: concept of Tag, types of HTML tags, structure of HTML program, Text formatting through HTML: Paragraph breaks, line breaks, background and BGcolor attributes, Emphasizing material in a web page: Heading styles, drawing lines, text styles, Text styles and other text effects-centering, spacing, controlling font size & color, Lists: Using unordered, ordered, definition lists Adding Graphics To HTML Documents: Using Image tag, attributes of Image tag, changing width & height of image

### UNIT-II

**Tables, Frames and Linking Documents:** Handling Tables: To define header rows & data rows, use of table tag and its attributes. Use of caption tag Linking Documents: Concept of hyperlink, types of hyperlinks, linking to the beginning of document, linking to a particular location in a document, Images as hyperlinks Frames: Introduction To frames, using frames & frameset tags, named frames how to fix the size of a frame, targeting named frames.

### UNIT-III

**Introduction to CSS:** Introducing CSS, font attributes, color and background attributes, text attributes, border attributes, margin related attributes, list attributes Using class and span tag, External Style Sheets, Creating Divs with ID style, Creating Tag & Class style, creating borders, Navigation links, creating effects with CSS.

### UNIT-IV

**Introduction to JavaScript:** use of JavaScript in web pages. Understand JavaScript event model, use some basic event and control webpage behavior. Variable declaration, Operators, , Control Statements, Error Handling, Understanding arrays, Function Declaration, Built In Functions, Standard Date and Time Functions, Working with Objects, Call method in JavaScript.

### UNIT-V

Web hosting - what is domain? Introduction to DNS, how to register a domain ?, what is web hosting ?, how to get a web hosting ?, host your website on web server. FTP - FTP introduction, FTP commands viewing files and directories, FTP commands transfer and rename files, FTP with WS FTP/ CuteFTP, Filezilla on Windows.

### References:

1. HTML and CSS, Jon Duckett, John Wiley, 2012
2. Achyut S Godbole and Atul Kahate, "Web Technologies", Tata McGraw Hill
3. Gopalan N P, Akilandeswari "Web Technology: a Developer S Perspective", PHI
4. H.M. Deitel, P.J. Deitel, a.B. Goldberg-Internet & World Wide Web How to Program, Pearson Education, 3rd Edition,
5. C. Xavier, "Web Technology & Design ", Tata McGraw Hill.
6. Ivan Bay Ross, "HTML, DHTML, JavaScript, Perl CGI", BPB.
7. Web Technologies, Black Book, Dreamtech Press
8. HTML 5, Black Book, Dreamtech Press
9. Joel Sklar -Web Design,, Cengage Learning

10. Harwani-Developing Web Applications in PHP and Ajax, Mcgrawhill
11. Learn HTML IN A Weekend By Steven E. Callihan, PHI

## THEORY OF COMPUTATION

BCA-303

L T P 3 1 0

### Unit-I

Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)- Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Non deterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Myhill-Nerode Theorem, Finite State Machine with output- Moore machine and Melay Machine, Properties and Limitations of Finite state machine, Conversion of Moore machine to Melay Machine & Vice-Versa, Application of Finite Automata.

### Unit-II

Properties of Regular languages: Regular Expressions, Definition, Operators of regular expression and their precedence, Chomsky Hierarchy, Conversion of DFA to Regular Expression, Arden Theorem, Pumping Lemma, Decision properties of Regular Languages,

### Unit-III

Context Free Grammar and Push Down Automata: Context Free Grammar, Derivation tree and Ambiguity, Application of Context free Grammars, Chomsky and Greibach Normal form, Properties of context free grammar, Decidable properties of Context free Grammar, Pumping Lemma for Context free grammar, Push down Stack Machine, Design of Deterministic and Non-deterministic Push-down stack.

### Unit-IV

**Turing Machine:** Turing machine definition and design of Turing Machine, Church-Turing Thesis, Variations of Turing Machines, combining Turing machine, Universal Turing Machine, Post Machine, Post correspondence problem.

### Unit-V

**Uncomputability:** Halting Problem, Turing enumerability, Turing Acceptability and Turing decidabilities, unsolvable problems about Turing machines, Rice's theorem.

### Textbooks:

1. Hopcroft E.J., Ullman D.J. and Motwani R., Introduction to Automata Theory, Languages and Computation, Pearson Education (2007) 3<sup>rd</sup> ed.
2. Martin C. J., Introduction to Languages and the Theory of Computation, McGraw-Hill Higher Education (2011) 4<sup>th</sup> ed.
3. Lewis H.C., Elements of the Theory of Computation, Prentice Hall (1998) 2<sup>nd</sup> ed.

### Reference Books:

1. Introduction to Languages and the Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Textbook on Automata Theory, P. K. Srimani, Nasir S.F.B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3<sup>rd</sup> edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.

**NPTEL Links:**

[https://www.youtube.com/results?search\\_query=AUTOMATA+NPTEL](https://www.youtube.com/results?search_query=AUTOMATA+NPTEL)

<https://www.youtube.com/watch?v=S3cOulqSAmU&list=PLidiQIHRzpXLOB6lg8hGUKLbbyekRz7JQ>

**Slide-ShareLinks:** <https://>

[www.slideshare.net/marinasantini1/automata45326059](https://www.slideshare.net/marinasantini1/automata45326059)

<https://www.slideshare.net/jenadgeorge/automata-250139119>

## MULTIMEDIA AND APPLICATIONS

BCA-304

L T P 310

### UNIT-I

**Introductory Concepts:** Multimedia - Definitions, Basic properties and medium types (Temporal and non-temporal), Multimedia applications, Uses of Multimedia, Introduction to making multimedia - The Stages of project, the requirements to make good multimedia, Multimedia skills and training.

### UNIT-II

**Multimedia-Hardware and Software:** Multimedia Hardware - Macintosh and Windows production Platforms, Hardware peripherals - Connections, Memory and storage devices, Media software - Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.

### UNIT-III

**Multimedia building blocks Creating & Editing Media elements:** Text, image, Sound, animation Analog/ digital video Data Compression: Introduction, Need, Difference of lossless/lossy compression techniques. Brief overview to different compression algorithms concern to text, audio, video and images etc.

### UNIT-IV

**Multimedia and the Internet:** History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW - Web Servers, Web Browsers, Webpage makers and editors, Plug-Ins and Delivery Vehicles, HTML, Designing for the WWW - Working on the Web, Multimedia Applications - Media Communication, Media Consumption, Media Entertainment, Media games.

### UNIT-V

**Multimedia-looking towards Future:** Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Virtual Reality, Digital Camera. Assembling and delivering a Multimedia project-planning and costing, Designing and Producing, content and talent, Delivering, CD-ROM: The CD family, production process, CD-i – Overview – Media Types Technology.

### TEXTBOOKS:

1. Tay Vaughan, "Multimedia: Making it work", TMH, 1999.
2. Ralf Steinmetz and Klara Naharstedt, "Multimedia: Computing, Communications Applications", Pearson, 2001.

### REFERENCES:

1. Keyes, "Multimedia Handbook", TMH, 2000.
2. Steve Heath, "Multimedia & Communication Systems", Focal Press, UK, 1999.
3. K. Andleigh and K. Thakkar, "Multimedia System Design", PHI, PTR, 2000.
4. Steve Rimmer, "Advanced Multimedia Programming", MHI, 2000

## OPTIMIZATION TECHNIQUES

BCA-305

L T P 310

### UNIT – I

**Measures of Central Tendency & Dispersion:** Definition, Importance & Limitation. Collection of data and formation of frequency distribution. Graphic presentation of frequency distribution – graphics, Bars, Histogram, Diagrammatic. Measures of central tendency – mean, median and mode, partition values – quartiles, deciles and percentiles. Measures of variation – range, IQR, quartile, deciles and percentiles.

### UNIT – II

**Correlation/Regression:** Correlation Coefficient; Assumptions of correlation analysis; coefficients of determination and correlation; measurement of correlation- Karl Person's Methods; Spearman's rank correlation; concurrent deviation the correlation coefficient; Pitfalls and limitations associated with regression and correlation analysis; real world application using IT tools.

### UNIT – III

**Linear Programming & Queuing:** Concept a assumptions usage in business decision making linear programming problem: formulation, methods of solving: graphical and simplex, problems with mixed constraints: duality; concept, significance, usage & application in business decision making. Queuing Models: Basic structure of queuing models, Birth-Death queuing models and its steady state solution, M/M/1 and M/M/C models with infinite/finite waiting space, PERT, CPM

### UNIT – IV

**Transportation & Assignment Problem:** General structure of transportation problem, solution procedure for transportation problem, methods for finding initial solution, test for optimality. Maximization of transportation problem, transportation problem.

### UNIT – V

**Assignment Problem:** Assignment problem approach of the assignment model, solution methods of assignment problem, maximization in an assignment, unbalanced assignment problem, restriction on assignment.

### TEXT BOOKS

1. Sharma, J.K.; Operations Research: problems & solutions; Macmillan India
2. Gupta, S.P. and Gupta, P.K.; Quantitative Techniques and Operations Research, Sultan Chand & Sons
3. Vohra, N.D.; Quantitative Techniques in Management 2003.
4. Gupta, S.P. Statistical Methods, Sultan Chand & Sons. 2004
5. A.M. Natarajan, P Balasubramani A. Tamilarasi, Operations Research, Pearson 2005

### REFERENCE BOOKS

1. R.L. Rardin, Optimization in Operations Research, Prentice Hall.
2. A. Racindran, D.T. Phillips, J.S. Solberg, Second edition, John Wiley.



## ELEMENTS OF STATISTICS

**BCA-305 A**

**Cr L-T-P**

**4 3-1-0**

### **Unit - I**

#### **Introduction to Statistics:**

Definition and scope of statistics, Importance of statistics in decision making, Types of data: Primary and secondary data, Methods of data collection, Classification and tabulation of data,

Frequency distribution.

### **Unit – II**

#### **Measures of Central Tendency and Dispersion:**

Measures of Central Tendency: Mean, Median, Mode, Properties and applications of central tendency, Measures of Dispersion: Range, Variance, Standard Deviation, Quartiles, Coefficient of variation, Moments, Skewness, and Kurtosis.

### **Unit - III**

#### **Probability and Probability Distributions:**

Introduction, Basic concepts: Sample space, Events, Probability axioms, Conditional probability, Independent events, Bayes' theorem, Random variables: Discrete and Continuous, Probability distributions: Binomial, Poisson, and Normal distributions.

### **Unit - IV**

#### **Sampling and Estimation**

Sampling methods: Simple random sampling, Stratified sampling, Systematic sampling, Sampling and non-sampling errors, Point and Interval estimation, Properties of estimators: Unbiasedness, Efficiency, Consistency, Introduction to Hypothesis testing

### **Unit – V**

**Correlation, Regression, and Time Series Analysis:** Types, Karl Pearson's correlation coefficient, Spearman's rank correlation, Simple and Multiple regression analysis, Time series analysis: Components of time series, Methods of measuring trends: Moving averages, Least squares method, Applications of correlation, regression.

#### **TEXT BOOKS:**

1. S.C. Gupta: **Fundamentals of Statistics**, Himalaya Publishing House
2. R.S. Bhardwaj: **Business Statistics**, Excel Books
3. Goon, A.M., Gupta, M.K. and Dasgupta, B.: **Fundamentals of Statistics**, Vol I, The World Press.

4. Richard A. Johnson: **Probability and Statistics for Engineers**, Pearson Education

**Reference Books:**

1. Murray R. Spiegel: **Schaum's Outline of Probability and Statistics**, McGraw-Hill
2. A.M. Mood, F.A. Graybill: **Introduction to the Theory of Statistics**, McGraw-Hill
3. Taro Yamane: **Statistics: An Introductory Analysis**, Harper and Row
4. Sheldon M. Ross: **Introduction to Probability and Statistics for Engineers and Scientists**, Academic Press

## COMBINATORIAL OPTIMIZATION

BCA-305B

Cr L-T-P

4 3-1-0

### Unit – I

#### Introduction to Combinatorial Optimization:

Basics of combinatorial optimization, Problem-solving strategies in combinatorial optimization

Introduction to graphs and networks, Linear programming and integer programming, Applications of combinatorial optimization in real-world problems.

### Unit – II

#### Greedy Algorithms and Dynamic Programming:

Greedy algorithm principles, Applications of greedy methods: Minimum spanning tree Huffman coding, Dynamic programming techniques, Examples: Knapsack problem, shortest paths, Comparison of greedy algorithms and dynamic programming.

### Unit - III

#### Network Flow and Matching:

Basics of network flow problems, Maximum flow problem: Ford-Fulkerson method, Bipartite matching and assignment problems, Minimum-cost flow problem, Applications of network flow in optimization.

### Unit – IV

#### Approximation Algorithms and Heuristics:

Concept of approximation algorithms, Polynomial-time approximation schemes (PTAS)

Heuristic methods for optimization: Genetic algorithms, Simulated annealing, Traveling salesman problem (TSP) and its approximations, Applications of heuristic methods in large-scale optimization problems.

### Text Books

1. Bernhard Korte, Jens Vygen: Combinatorial Optimization: Theory and Algorithms, Springer
2. Christos H. Papadimitriou, Kenneth Steiglitz: Combinatorial Optimization: Algorithms and Complexity, Dover Publications
3. William J. Cook, William H. Cunningham: Combinatorial Optimization, Wiley-Interscience
4. Michael R. Garey, David S. Johnson: Computers and Intractability: A Guide to the Theory of NP-Completeness, W.H. Freeman

### Reference Books

1. R. K. Ahuja, Thomas L. Magnanti, James B. Orlin: Network Flows: Theory, Algorithms, and Applications, Prentice Hall
2. Jon Kleinberg, Éva Tardos: Algorithm Design, Pearson Education
3. Vangelis Th. Paschos: Concepts of Combinatorial Optimization, Wiley
4. Robert Sedgewick, Kevin Wayne: Algorithms, Addison-Wesley

## MULTI-OBJECTIVE OPTIMIZATION

BCA-305C

Cr L-T-P

4 3-1-0

### Unit – I

#### Introduction to Multi-objective Optimization:

Basics of optimization, Single vs. multi-objective optimization, Concept of Pareto optimality

Formulation of multi-objective optimization problems, Applications of multi-objective optimization in real-world scenarios.

### Unit – II

#### Techniques for Multi-objective Optimization:

Weighted sum method,  $\epsilon$ -constraint method, Goal programming, Evolutionary algorithms for multi-objective optimization, Examples and case studies.

### Unit - III

#### Decision Making in Multi-objective Optimization:

Ranking and selection of solutions, Multi-criteria decision-making (MCDM)

Methods: Analytic Hierarchy Process (AHP), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Trade-offs and decision making in multi-objective problems.

### Unit – IV

#### Applications and Advanced Topics:

Real-world applications in engineering, finance, and logistics, Introduction to hybrid optimization techniques, Fuzzy multi-objective optimization, Case studies in multi-objective optimization.

### Text Books

1. Kalyanmoy Deb: **Multi-objective Optimization Using Evolutionary Algorithms**, Wiley
2. Carlos M. Fonseca: **Evolutionary Multi-objective Optimization**, Springer
3. Matthias Ehrgott: **Multicriteria Optimization**, Springer
4. CoelloCoello, Carlos A., Lamont, Gary B.: **Applications of Multi-objective Evolutionary Algorithms**, World Scientific

### Reference Books

1. Jeffrey Horn: **Multi-objective Problem Solving from Nature**, Springer
2. Masatoshi Sakawa: **Fuzzy Multi-objective and Goal Programming**, Springer
3. Paolo Vercellis: **Multi-objective Combinatorial Optimization**, Wiley
4. AndrzejJaszkiewicz: **Genetic and Evolutionary Algorithms for Multi-objective Optimization**,

## BIOSTATISTICS

BCA-305 D

Cr L-T-P

4 3-1-0

### Unit - I

#### Introduction to Biostatistic:

Definition and scope of biostatistics, Types of data: Qualitative and quantitative

Data collection methods in biological sciences, Descriptive statistics: Mean, median, mode, standard deviation, Introduction to probability theory.

### Unit - II:

#### Probability Distributions:

Basic probability concepts, Normal distribution, binomial distribution, Poisson distribution

Application of probability distributions in biology, Sampling methods and sample size determination, Central limit theorem and its importance.

### Unit - III

#### Hypothesis Testing:

Null and alternative hypotheses, Types of errors (Type I and Type II), t-test, chi-square test, and ANOVA, Confidence intervals, Applications of hypothesis testing in biological research.

### Unit - IV: Regression and Correlation:

Simple linear regression, Multiple regression analysis, Correlation coefficient: Pearson and Spearman, Logistic regression in biological data, Applications of regression in biological and medical research.

### Text Books

1. Kalyanmoy Deb: **Multi-objective Optimization Using Evolutionary Algorithms**, Wiley
2. Carlos M. Fo Wayne W. Daniel: **Biostatistics: A Foundation for Analysis in the Health Sciences**, Wiley
3. Harvey Motulsky: **Intuitive Biostatistics**, Oxford University Pressnseca: **Evolutionary Multi-objective Optimization**, Springer
4. Matthias Ehrgott: **Multicriteria Optimization**, Springer
5. CoelloCoello, Carlos A., Lamont, Gary B.: **Applications of Multi-objective Evolutionary Algorithms**, World Scientific.

### Reference Books

1. P. S. S. Sunder Rao, J. Richard: **An Introduction to Biostatistics**, PHI Learning
2. Robert R. Sokal, F. James Rohlf: **Biometry: The Principles and Practice of Statistics in Biological Research**, W.H. Freeman
3. John A. Rice: **Mathematical Statistics and Data Analysis**, Cengage Learning
4. Jerrold H. Zar: **Biostatistical Analysis**, Pearson

1. Basics of MS-Dos commands and Implementation
2. Implementation of CPU Scheduling.
  - i. FCFS
  - ii. SJF
  - iii. Round Robin
  - iv. Priority.
3. Simulate algorithm for deadlock prevention and detection
4. Simulate the algorithm for deadlock avoidance
5. Simulate algorithm for deadlock recovery
6. Simulate page replacement algorithms:
  - i. FIFO
  - ii. LRU
  - iii. Optimal
7. Implementation of Disk Scheduling using
  - i. FCFS,
  - ii. SCAN
  - iii. C-SCAN algorithm
8. Implementation of Disk Scheduling using
  - i. LOOK
  - ii. C-LOOK
  - iii. SSTF algorithm

## **HTML, DHTML and CSS Programming**

**BCA 352**

**L T P 0 0 2**

### **List of Programs**

1. Program to describe various text formatting commands.
2. Program to create an unordered list.
3. Program to create an ordered list.
4. Program to create a Table.
5. Program to create a simple form.
6. Program to create a Hyperlink.
7. Program to insert an image to Web page.
8. Program to insert scrolling text using Marquee tag.
9. Program to divide a page into Frames.
10. Program to create a simple layout of Webpage.
11. Program to insert a Video element.
12. Implement the CSS functioning with any of the program.
13. Program to calculate the length of the given string.
14. Apply the User consent option with the web page.
15. Insert the current date and time in the web page.



**Course Objectives:**

- To enhance critical thinking and presentation skills.
- To foster collaborative learning and peer feedback.
- To deepen understanding of selected topics through research and discussion.

**Module 1: Seminar Preparation****1. Introduction to Seminar Topics**

- Overview of themes and subject areas.
- Guidelines for topic selection.

**2. Research Skills**

- Finding credible sources (books, journals, online databases).
- Evaluating and synthesizing information.

**3. Creating Effective Presentations**

- Designing visual aids (slides, posters).
- Tips for effective public speaking and engagement.

**Module 2: Seminar Execution****1. Presentation Skills**

- Delivering content clearly and confidently.
- Engaging the audience through questions and discussions.

**2. Peer Feedback Mechanism**

- Constructive feedback techniques.
- Self-assessment and reflection post-presentation.

**3. Group Dynamics**

- Working in teams to prepare collaborative seminars.
- Assigning roles and responsibilities within groups.

**Module 3: Topics for Seminars****1. Interdisciplinary Themes**

- Examples: Technology in Education, Environmental Sustainability, Mental Health Awareness.
- Encouraging connections across various disciplines.

**2. Current Events and Issues**

- Analyzing recent developments and their implications.
- Encouraging critical discourse around current affairs.

## **DATA STRUCTURES**

**BCA-401**

**L T P 3 1 2**

### **UNIT 1**

Introduction: Data types, structures, review of data structures in C/C++, static and dynamic memory allocation, recursion, Tower of Hanoi problem.

### **UNIT 2**

Stacks & Queues: Concept, operations and representation in C/C++, application to evaluation of post fix expressions, conversion from in fix to post fix representation. Queues-Sequential representation, operations, priority queues, and array implementation.

### **UNIT 3**

Linked Lists & Binary Trees: Concept, operations, stacks and queues as lists, array and dynamic representation circular lists, doubly linked lists, Josephus problem. Binary trees definition, array and dynamic representations, operations, lists as trees. Almost complete binary trees, threaded binary trees, Games Trees.

### **UNIT 4**

Sorting: Efficiency considerations, Onotation, Bubblesort, Quicksort, Selection sort, binary trees or Heap, heapsort, heapasapriority queue, Insertion sort, Shellsort, Mergesort, Radixsort.

### **UNIT5**

Searching: Sequential searching, indexed Sequential searching, binary search, interpolation search, binary tree searching, insertion and deletion, Optimum search trees, height balanced trees, single and double rotations, Multiway, search trees, B-trees, B+- trees, Hashing methods of resolving clashes, methods of choosing hash functions.

### **Laboratory work:**

Implementation of Arrays, Recursion, Stacks, Queues, Lists, Binary trees, Sorting techniques, Searching techniques. Implementation of all the algorithmic techniques.

**Text Books:** Kruse, R.L., Leung, B.P. and Tondo, C.L., Data Structures and Program Design in C, Dorling Kindersley (2008). • Langsam, Y. and Augenstein, M.J., Data Structures Using C and C++, Dorling Kindersley (2008) 2nd ed.

**Reference Books:** • Trembley, J.P., Sorenson, P.G., An introduction to data structures with applications, Tata McGraw Hill (2008) 2nd ed. • Sahni, Sartaj, Data Structures, Algorithms and Applications in C++, Universities Press (2005) 2nd ed.

## JAVA PROGRAMMING

BCA-402

L T P  
3 1 2

### UNIT-I

**Java Programming:** Introduction, Data types, access specifiers, operators, control statements, arrays. Classes: Fundamentals, objects, methods, constructors. Inheritance: Super class, subclass, this and super operator, method overriding, use of final, packages, abstract class, interface. Polymorphism: Method overloading, constructor overloading.

### UNIT – II

**Java Library:** String handling (only main functions), String Buffer class. Elementary concepts of Input/Output: byte and character streams, System.in and System.out, print and println, reading from a file and writing in a file.

### UNIT – III

**Exception Handling:** Exception Class, built in checked and unchecked exceptions, user defined exceptions, use of try, catch, throw, throws, finally. Multi threaded programming: Overview, comparison with multiprocessing, Thread class and Runnable interface, life cycle, creation of single and multiple threads, thread priorities, overview of Synchronization.

### UNIT-IV

**Software Development using Java:** Applets: Introduction, Life cycle, creation and implementation, AWT controls: Button, Label, TextField, TextArea, Choice lists, list, scrollbars, check boxes, Layout managers, Elementary concepts of Event Handling: Delegation Event Model, Event classes and listeners, Adapter classes, Inner classes. Swings: Introduction and comparison with AWT controls.

### UNIT-V

**Networking Basics:** Socket (datagram and TCP/IP based client and server socket), factory methods, InetAddress. JDBC: JDBC Architecture, JDBC Drivers, Connecting to the Database. Introduction to Java Servlets: Life cycle, Interfaces and classes in javax.servlet package (only description) Creating a simple servlet

### TEXT BOOKS:

1. Patrick Naughton and Herbert Schildt, "Java-2 The Complete Reference", TMH.
2. Y. Daniel Liang, "Introduction to Java Programming, Comprehensive Version, 7/e" Pearson.

### REFERENCE BOOKS: -

1. Krishnamoorthy R, Prabhu S, "Internet and Java Programming", New Age Intl.
2. David Flanagan, Jim Farley, William Crawford and Kris Magnusson, "Java Enterprise in a Nutshell", O'Reilly.

## COMPUTER SYSTEM ARCHITECTURE

BCA-403

L T P 312

### UNIT-I

**Register Transfer and Micro-operations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Microoperations, Arithmetic logic shift unit

### UNIT-II

**Basic Computer Organizations and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Register reference instructions, Input - Output Instructions, Design of Accumulator Logic.

### UNIT-III

**Design of Microprogrammed Control Unit**

**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes. Difference between RISC and CISC.

**Pipeline and Vector Processing:** Arithmetic and Instruction pipeline, Vector operations, Matrix Multiplication, memory interleaving.

### UNIT-IV

**Computer Arithmetic:** Introduction, Multiplication Algorithms, Division Algorithms, for fixed point-members.

**Input-Output Organization:** Peripheral Devices, Input-Output Interfaces, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA)

### UNIT-V

**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

### TEXT BOOKS :

1. Morris Mano, Computer System Architecture, 3rd Edition, Prentice-Hall of India Private Limited, 1999.

### REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture, 4th Edition, Prentice Hall of India Private Limited, 2001
2. Subrata Ghosal, "Computer Architecture and Organization", Pearson 2011
3. Malvino, "Digital Computer Electronics: An Introduction to Microcomputers", McGraw Hill,

## **KNOWLEDGE MANAGEMENT**

**BCA-404**

**L T P 310**

### **UNIT I**

#### **INTRODUCTION**

An Introduction to Knowledge Management - The foundations of knowledge management-including cultural issues- technology applications organizational concepts and processes-management aspects- and decision support systems. The Evolution of Knowledge management : From Information Management to Knowledge Management - Key Challenges Facing the Evolution of Knowledge Management - Ethics for Knowledge Management.

### **UNIT II**

#### **CREATING THE CULTURE OF LEARNING AND KNOWLEDGE SHARING**

Organization and Knowledge Management - Building the Learning Organization. Knowledge Markets: Cooperation among Distributed Technical Specialists – Tacit Knowledge and Quality Assurance.

### **UNIT III**

#### **KNOWLEDGE MANAGEMENT-THE TOOLS**

Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval - Information Coding in the Internet Environment - Repackaging Information.

### **UNIT IV**

#### **KNOWLEDGEMANAGEMENT-APPLICATION**

Components of a Knowledge Strategy - Case Studies (From Library to Knowledge Center, Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).

### **UNIT V**

#### **FUTURE TRENDS AND CASE STUDIES**

Advanced topics and case studies in knowledge management - Development of a knowledge management map/plan that is integrated with an organization's strategic and business plan - A case study on Corporate Memories for supporting various aspects in the process life -cycles of an organization.

#### **TEXT BOOK:**

1. Srikantaiah.T. K., Koenig, M., “Knowledge Management for the Information Professional” Information Today, Inc., 2000.

#### **REFERENCE:**

1. Nonaka, I., Takeuchi, H., “The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation”, Oxford University Press, 1995.

## KNOWLEDGE TRANSFER

BCA-404 A

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### Unit - I

#### Fundamentals of Knowledge Transfer

Definition and scope of knowledge transfer, Importance of knowledge sharing in organizations

Types of knowledge: Tacit and Explicit, Knowledge transfer vs. Knowledge management, Barriers to effective knowledge transfer.

### Unit – II

#### Models and Frameworks of Knowledge Transfer

SECI model (Socialization, Externalization, Combination, Internalization), Wiig's Knowledge Management Cycle, Nonaka and Takeuchi's Knowledge Creation Model, Communities of practice (CoP), Knowledge transfer strategies in organizations.

### Unit - III

#### Techniques for Knowledge Transfer

mentoring and coaching methods, Storytelling as a knowledge transfer tool, Use of technology: Wikis, blogs, and forums, Workshops and seminars for knowledge dissemination, Knowledge repositories and databases.

### Unit - IV

#### Knowledge Transfer in Organizations

knowledge-sharing culture, Role of leadership & knowledge transfer, Cross-functional knowledge sharing, Measuring knowledge transfer effectiveness, Legal and ethical considerations in knowledge transfer.

### Unit – V

#### Knowledge Transfer and Emerging Technologies

Artificial Intelligence and knowledge transfer, Data mining and knowledge discovery, Virtual teams and remote collaboration, Future trends in knowledge transfer, Case studies of knowledge transfer in modern organizations.

#### TEXT BOOKS:

5. Ikujiro Nonaka and Hirotaka Takeuchi: **The Knowledge-Creating Company**, Oxford University Press
6. Elias M. Awad and Hassan Ghaziri: **Knowledge Management**, Pearson Education
7. J. W. Cortada and J. A. Woods: **The Knowledge Management Yearbook**, Butterworth-Heinemann

8. Thomas H. Davenport and Laurence Prusak: **Working Knowledge**, Harvard Business Review Press

**Reference Books:**

1. Amrit Tiwana: **The Knowledge Management Toolkit**, Pearson Education
2. Michael Polanyi: **The Tacit Dimension**, University of Chicago Press
3. Karl M. Wiig: **Knowledge Management Foundations**, Schema Press
4. Mark W. McElroy: **The New Knowledge Management**, Butterworth-Heinemann
5. Alex Bennet and David Bennet: **Organizational Survival in the New World**, Routledge

**Course Objectives:**

- To develop skills in visualizing and organizing information.
- To enhance critical thinking and knowledge retention.
- To promote collaborative learning through shared knowledge maps.

**Module 1: Introduction to Knowledge Mapping**

1. **Understanding Knowledge Mapping**
  - Definition and purpose of knowledge mapping.
  - Types of knowledge maps (concept maps, mind maps, flowcharts).
2. **Tools and Technologies**
  - Overview of digital tools for knowledge mapping (e.g., MindMeister, XMind, Lucidchart).
  - Introduction to paper-based mapping techniques.

**Module 2: Creating Knowledge Maps**

1. **Basic Techniques**
  - Identifying key concepts and relationships.
  - Structuring information hierarchically.
2. **Practical Lab Sessions**
  - Hands-on workshops to create individual knowledge maps.
  - Group activities to develop collaborative knowledge maps.
3. **Applying Knowledge Mapping**
  - Mapping for different purposes (study aids, project planning, brainstorming).
  - Case studies on effective knowledge mapping.

**Module 3: Analyzing and Sharing Knowledge Maps**

1. **Evaluating Knowledge Maps**
  - Criteria for assessing clarity, completeness, and organization.
  - Peer review sessions for constructive feedback.
2. **Presenting Knowledge Maps**
  - Techniques for effectively presenting and explaining maps.
  - Role-playing to simulate audience engagement.
3. **Reflection and Iteration**
  - Importance of revisiting and updating knowledge maps.
  - Reflective practices on personal learning and mapping experiences.

**Assessment and Evaluation**

- Grading based on creativity, clarity, and effectiveness of knowledge maps.
- Participation in group activities and peer evaluations.



## Course Objectives:

- To understand the principles and practices of knowledge management.
- To explore various knowledge management systems and tools.
- To develop skills in designing and implementing knowledge management solutions.

## Module 1: Introduction to Knowledge Management

1. **Understanding Knowledge Management (KM)**

- Definition and importance of KM.
- Types of knowledge (tacit vs. explicit).

2. **KM Frameworks and Models**

- Overview of key KM theories and frameworks.
- Case studies on successful KM implementations.

## Module 2: Knowledge Management Tools and Technologies

1. **Overview of KM Systems**

- Types of KM systems (content management systems, collaborative tools, etc.).
- Comparison of popular KM tools (e.g., SharePoint, Confluence, Notion).

2. **Hands-On Lab Sessions**

- Setting up a KM system using selected tools.
- Practical exercises in content creation and management.

3. **Data Management and Organization**

- Best practices for organizing and tagging knowledge.
- Introduction to metadata and taxonomies.

## Module 3: Designing and Implementing KM Solutions

1. **Identifying Knowledge Needs**

- Conducting needs assessments for KM systems.
- Engaging stakeholders in the KM process.

2. **Creating a KM Strategy**

- Steps for developing a KM strategy.
- Aligning KM initiatives with organizational goals.

3. **Project Work**

- Group projects to design and propose a KM solution for a hypothetical organization.
- Presentations of project findings and proposed implementations.

## Assessment and Evaluation

- Grading based on participation, project work, and practical assignments.
- Peer feedback on group projects.

**Course Objectives:**

- To understand the role of information systems in knowledge management.
- To explore the design and implementation of information systems for KM.
- To develop practical skills in using KM information systems and tools.

**Module 1: Introduction to Information Systems in KM****1. Understanding Information Systems**

- Definition and components of information systems.
- The relationship between information systems and knowledge management.

**2. Types of Information Systems for KM**

- Overview of various systems (e.g., databases, document management systems, collaborative tools).
- The role of decision support systems in KM.

**Module 2: Knowledge Management System Components****1. Core Components of KM Systems**

- Data management and storage.
- Knowledge repositories and databases.
- User interfaces and access controls.

**2. Tools and Technologies**

- Introduction to popular KM tools (e.g., SharePoint, KnowledgeOwl, Trello).
- Hands-on exercises with selected KM software.

**Module 3: Designing KM Information Systems****1. System Design Principles**

- User-centered design and usability.
- Best practices for designing intuitive interfaces.

**2. Lab Activities**

- Group projects to create prototypes of KM systems.
- Exercises in data modeling and knowledge mapping.

**3. Implementation Strategies**

- Steps for deploying a KM information system.
- Change management considerations in KM implementation.

**Module 4: Evaluating KM Information Systems****1. Assessment Criteria**

- Evaluating the effectiveness of KM systems.
- Metrics for measuring user satisfaction and knowledge utilization.

**2. Feedback Mechanisms**

- Implementing feedback loops for continuous improvement.
- Conducting user testing and gathering insights.

**Assessment and Evaluation**

- Grading based on participation, project quality, and practical assignments.
- Peer reviews of group projects.

## **DATASTRUCTUREUSINGCLAB (BCA-451)**

Program 1:-To search an element in the array using Linear Search.

Program 2:-To search an element in the 2-dimensional array using Linear Search.

Program 3:-To merge two sorted array in to one sorted array.

Program 4:-To perform the following operation in Matrix  
1.Addition 2.Subtraction 3.Multiplication 4.Transpose

Program 5: - To perform the swapping of two numbers using call by value and call by reference

Program 6:-To perform following operation on strings using string functions  
1.Addition 2.Copying 3.Reverse 4.LengthofString

Program 7:-To search an element in the array using Iterative Binary Search.

Program 8:-To search an element in the array using Recursive Binary Search.

Program 9:-To implement Bubble Sort.

Program 10:-To implement Selection Sort.

Program 11:-To implement Insertion Sort.

Program 12:-To implement Quick Sort.

Program 13:-To implement Merge Sort.

Program 14:-To implementStack using array.

Program 15:-To implement Queue using array.

S.NO	PRACTICAL PROGRAMS
1.	Write a program to create class and object in java.
2.	Write a program to create user define function in a user define class in java.
3.	Write a program to find function overloading in java.
4.	Write a program to to create function overriding in java.
5.	Write a program to create single inheritance in java.
6.	Write a program to create multilevel inheritance in java.
7.	Write a program to create multiple inheritance in case of interface in java.
8.	Write a program to create abstract class and abstract function in java.
9.	Write a program to create parameterized constructor in java.
10.	Write a program to create Button using awt in java.
11.	Write a program to using JDBC in java.
12.	Write a program to crate Multithreading in java.
13.	Write a program to create Event handling in java.
14.	Write a program to print matrix in java.
15.	Write a program to print addition of two matrix in java.

Program 1:-Program to implement basic logic gates like AND, OR, NOT, NAND, NOR, XOR using HDL (Verilog/VHDL).
Program 2:- Design and simulate half adder and full adder circuits.
Program 3:- Write programs to implement multiplexer and demultiplexer circuits.
Program 4:- Design a 4-bit binary adder/subtractor using Verilog or VHDL.
Program 5:- Develop a program to implement a simple ALU that performs basic arithmetic and logical operations.
Program 6:- Implement flip-flops using HDL and simulate their behavior.
Program 7:- Design and simulate a 4-bit synchronous up/down counter.
Program 8:- Program to simulate registers and shift registers using Verilog/VHDL.
Program 9:- Simulate the working of RAM/ROM using hardware description languages (HDL).
Program 10:- Design and implement a finite state machine (FSM) for sequence detection.
Program 11:- Write and simulate Booth's algorithm for signed binary multiplication.
Program 12:- Develop a basic CPU design that can execute simple instructions like ADD, SUB, and LOAD using HDL.
Program 13:- Simulate a custom instruction set architecture (ISA) with simple operations.
Program 14:- Implement a basic instruction pipeline to simulate how pipelining works in processors.
Program 15:- Simulate cache memory using various mapping techniques (direct mapping, associative mapping).

## **Seminar Based on Learning(BCA-454)**

- **Educational technology**

A common topic at EdCamps, this includes practical examples of using modern tools in the classroom and how to solve problems that technology can cause.

- **Current events**

Students can track current events and create a news show or podcast about them.

- **Artificial intelligence**

Seminars can help you learn about responsible AI development and deployment, and build a professional network.

- **Case studies and debates**

These activities can help students engage with the material and develop communication, critical analysis, and teamwork skills.

- **Classroom management**

This includes strategies and techniques for creating a learning environment that reduces disruptions.

- **Global issues in education and research**

This can include topics such as the impact of crisis on education, ethical issues in education, and technology in teaching and learning.

- **Psychology**

This includes core areas such as biological, cognitive, developmental, social, and individual differences.

# SOFTWARE ENGINEERING

BCA-501

L T P 3 12

## UNIT 1

**Software Engineering and Processes:** Introduction to Software Engineering, Software Evolution, Software Characteristics, Software Crisis: Problem and Causes, Software process models (Waterfall, Incremental, and Evolutionary process models and Agile), Software quality concepts, process improvement, software process capability maturity models, Personal Software process and Team Software Process, Overview of Agile Process.

## UNIT 2

**Requirements Engineering:** Problem Analysis, Requirement elicitation and Validation. Requirements modelling: Scenarios, Information and analysis classes, flow and behavioral modeling, documenting Software Requirement Specification (SRS).

## UNIT 3

**Software Design and construction:** System design principles: levels of abstraction (architectural and detailed design), separation of concerns, information hiding, coupling and cohesion, Structured design (top-down functional decomposition), object-oriented design, event driven design, component-level design, test driven design, function oriented, service oriented, Design patterns.

## UNIT 4

**Software Verification and Validation:** Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Software Testing Strategies, Verification & Validation, Unit, Integration Testing, Top Down and Bottom-Up Integration Testing, Alpha & Beta Testing, White box and black box testing techniques, System Testing and Debugging.

## UNIT 5

**Software Project Management:** (COCOMO models), Quality Management, Plan for software Quality Control and Assurance, Earned Value Analysis. Advanced Topics: Formal specification, CASE Tools, Software Business Process Reengineering, Configuration Management.

### Laboratory work:

Implementation of Software Engineering concepts and exposure to CASE tools like Rational Software suit, Turbo Analyst, Silk Suite. Follow entire SDLC depending on project domain.

**Text Books:** 1. Pressman S. R. and Maxim R. B., Software Engineering, A Practitioner's Approach, McGraw Hill International (2015) 8th Edition. 2. Sommerville I., Software Engineering, Addison-Wesley Publishing Company (2011) 9th Edition.

**Reference Book:** 1. Foster C. E., Software Engineering: A Methodical Approach, Apress (2014) 1st ed. 2. Booch G., Rumbaugh J., Jacobson I., The Unified Modeling Language User Guide (2005) 2nd Edition.

## ANALYSIS OF ALGORITHM AND DATA STRUCTURES

BCA-502

L T P 3 1 2

### UNIT 1

**Linear Data Structures:** Arrays, Records, Strings and string processing, References and aliasing, Linked lists, Strategies for choosing the appropriate data structure, Abstract data types and their implementation: Stacks, Queues, Priority queues, Sets, Maps.

### UNIT 2

**Basic Analysis:** Differences among best, expected, and worst-case behaviours of an algorithm, Asymptotic analysis of upper and expected complexity bounds, Big O notation: formal definition and use, Little o, big omega and big theta notation, Complexity classes, such as constant, logarithmic, linear, quadratic, and exponential, Time and space trade-offs in algorithms, Recurrence relations, Analysis of iterative and recursive algorithms.

### UNIT 3

**Algorithmic Strategies with examples and problem solving:** Brute-force algorithms with examples, Greedy algorithms with examples, Divide-and-conquer algorithms with examples, Recursive backtracking, Dynamic Programming with examples, Branch-and-bound with examples, Heuristics, Reduction: transform-and-conquer with examples.

### UNIT 4

**Non-Linear Data Structures and Sorting Algorithms:** Hash tables, including strategies for avoiding and resolving collisions, Binary search trees, Common operations on binary search trees such as select min, max, insert, delete, iterate over tree, Graphs and graph algorithms, Representations of graphs, Depth- and breadth-first traversals, Heaps, Graphs and graph algorithms, Shortest-path algorithms (Dijkstra and Floyd), Minimum spanning tree (Prim and Kruskal)

### UNIT 5

**Problem Clauses:** P, NP, NP- Hard and NP-complete, deterministic and non-deterministic polynomial time algorithm approximation and algorithm for some NP complete problems. Introduction to parallel algorithms, Genetic algorithms, intelligent algorithms.

#### **Laboratory work:**

Implementation of Arrays, Recursion, Stacks, Queues, Lists, Binary trees, Sorting techniques, Searching techniques. Implementation of all the algorithmic techniques.

**Text Books:** 1. Cormen H. T., Leiserson E. C., Rivest L. R., and Stein C., Introduction to Algorithms, MIT Press (2009) 3rd ed. 2. Goldberg E. D., Genetic Algorithms, Pearson education 1989 (2009) 1st ed.

**Reference Books:** 1. Sedgewick R. and Wayne K., Algorithms, Addison-Wesley Professional (2011), 4th ed.



## **MOBILE COMPUTING**

**BCA-503**

**L T P 3 10**

### **UNIT 1: Introduction**

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA

### **UNIT 2: Mobile Telecommunication System**

Introduction to Cellular Systems - Cellular systems- Frequency Management and Channel Assignment- types of handoff and their characteristics, dropped call rates & their evaluation, GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover - Security

### **UNIT 3: Telecommunication Networks & Wireless Lan**

Telecommunication systems – GSM – GPRS - Satellite Networks ,Wireless LAN – IEEE802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a -802.11b standards–HIPERLAN – Blue Tooth.

### **UNIT 4: Mobile Network Layer & Transport Layer**

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security, Traditional TCP, Mobile TCP

### **UNIT5: Mobile Platforms and Applications**

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems, Mobile Payment System – Security Issues, WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAP useragent profile- caching model-wireless bearers for WAP - WML – WML Scripts

### **TEXT BOOKS:**

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2003.
2. William Stallings, “Wireless Communications and Networks”, Pearson Education, 2002.

### **REFERENCE BOOKS:**

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003..
3. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007
4. Asoke K. Talukdar, “Mobile Computing”, Tata McGraw-Hill Education, 2010.
5. Mohammad Ilyas , Imad Mahgoub,” Mobile Computing Handbook” ,AUERBACH, 2004.
6. Vilas S. Bagad , “Mobile Computing Introduction”, Technical Publications, 2014
7. DR SANJAY Sharma, “Mobile Computing”, S.K. Kataria & Sons Publication, 2014.

8. Dr. Ashish N.Jani, Dr. N.N. Jani , Neeta Kanabar ,” Mobile Computing – Technologiesand Applications”, 2010
9. Pattnaik, Prasant Kumar, Mall, Rajib, “Fundamentals Of Mobile Computing”, SecondEdition, PHI Learning Pvt. Ltd., 2015.

## **BIG DATA AND MACHINE LEARNING**

**BCA-504**

**L T P 3 10**

### **UNIT 1**

Introduction to Business Intelligence: Business View of IT Applications, Digital Data, OLTP vs. OLAP, Why, What and How BI? , BI Framework and components, BI Project Life Cycle, Business Intelligence vs. Business Analytics.

### **UNIT 2**

Introduction to Data Analytics: Data and Relations, Data Visualization, Correlation, Regression, Forecasting, Classification, Clustering. Big Data Technology Landscape: Fundamentals of Big Data Types, Big data Technology Components, Big Data Architecture, Big Data Warehouses, Functional vs. Procedural Programming Models for Big Data.

### **UNIT 3**

Basic concepts, Designing a learning system, Issues in machine learning. Types of machine learning: Learning associations, Supervised learning, Unsupervised learning, Reinforcement learning, Model Evaluation Parameters, Feature Selection and Extraction. Linear Regression, Multi Regression, Gradient Descent, SVM.

### **UNIT 4**

Clustering: K-Means, k-Medoids, Agglomerative versus Divisive Hierarchical Clustering Distance Measures in Algorithmic Methods, Mean-shift Clustering.

### **UNIT5**

Decision Tree Learning: Decision tree representation, appropriate problems for decision tree learning, Univariate Trees (Classification and Regression), Bayesian Learning: Bayes theorem and concept learning, Bayes optimal classifier, Naive Bayes Classifier.

**Text Books:** . Mitchell T.M., Machine Learning, McGraw Hill (1997) 2nd ed. 2. Alpaydin E., Introduction to Machine Learning, MIT Press (2010) 2nd ed.

**Reference Books:** Bishop C., Pattern Recognition and Machine Learning, Springer-Verlag (2006) 2nd ed. 4. Michie D., Spiegelhalter D. J., Taylor C. C., Machine Learning, Neural and Statistical Classification. Overseas Press (2009) 1st ed.

1. To prepare problem statement for any project.
2. Create a problem statement for an online learning platform.
3. Develop an understanding and Software Requirements Specification(SRS).
4. To draw a sample Entity Relationship Diagram for library management system.
5. To prepare DataFlow Diagram Online shopping management system.
6. To prepare the student / university management system Use Case Diagram.
7. To draw a sample activity diagram for enterprise architectural modeling.
8. To draw a sample Class diagram for seminar.
9. To draw a Sequence Diagram for Online Shopping Checkout Process
10. To draw a Component Diagram for Library Management System.
11. To draw a Deployment Diagram for University Management System.
12. Develop a testing strategy for an online banking application.
13. Create a presentation that explains each phase of the SDLC with examples.

**Course Objectives**

- Implement various data structures
- Analyze algorithm efficiency
- Develop practical problem-solving skills

**1. Introduction to C++**

- Review of C++ syntax and fundamentals
- Basic data types and control structures

**2. Arrays and Strings**

- Dynamic and static arrays
- String manipulation functions

**3. Linked Lists**

- Singly and doubly linked lists
- Basic operations: insert, delete, traverse

**4. Stacks and Queues**

- Stack implementation and applications
- Queue implementation and applications

**5. Trees**

- Binary trees and traversal techniques
- Binary search trees: operations and applications

**6. Heaps**

- Heap data structure and heap sort
- Priority queues

**7. Hashing**

- Hash tables: creation and collision handling
- Practical applications of hashing

**8. Graphs**

- Graph representations (adjacency list/matrix)
- Traversal algorithms: BFS and DFS

**9. Sorting Algorithms**

- Overview of sorting algorithms: quicksort, mergesort, bubblesort
- Analysis of time and space complexity

**10. Searching Algorithms**

- Linear search vs. binary search
- Searching techniques on various data structures

**11. Algorithm Analysis**

- Big O notation and complexity analysis
- Practical examples and case studies

**12. Final Project**

- Implementation of a complex data structure or algorithm
- Presentation and demonstration of project

- **Introduction to Research Methodologies:** Overview of qualitative, quantitative, and mixed methods.
- **Research Topic Selection:** Strategies for identifying and refining research questions.
- **Literature Review:** Conducting thorough searches and summarizing relevant literature.
- **Research Methodology Design:** Choosing appropriate research methods and approaches.
- **Data Collection Techniques:** Exploring surveys, interviews, experiments, and observations.
- **Data Analysis:** Introduction to statistical and qualitative analysis techniques.
- **Research Proposal Development:** Structuring and writing an effective research proposal.
- **Ethical Considerations in Research:** Understanding ethical issues and obtaining necessary approvals.
- **Project Review and Feedback:** Presenting progress and receiving constructive feedback.
- **Final Project Submission:** Preparing and submitting the completed research project.

## DATA COMMUNICATION AND COMPUTER NETWORK

BCA-601

L T P 3 12

### UNIT 1

Introduction: Organization of the Internet, ISP, Network criteria, Categories of networks, Network performance and Transmission Impairments. Network Devices, OSI Model, TCP/IP Protocol Suite, Layering principles, Line Encoding, Switching technique and Multiplexing.

### UNIT 2

Local Area Networks: LAN topologies: Bus topology, Ring topology, Token passing rings, FDDI, Star topologies, Asynchronous transfer mode, Ethernet, IEEE standards 802.3, 802.5. Wireless LANs: IEEE 802.11 and Bluetooth, introduction to Virtual circuit switching including frame relay, X.25, and ATM.

### UNIT 3

Reliable Data Delivery: Error control (retransmission techniques, timers), Flow control (Acknowledgements, sliding window), Multiple Access, Performance issues (pipelining). Routing and Forwarding: Routing versus forwarding, Static and dynamic routing, Unicast and Multicast Routing. Distance-Vector, Link-State, Shortest path computation.

### UNIT 4

Process-to-Process Delivery: UDP, TCP and SCTP, Multiplexing with TCP and UDP, Principles of congestion control, Approaches to Congestion control, Quality of service, Flow characteristics, Techniques to improve QoS.

### UNIT 5

Network Applications: Naming and address schemes (DNS, IP addresses, Uniform Resource Identifiers, etc.), Distributed applications (client/server, peer-to-peer, cloud, etc.), HTTP as an application layer protocol, Electronic mail, File transfer, Remote login.

**Laboratory work:** To design conceptual networks using E-Draw, Visual Studio etc. and to implement topologies BUS, RING, STAR, Mesh and configuring Router using Packet tracer or GNS3 platform

**Text Books:** 1. Forouzan A. B., Data communication and Networking, McGraw Hill (2012) 5thed. 2. Tanenbaum S. A. and Wetherall J. D., Computer Networks, Prentice Hall (2013) 5thed.

**Reference Books:** Kurose J. and Ross K., Computer Networking: A Top Down Approach, Pearson (2017) 7thed. 2. Stallings W., Computer Networking with Internet Protocols and Technology, Pearson (2004)

# ARTIFICIAL INTELLIGENCE

BCA-602

L T P 310

## UNIT 1

**Overview:** foundations, scope, problems, and approaches of AI. Intelligent agents: reactive, deliberative, goal-driven, utility-driven, and learning agents Problem-solving through Search: forward and backward, state-space, blind, heuristic, problem reduction, A, A\*, AO\*.

## UNIT 2

**Knowledge Representation and Reasoning:** ontologies, foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space; predicate logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.

## UNIT 3

**Planning:** planning as search, partial order planning, construction and use of planning graphs Representing and Reasoning with Uncertain Knowledge: probability, connection to logic, independence, Bayes rule, Bayesian networks, probabilistic inference, sample applications

## UNIT 4

**Decision-Making:** decision theory, sequential decision problems  
Machine Learning and Knowledge Acquisition: learning from memorization, Learning nearest neighbour, naive Bayes, and decision tree classifiers, Q-learning for learning action policies, applications.

## UNIT 5

**Expert Systems:** Architecture of an expert system, existing expert systems like MYCIN, RI, Expert system shells.

### Laboratory work:

Programming in C/C++/Java/LISP/PROLOG: Programs for Search algorithms- Depth first, Breadth first, Hill climbing, Best first, A\* algorithm, Implementation of games: 8-puzzle, Tic-Tac-Toe, tower of Hanoi and water jug problem using heuristic search, Designing expert system using logic in PROLOG, Implementing an intelligent agent.

**Text Books:** 1. Rich E., Knight K. and Nair B. S., Artificial Intelligence, Tata McGraw Hills (2009) 3rd ed. 2. Luger F. G., Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education Asia (2009) 6th ed.

**Reference Books:** 1. Patterson W. D., Introduction to Artificial Intelligence and Expert Systems, Pearson (2015) 1st ed. 2. Russel S., Norvig P., Artificial Intelligence: A Modern Approach, Prentice Hall (2014) 3rd ed.



## **CYBER SECURITY AND CYBER LAW**

**BCA-603**

**L T P 3 10**

### **Unit-I**

Information Security, Cyber Security, Information Assurance, Cyber Crime- Meaning, Types, Need, Function

### **Unit-II**

Information Policy- Meaning, Types, Need, Function, Case Studies, Need, Convergence, Information Divide, Digital Divide, Information Literacy, Network Literacy, Digital Humanities & Sociology, Information and IT Policy as a Discipline and Degrees worldwide

### **Unit-III**

Information Technology Act, Information Security Protocols, Non-repudiation services, related protocols, Fairness in Information Exchanges Protocols

### **Unit-IV**

Trusted Third Party, its use as Adjudicator, message authenticator, Information Security standards, Information Security Infrastructure.

### **Unit-V**

International Information Act & IT Act, Right to Information Act-2005 with Process, Features and Functions, IT Act 2000-Role, Features, Summary, Changes, Data Privacy Rules, Real life Example of IT Act uses, Emerging Cyber Act in India

### **Text/References:**

1. Kahin, B., & Nesson, C. (1996). Borders in cyberspace: Information policy and the global information infrastructure. MIT Press.
2. Kamisar, Y. (1980). Police interrogation and confessions: Essays in law and policy (p. 1) Ann Arbor, MI: University of Michigan Press.
3. Holtshouse, D. K. (2013). Information technology for knowledge management. U. M. Borghoff, & R. Pareschi (Eds.). Springer Science & Business Media.

# SOFTWARE PROJECT MANAGEMENT

BCA-604

L T P 310

## UNIT 1

**Introduction to Project Management:** The characteristics of software projects, Objectives of project management: time, cost and quality, Basics of Project Management, Stakeholders, Stages of Project, The Feasibility Study, Cost-benefit Analysis, Planning, Project Execution, Project and Product Life Cycles, Project Management Knowledge areas, Project Management Tools & Techniques, Project success factors, role of project manager

## UNIT 2

**Project Management and Planning:** System view of project management, Understanding organizations, stakeholder's management, project phases and project's life cycles. Introduction to Agile software, why planning is necessary, Iterative steps for planning, Project Plan documentation methods, Software Requirement Specification.

## UNIT 3

**Project Quality Management:** Quality Planning, quality Assurance, Quality control, Tool & techniques for quality control, Pareto Analysis, Six Sigma, CMM, ISO Standards, Juran Methodology.

## UNIT 4

**Project risk management:** Risk Management planning, common sources of risk, risk identification, risk register, qualitative risk analysis, using probability impact matrixes, expert judgement, qualitative risk analysis, decision trees & expected monetary value, simulation, sensitivity analysis, risk response planning, risk monitoring & control.

## UNIT 5

**Software Configuration Management:** Why versions exist, why retain versions, SCI, Releases vs. version. Change Control and Management

### Laboratory work:

Laboratory work: Using Function Point calculation tools for estimation, comparing with COCOMO estimates, Implementation of various exercises using PERT, CPM methods, Preparing schedule, resource allocation etc. using MS Project or Fissure. sim or VENSIM can also be used, Preparing an RMMM Plan for a case study, Preparing Project Plan for a Software Project for Lab Project or case study. Exploring about PMBOK (Project Management Body of Knowledge) and SWEBOK (Software Engineering Body of Knowledge) from related website, Implementation of software project management concepts using related tools and technologies.

**Text Books:** 1. Hughes B. and Cotterell M. and Mall R., Software Project Management, Tata McGraw Hill (2011) 5th Ed. 2. Pressman R., A practitioner's Guide to Software Engineering, Tata McGraw Hill (2014) 7th Ed.

**Reference Books:** 1. Stellman A., Greene J., Applied Software Project Management, O'Reilly Media, Inc. (2008). 2. Futrell T. R., Shafer F. D. and Shafer I. L., Quality Software Project Management, Prentice Hall (2002).

**BCA-651**

**COMPUTER NETWORK**

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols

**BCA-656**

## **Seminar and Group Discussion**

- **Introduction to Seminar Presentations:** Overview of effective presentation techniques and styles.
- **Topic Selection:** Guidance on choosing relevant and engaging topics for seminars.
- **Research Skills:** Techniques for researching and organizing information for presentations.
- **Presentation Skills:** Training on voice modulation, body language, and visual aids.
- **Group Discussion Dynamics:** Understanding roles in discussions, including facilitators, note-takers, and speakers.
- **Critical Thinking:** Techniques for analyzing arguments and providing constructive feedback.
- **Peer Evaluation:** Learning how to give and receive feedback on presentation skills and content.
- **Technology in Presentations:** Utilizing tools such as PowerPoint, Prezi, and video aids effectively.
- **Special Topics:** Guest lectures or workshops on specific communication skills (e.g., negotiation, conflict resolution).
- **Final Group Discussion:** A culminating group discussion where students will apply skills learned throughout the course.

- **Project Implementation:** Execution of the research plan, including data collection and analysis.
- **Data Analysis Techniques:** Application of statistical tools and software for data interpretation.
- **Research Documentation:** Structuring and writing a detailed research report.
- **Presentation Preparation:** Techniques for effectively communicating research findings.
- **Peer Review Process:** Engaging in constructive feedback sessions with peers on research presentations and reports.
- **Ethical Considerations:** Addressing ethical issues encountered during the research process.
- **Final Presentation:** Preparing and delivering a presentation summarizing the research project and findings.



**Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

**School of School of Engineering and Technology**

**Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Computer Application (BCA) Three Year  
Programme**

**Semester System**

**(w.e.f. session 2013-14)**

**Approved and adopted in the year 2016 (7<sup>th</sup> Meeting, Board of  
Studies)**

## **Programme Educational Objectives (PEOs)**

**PEO1:** To facilitate in development of strong basic fundamentals of Computer Applications that fit as a perfect foundation towards a beginning a professional career in industry.

**PEO2:** To develop programming skills in learners by using fundamental knowledge of computer Science.

**PEO3:** To apply new designs and solutions to complex real life problems using existing and/or novel technologies.

**PEO4:** To play a creative role during professional life through turning problems to opportunities and foster personal and organizational growth

**PEO5:** To inculcate comprehensive communication ability that is useful during professional communication and leading of teams in future

## **Programme Specific Objectives (PSO's)**

**PSO 1** Students will able to understand, analyze and develop computer programs in the areas related to algorithm, web design and networking for efficient design of computer based system.

**PSO 2** Apply standard software engineering practices and strategies in software project development using open source programming environment to deliver a quality of product for business success.

**PSO 3** Student will able to know various issues, latest trends in technology development and thereby innovate new ideas and solutions to existing problems.

**PSO 4** Analyze and design solutions for real-world problems using computational techniques.

**PSO 5** Explore trends in AI, Machine Learning, Cloud Computing, and Big Data.

## **Programme Outcome Objectives (POO's)**

**PO1:** Understand the concepts of key areas in computer science.

**PO2:** Analyze and apply latest technologies to solve problems in the areas of computer applications.

**PO3:** Analyze and synthesis computing systems through quantitative and qualitative techniques

**PO4:** Apply technical and professional skills to excel in business.

**PO5:** Communicate effectively in both verbal and written form.

**PO6:** Develop practical skills to provide solutions to industry, society and business.

**PO7:** Acquire Knowledge of mathematical foundations, computer application theory and algorithm principles in the design and modeling of computer based system.

**PO8:** Earn caliber to design, analyze and development principles in the construction of complex hardware and software computer systems.



**Shobhit University, Gangoh (Saharanpur)**  
**Teaching Scheme**  
**Effective form 2016**  
**BCA**  
**I Semester**

Course Types	Subject Code and Title	L	P	Total	Cr.
<b>Core Course</b>	CCAC-101 :C Programming Fundamentals	4			4
	CCAC-103:Computer System Architecture	4			4
<b>Ability Enhancement Compulsory Course</b>	AECC-101:Professional Communication AECC-101A: Personality Development- I AECC-101B: Behaviour Skill- I AECC-101C: language Proficiency and English I AECC-101D:Public Speaking and Presentation I	4			2
<b>Generic Elective</b>	GCAC-101Mathematics GCAC- 101 A- Engineering Mathematics I GCAC- 101 B – Discrete Mathematics I GCAC- 101 C- Basic Mathematics I GCAC- 101 D- Mathematical Foundation of Computer Science I GCAC- 101 E- Elementary Mathematics I	4			4
	GCAC-103: Computer Fundamentals				
<b>Practical</b>	CCAC-151: C Programming Fundamentals		2		1
	CCAC-153: Computer System Architecture Lab		2		1
	AECC-151: Professional Communication LAB AECC -151A: Personality Development- I AECC -151 B: Behaviour Skill- I AECC -151 C: language Proficiency and English I AECC -151 D:Public Speaking and Presentation I		2		1
	Total Credits (4 Theory +3 Lab)	16	6	22	17

## II Semester

Course Types	Subject Code and Title	L	P	Total	Cr.
<b>Core Course</b>	CCAC-102:Java Programming	4			4
	CCAC 104: Data Structures	4			4
<b>Ability Enhancement Compulsory Course</b>	AECC-104 Environmental Science AECC-104 A- Life Skills AECC-104 B- Moral values and Ethics AECC-104 C – Leadership and managerial Skills AECC-104 D - Enterpreneurships	4			2
<b>Generic Elective</b>	GCAC 106: Digital Electronics	4			4
	GCAC:108:Business Communication II				
	GCAC:108A: Personality Development- II				
	GCAC:108 B: Behaviour Skill- II				
	GCAC:108 C: language Proficiency and English II				
GCAC:108 D:Public Speaking and Presentation II					
<b>Practical</b>	CCAC 152:Java Programming Lab		2		1
	CCAC 154: Data Structures Lab		2		1
	CCAC 156: Digital Electronics Lab		2		1
	CCAC 158: Business Communication Lab				
	CCAC 158 A: Personality Development- II				
	CCAC 158 B: Behaviour Skill- II				
CCAC 158 C: language Proficiency and English II					
CCAC 158 D:Public Speaking and Presentation II					
Total Credits (4 Theory +3 Lab)		16	6	22	17

**Shobhit University, Gangoh (Saharanpur)**  
**Teaching Scheme**  
**Effective form 2016**  
**BCA**  
**III Semester**

Course Types	Subject Code and Title	L	P	Total	Cr.
<b>Core Course</b>	CCAC-201: Database Management Systems	4			4
	CCAC-203: Operating Systems	4			4
	CCAC-205: Computer Networks	4			4
<b>Skill Enhancement Courses</b>	SCAC-201: HTML Programming	4			4
	SCAC-203: PHP Programming				
<b>Generic Elective</b>	GCAC-201 Multimedia Technology	4			4
	GCAC-203 Introduction to Programming				
<b>Practical</b>	CCA-251: Database Management Systems lab		2		1
	CCA-253 Operating Systems Lab		2		1
	CCA-255: Computer Networks Lab		2		1
	SCAC-251: HTML Programming		2		1
	SCAC-253: PHP Programming Lab				
Total Credits (5 Theory +4 Lab)		20	8		24

**IV Semester**

Course Types	Subject Code and Title	L	P	Total	Cr.
<b>Core Course</b>	CCAC202: Software Engineering	4			4
	CCAC 204: Design and Analysis of Algorithms	4			4
	CCAC 206: OOPS Using C++	4			4
<b>Skill Enhancement Courses</b>	SCAC-202: UNIX/LINUX Programming	4			4
	SCAC-204:: Programming in Visual Basic				
<b>Generic Elective</b>	GCAC-202: Discrete Structure	4			4
	GCAC- 202 A- Engineering Mathematics II				
	GCAC- 202 B – Discrete Mathematics II				
	GCAC- 202 C- Basic Mathematics II				
	GCAC-204 :Information Security and Cyber Laws				
<b>Practical</b>	CCAC-252: Software Engineering Lab		2		1
	CCAC-254:Design and Analysis of Algorithms Lab		2		1
	CCAC-256: OOPS Using C++ Lab		2		1
	SCAC-202:UNIX/LINUX Programming Lab		2		1
	SCAC-204:: Programming in Visual Basic				
Total Credits (5 Theory +4 Lab)		20	8		24

**Shobhit University, Gangoh (Saharanpur)**  
**Teaching Scheme**  
**Effective form 2016**  
**BCA**  
**V Semester**

<b>Course Types</b>	<b>Subject Code and Title</b>	<b>L</b>	<b>P</b>	<b>Total</b>	<b>Cr.</b>
<b>Core Course</b>	CCAC-301: Internet Technologies	4			4
	CCAC-303: Software Project Management	4			4
<b>Discipline Specific Elective-1 (Choose any one)</b>	DCAC-301: Knowledge Management DCAC-301 A: Knowledge Management Strategies DCAC-301 B: Information Systems and Technology DCAC-301 C: Organizational Learning DCAC-301 D: Emerging Trends in Knowledge Management	4			4
	DCAC-303: Data Mining				
<b>Discipline Specific Elective-2 (Choose any one)</b>	DCAC-305 System Programming	4			4
	DCAC-307 Digital Image Processing				
<b>Practical (Choose any four)</b>	CCAC-351: Internet Technologies Lab		2		1
	CCAC-353: Software Project Management Lab		2		1
	CCAC-355: Minor Project		2		1
	DCAC-355: System Programming Lab		2		1
	DCAC-357 Digital Image Processing Lab				
Total Credits (4 Theory +4 Lab)		16	8		20

## VI Semester

Course Types	Subject Code and Title	L	P	Total	Cr.
<b>Core Course</b>	CCAC-302: Artificial Intelligence	4			4
	CCAC-304: Computer Graphics	4			4
<b>Discipline Specific Elective-3 (Choose any one)</b>	SCAC-302: Management Information system SCAC-302 A: Business Intelligence and Analytics SCAC-302 B: Information Systems Strategy SCAC-302 C: Enterprise Resource Planning SCAC-302 D: Information Security Management	4			4
	SCAC-304 : Software Testing				
<b>Discipline Specific Elective-4 (Choose any one)</b>	SCAC-306 Soft Computing	4			4
	SCAC-308 Mobile Computing				
<b>Practical (Choose any four)</b>	CCAC-352:Artificial Intelligence Lab		2		1
	CCAC-354: Computer Graphics Lab		2		1
	CCAC-356: Seminar &Group Discussion		2		1
	CCAC-358: Project Work		2		1
Total Credits (4 Theory +4 Lab)		16	8		20

**UNIT I**

**Introduction to C :**History of C , Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C.**Data Types, Variables, Constants, Operators and Basic I/O:** Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putcharc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.hetc).

**UNIT II: Expressions, Conditional Statements and Iterative Statements:** Simple Expressions in C (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

**UNIT III: Functions and Arrays:** Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Functions with variable number of Arguments. Creating and Using One Dimensional Arrays ( Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional array.

**UNIT IV Pointers and References in C:**Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values **Memory Allocation in C:** Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation

**UNIT V: File I/O, Preprocessor Directives:** Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifndef, #ifnndef and #undef), Macros

## Reference Books

1. HerbtzSchildt, "C : The Complete Reference", Fourth Edition, McGraw Hill.20032.  
BjarneStroustrup, "The C Programming Language", 4<sup>th</sup> Edition, Addison-Wesley , 2013.
2. BjarneStroustrup, "Programming -- Principles and Practice using C++", 2nd Edition,Addison-Wesley 2014.
3. E Balaguruswamy, "Fundamental Programming with C", Tata McGraw-Hill Education, 2008.

**CCAC 103**

**Computer System Architecture**

**L T P 3 1 0 4**

**Unit- I :** Basic organization of computers, Block level description of the functional units asrelated to the execution of a program; Fetch, decode and execute cycle.

**Unit- II:** Machine instructions, Instruction set architectures, Assembly languageprogramming, addressing modes, instruction cycles, registers and storage, addressing modes; discussions about RISC versus CISC architectures; Inside a CPU:

**Unit- III :** Information representation, Floating point representation (IEEE 754), computerarithmetic and their implementation; Fixed-Point Arithmetic: Addition, Subtraction, Multiplication and Division, Arithmetic Logic Units control and data path, data path components, design of ALU and data path, controller design; Hardwired and Micro programmed Control.

**Unit- IV:** Memory Technology, static and dynamic memory, Random Access and SerialAccess Memories, Cache memory and Memory Hierarchy, Address Mapping, Cache pupation schemes, Virtual memory and memory management unit.

**Unit- V:** I/O subsystems: Input-Output devices such as Disk, CD-ROM, Printer etc.;Interfacing with IO devices, keyboard and display interfaces; Basic concepts Bus Control, Read Write operations, Programmed IO, Concept of handshaking, Polled and Interrupt-driven I/O, DMA data transfer;. Pipeline Processing, Instruction and Arithmetic Pipeline, Pipeline hazards andtheir resolution, Parallel Processing

### ***Text Book:***

1. Computer Organization by V. Carl Hamacher, Safwat G. Zaky and Zvonko G. Vranesic , McGraw-Hill series (2002)

### ***Reference Books:***

1. Computer Organization and Design, by David Patterson and John Hennessey, ” Elsevier. 2008.

2.Computer System Architecture by Mano, M.M., Prentice Hall of India, New Delhi, 1992

3.Computer Systems Design and Architecture (2nd Edition) by Vincent P. Heuring and Harry F. Jordan (Dec 6,2003)

4.Computer Architecture and Organization, by Hayes, J.P.1998,McGraw-Hill



**UNIT I:**

Introduction: Theory of Communication, Types and modes of Communication.

**UNIT II:**

Language of Communication: Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication

**UNIT III:**

Speaking Skills: Monologue Dialogue Group Discussion Effective Communication/ Mis-Communication Interview Public Speech

**UNIT IV:**

Reading and Understanding Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation Translation(from Indian language to English and vice-versa) Literary/Knowledge Texts

**UNIT V:**

Writing Skills Documenting Report Writing Making notes Letter writing

**Text Books:**

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.

**UNIT:1 Introduction to Behavioural Skills**

Understanding personality traits and types, Self-assessment tools for identifying strengths and areas for improvement, Importance of self-awareness and how it impacts relationships and career.

**UNIT :2 Self-Motivation and Personal Development**

Goal-setting techniques (SMART goals), Building self-discipline and resilience, Techniques to stay motivated, even during challenging times.

**UNIT:3 Interpersonal Skills**

Developing empathy and active listening, Conflict resolution strategies, Building strong relationships through trust and effective communication.

**UNIT:4 Time Management & Prioritization**

Time-blocking, scheduling, and the Eisenhower Matrix, Techniques to reduce procrastination, Setting realistic goals and evaluating progress.

**UNIT:5 Stress and Anger Management**

Identifying personal triggers and stressors, Techniques for stress relief, like deep breathing, meditation, and exercise, Anger management strategies and learning to communicate effectively when angry.

**UNIT:1 Fundamentals of English Grammar**

Parts of speech, sentence structure, types of sentences, Tenses, subject-verb agreement, and common grammatical errors, Usage of prepositions, articles, and conjunctions.

**UNIT:2 Vocabulary Building**

Expanding vocabulary with synonyms, antonyms, idioms, and phrases, Techniques to retain and use new vocabulary, Importance of context in vocabulary usage.

**UNIT:3 Listening and Speaking Skills**

Improving pronunciation and intonation, Active listening techniques for better comprehension, Developing fluency through speaking exercises and dialogue practice.

**UNIT:4 Reading and Writing Skills**

Developing reading strategies (skimming, scanning, and detailed reading), Practice exercises for comprehension and critical analysis of texts, Basics of writing formats: formal and informal letters, essays, and reports.

**UNIT:5 Communication Skills in English**

Difference between verbal and non-verbal communication, Engaging in effective communication, both spoken and written, Role of English in professional and academic settings.

**Unit-I**

**Differential Calculus:** Limits and continuity, Differentiation of algebraic, polynomial, trigonometric, logarithmic, exponential functions, Simple applications of derivatives, Increasing and decreasing functions, Maxima and minima of functions of one variable;

**Unit-II**

**Vectors :**Vector, vector algebra Addition, subtraction, scalar multiplication, magnitude, vector multiplication. Simple applications of vectors.

**Matrices:** Matrix, sub matrix, types of matrices, such as symmetric, square, diagonal Matrices, singular and nonsingular matrices. Addition, subtraction, multiplication of matrices. Rank of a matrix, Matrix equation, solution by Cramer's rule and Gauss elimination method.

**Unit-III**

**Matrix Algebra:** Types of matrices, Rank of a matrix, Inverse of a matrix by elementary operations, Eigenvalues and Eigenvectors of matrices, Cayley-Hamilton theorem and its use in finding inverse of a matrix, Complex matrices and their elementary properties, Application of matrices to a system of linear (homogeneous and non-homogeneous) equations.

**Unit-IV Functions:** Interval and sub-intervals. Definition of function and examples, polynomial, rational, exponential, logarithmic and trigonometric functions. Graph of some simple functions like polynomial (upto 3rd deg), rational trigometric functions, modulus, function, step functions, rational functions, composite functions.

**Unit-V : Probability and Statistics:**Masure of central tendency (Mean, Weighted mean, Median, Mode), Dispersion (Range, Deviation from the mean, Variance, Standard deviation, Coefficient of variation), Symmetry and Kurtosis in data. Quartiles and Percentiles.Probability and axioms of probability.Probability and probability distribution (Binomial, Poisson and Normal).Correlation and Regression.

**Reference Books**

1. Engineering Mathematics : E. Kreyzig
2. Higher Engineering Mathematics : B. S. Grewal
3. Advanced Engineering Mathematics : H. K. Das
4. Differential Calculus : Shanti Narayan

**1. Calculus**

Limits, continuity, and differentiability, Derivatives, applications of derivatives in real-world problems, Integration techniques and applications of definite integrals in engineering.

**2. Linear Algebra**

Matrices: types, operations, determinants, and inverse, System of linear equations and methods (Gaussian elimination, Cramer's rule), Eigenvalues, eigenvectors, and applications.

**3. Differential Equations**

First-order differential equations and applications, Higher-order differential equations, Laplace transforms and their application in solving differential equations.

**4. Vector Calculus**

Vector functions, gradient, divergence, and curl, Line, surface, and volume integrals, Green's, Stokes', and Gauss' theorems.

**GCAC-101B:**

**Discrete Mathematics I**

**L T P Cr**

**3 1 0 4**

**UNIT:1 Fundamentals of Logic and Proof**

Propositional and predicate logic, Methods of proof, including direct, indirect, contradiction, and contraposition, Mathematical induction and recursive definitions.

**UNIT:2 Set Theory**

Sets, relations, and functions, Set operations, Cartesian product, and power sets, Countable and uncountable sets.

**UNIT:3 Combinatorics**

Basic counting principles (addition and multiplication), Permutations and combinations, Introduction to recurrence relations and generating functions.

**UNIT:4 Graph Theory**

Basics of graphs, types of graphs, and graph terminology, Paths, cycles, connectivity, and graph traversal (BFS and DFS), Applications in computer science, such as networking and shortest path problems.

**UNIT:1 Basic Algebra**

Algebraic expressions, equations, and inequalities, Linear and quadratic equations and their solutions, Introduction to complex numbers and polynomials.

**UNIT:2 Coordinate Geometry**

Cartesian coordinate system and distance formula, Straight lines, slope, and equations of lines, Circles and conic sections: parabolas, ellipses, and hyperbolas.

**UNIT:3 Trigonometry**

Basic trigonometric ratios and identities, Solving trigonometric equations, Applications of trigonometry in real-world problems.

**UNIT:4 Elementary Calculus**

Basic concepts of limits and continuity, Introduction to differentiation and integration, Applications of differentiation and integration in simple scenarios.

**GCAC-101D**

**Mathematical Foundation of Computer Science I**

**L T P Cr**

**3 1 0 4**

**UNIT:1 Propositional Logic and Predicate Logic**

Logic statements, connectives, truth tables, Quantifiers, predicates, and proofs in predicate logic, Applications in digital circuit design and algorithm logic.

**UNIT:2 Set Theory and Relations**

Sets, subsets, power sets, and set operations, Relations, properties of relations, equivalence relations, and partial orderings, Functions: one-to-one, onto, and bijective functions.

**UNIT:3 Algorithms and Complexity**

Introduction to algorithm design and efficiency, Time complexity and Big O notation, Recursive functions and basic recurrence relations.

**UNIT:4 Graph Theory for Computer Science**

Graphs, trees, and basic graph algorithms, Applications of graphs in computer science (e.g., networks, pathfinding), Introduction to Boolean algebra and its application in computer logic.



**UNIT – I****Computer Fundamentals**

Brief history of development of computers, Computer system concepts and characteristics, Types of computers, Generations of computers, Capabilities and limitations, Basic components of a computer system - CU, ALU, Input/Output functions and characteristics, memory - RAM, ROM, EPROM, PROM and other types of memory.

**UNIT – II**

Input/Output units, Keyboard, Mouse, Trackball, Joystick, Scanners Printers - Daisy wheel, Dot Matrix, Inkjet, Laser, Line Printer, Plotter, Sound Card and Speakers,

**UNIT – III****Storage devices**

Primary vs Secondary Data Storage and Retrieval methods, Sequential and Direct, Various Storage Devices, Magnetic Tape, Magnetic Disks, Cartridge Tape, Hard Disk Drives, Floppy Disks (Winchester Disk), Optical Disks, CD, VCD, CD-R, CD-RW, Zip Drive, flash drives Video Disk, Blue Ray Disc, SD/MMC Memory cards, Physical structure of floppy & hard disk, drive naming conventions.

**UNIT – IV**

Software and its Need, Types of Software, System & Application software, System Software- Operating System, Utility Program, Programming languages, Assemblers, Compilers and Interpreter, Introduction to MSDOS, Windows, booting process details of DOS and Windows, DOS system files. Application Software and its types - Word-processing, Spreadsheet, Presentation Graphics, Data Base Management Software, characteristics, Uses principles, Types of viruses, virus detection and prevention, viruses on network.

**UNIT – V Information Technology**

Use of communication and IT, Communication Process, Communication types- Simplex, Half Duplex, Full Duplex, Communication Protocols, Communication Channels - Twisted, Coaxial, Fiber Optic, Serial and Parallel Communication, Modem - Working and characteristics, Types of Network - LAN, WAN, MAN, Internet, VPN etc., Topologies of LAN - Ring, Bus, Star, Mesh and Tree topologies, World Wide Web Internet Services, Convergence of technologies.

**TEXT & REFERENCE BOOKS:**

1. Using Information Technology, 5<sup>th</sup> Edi, Brian K Williams & Stacey C. Sawyer, 2003, TMH
2. Fundamentals of computers and programming with C, A. K. Sharma, Dhanpat Rai Publications, Daryaganj New Delhi
3. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998, TMH

**AECC-151****Professional Communication Lab**

1. Write a program to calculate the sum of two integers entered by the user.
2. Write a program to check whether a given number is prime or not.
3. Write a program to reverse a given string without using built-in functions.
4. Write a program to find the largest element in an array of integers.
5. Write a program to compute the factorial of a given number using recursion.
6. Write a program to check if a string entered by the user is a palindrome.
7. Write a program to count the number of vowels in a given string.
8. Write a program to calculate the length of a string without using any library functions.
9. Write a program to calculate the power of a number raised to an exponent.
10. Write a program to print the Fibonacci sequence up to the nth term.
11. Write a program to determine if a given number is even or odd.
12. Write a program to swap two numbers without using a third variable.
13. Write a program to merge two arrays into one and display the result.
14. Write a program to print the multiplication table of a number from 1 to 10.
15. Write a program to find the greatest common divisor (GCD) of two numbers using Euclid's algorithm.

**Textbooks:**

1. *Effective Technical Communication* by M. Ashraf Rizvi
2. *Business Communication* by Meenakshi Raman and Prakash Singh

**Reference Books:**

1. *Professional Communication* by Aruna Koneru
2. *The Art of Public Speaking* by Stephen E. Lucas

**Unit I:**

- Introduction to Personality Development: Definition, importance, and goals.
- Self-awareness and Self-assessment.

**Unit II:**

- Positive Attitude: Developing a positive mindset and self-confidence.
- Motivation and Goal Setting.

**Unit III:**

- Time Management: Techniques and tips for effective time management.
- Stress Management and Resilience Building.

**Unit IV:**

- Emotional Intelligence: Understanding and managing emotions.
- Communication in Relationships and Interpersonal Skills.

**Unit V:**

- Leadership Skills: Types of leadership and leadership qualities.
- Teamwork and Conflict Resolution.

**Textbooks:**

1. *Personality Development and Soft Skills* by Barun Mitra
2. *The 7 Habits of Highly Effective People* by Stephen R. Covey

**Reference Books:**

1. *How to Win Friends and Influence People* by Dale Carnegie
2. *Emotional Intelligence* by Daniel Goleman

## **AECC-151B**

## **Behaviour Skill - I**

### **Unit I:**

- Basics of Behavioral Skills: Definition, importance, and categories.
- Self-esteem and Self-confidence.

### **Unit II:**

- Adaptability and Flexibility in Workplace: Coping with changes.
- Empathy and Compassion.

### **Unit III:**

- Developing a Positive Work Ethic.
- Problem Solving and Decision Making.

### **Unit IV:**

- Conflict Management and Handling Criticism.
- Respect and Ethics in Professional Conduct.

### **Unit V:**

- Building Effective Interpersonal Relationships.
- Collaboration and Building a Team.

### **Textbooks:**

1. *Behavioral Skills for Managers and Supervisors* by Edward J. Willett
2. *The Essential Workplace Conflict Handbook* by Barbara Mitchell and Cornelia Gamlem

### **Reference Books:**

1. *Emotional Intelligence for Project Managers* by Anthony Mersino
2. *People Skills* by Robert Bolton

**Unit I:**

- Basics of Grammar: Parts of speech, tenses, and sentence structure.
- Vocabulary Building.

**Unit II:**

- Writing Skills: Paragraph and essay writing.
- Reading Comprehension Techniques.

**Unit III:**

- Pronunciation and Accent Neutralization.
- Listening Skills: Techniques for effective listening.

**Unit IV:**

- Conversational Skills: Dialogues, debates, and discussions.
- Formal and Informal Communication.

**Unit V:**

- Business Communication: Report writing, emails, and proposals.
- Presentation and Public Speaking Skills.

**Textbooks:**

1. *High School English Grammar & Composition* by Wren and Martin
2. *English Grammar in Use* by Raymond Murphy

**Reference Books:**

1. *The Elements of Style* by William Strunk Jr. and E.B. White
2. *Word Power Made Easy* by Norman Lewis

**UNIT I: Introduction to Java:** Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

**UNIT II: Arrays, Strings and I/O:** Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods.

**UNIT III: Object-Oriented Programming Overview:** Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

**UNIT IV: Exception Handling, Threading, Networking and Database Connectivity:** Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

**UNIT V : Applets and Event Handling:** Java Applets:Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms,Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels,

**UNIT I:** Introduction: to Notions of data type, abstract data type, and data structures. Importance of algorithms and data structures in programming. Examples of simple algorithms and illustration of their complexity. **Array** Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation)

**UNIT II: Stack** Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack **Queue** Array and Linked representation of Queue, De-queue, Priority Queues

**UNIT III: Linked Lists** Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular representation of Stack in Lists; Self Organizing Lists; Skip Lists. Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion;

**sssssUNIT IV:**

Introduction to Tree as a data structure: Binary Trees (Insertion, Deletion, Iterative Traversals on Binary Search Trees); Algebraic Expressions, Height-Balanced Trees (Various operations on AVL Trees).

**UNIT V:** Searching: Linear Search, Binary Search, Comparison of Linear and Binary Search, Sort: Selection Sort, Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques

**Text Books:**

1. Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft, Addison-Wesley Series (1983)
2. Data Structures and Algorithm Analysis in Java (3rd Edition) by Mark Allen Weiss, Addison Wesley, (2011).

**Reference Books:**

1. T.H. Cormen, C.E. Leiserson, and R.L. Rivest. *Introduction to Algorithms*. The MIT Press and McGraw-Hill Book Company, Cambridge, Massachusetts, 1990 (Available in Indian Edition).
2. Steven S. Skiena. *The Algorithm Design Manual*. Springer, Second Edition

## **DATA STRUCTURES & USING 'C' Lab.**

### **CCAC-154**

1. Programs based on Arrays (Insertion and Deletion of elements).
2. Programs based on Sorting in Arrays.
3. Programs based on Searching in Arrays.
4. Programs based on Linked Lists
5. Programs based on Stacks.
6. Programs based on Evaluating expressions in Stacks.
7. Programs based on Queues.
8. Programs based on Trees.
9. Programs based on Graphs.

### **Reference Books:**

R. P. Agarwal, Ankita Singh, "*Laboratory Manual on Data Structures using C*", 1<sup>st</sup> Edition, 2010, Shobhit University Publications.



**Unit I: Introduction to Environmental Science**

- Definition, Scope, and Importance: Understanding the interdisciplinary nature of environmental science and its relevance in today's world.
- Concept of Ecosystems: Structure, function, and types of ecosystems (forest, grassland, desert, and aquatic).
- Biodiversity: Importance of biodiversity, threats to biodiversity, conservation methods, and types of biodiversity (genetic, species, and ecosystem).

**Unit II: Natural Resources**

- Forest Resources: Importance, deforestation causes and effects, and sustainable forest management.
- Water Resources: Importance, over-utilization, water scarcity, and conservation of water resources.
- Mineral Resources: Environmental effects of extracting and using mineral resources.
- Energy Resources: Renewable and non-renewable energy sources, energy conservation, and sustainable energy practices.

**Unit III: Environmental Pollution**

- Air Pollution: Sources, effects on health and the environment, and control measures.
- Water Pollution: Sources, effects on aquatic ecosystems, and methods of control.
- Soil Pollution: Causes, effects, and soil conservation techniques.
- Noise Pollution: Sources, effects on health, and noise pollution control.
- Waste Management: Types of waste (solid, liquid, e-waste), waste management techniques, and the concept of "Reduce, Reuse, Recycle."

**Unit IV: Environmental Policies and Practices**

- Environmental Policies in India: Major environmental laws and regulations, such as the Environment Protection Act, Wildlife Protection Act, and Forest Conservation Act.
- Environmental Impact Assessment (EIA): Purpose, process, and importance in developmental projects.
- Role of Individuals and Communities: How individuals and communities can contribute to environmental conservation and sustainable practices.
- Climate Change and Global Warming: Causes, effects, and measures to combat climate change.

## **Unit V: Human Population and the Environment**

- Population Growth and Environment: Effects of population growth on natural resources and urbanization.
- Human Health and Environment: Impact of environmental factors on health, including waterborne diseases, air pollution, and sanitation.
- Sustainable Development: Principles, importance, and practices for achieving sustainable development.
- Environmental Ethics and Awareness: Importance of ethics in environmental conservation and the role of environmental education.

### Textbooks:

1. *Textbook of Environmental Studies for Undergraduate Courses* by Erach Bharucha
2. *Environmental Science: Principles and Practices* by R.C. Sharma and Gurbir Singh

### Reference Books:

1. *Environmental Studies* by Benny Joseph
2. *Environmental Science: Earth as a Living Planet* by Daniel B. Botkin and Edward A. Keller

**Unit I: Self-Awareness and Personal Development**

Understanding self-awareness and its importance, Personal values, goals, and identity, Building self-confidence and self-esteem, Techniques for personal growth and development.

**Unit II: Emotional Intelligence and Stress Management**

Introduction to emotional intelligence (EI), Components of EI: self-awareness, self-regulation, motivation, empathy, and social skills, Stress sources, types of stress, and coping mechanisms, Techniques for managing stress and promoting mental well-being.

**Unit III: Effective Communication and Interpersonal Skills**

Types of communication: verbal, non-verbal, and written, Active listening, empathy, and assertive communication, Building healthy interpersonal relationships, Conflict resolution and negotiation skills.

**Unit IV: Decision Making and Problem Solving**

Steps and techniques in decision-making, Problem-solving models and creative thinking, Critical thinking and evaluating outcomes, Ethical decision-making and responsibility.

**Unit V: Time Management and Goal Setting**

Importance of time management for personal and professional life, Prioritization, scheduling, and delegation techniques, Setting SMART (Specific, Measurable, Achievable, Relevant, Time-bound) goals, Overcoming procrastination and developing discipline

**Suggested Books:**

• **Textbooks:**

1. "Life Skills: Managing Your Future Success" by Evan Davis
2. "Developing Life Skills" by John Smith and Martha Rogers

• **Reference Books:**

1. "Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman
2. "How to Win Friends and Influence People" by Dale Carnegie

**Unit I: Introduction to Ethics and Moral Values**

Concept of ethics, morality, and values, Relationship between ethics and moral values, Importance of moral values in personal, social, and professional contexts

**Unit II: Ethical Theories and Principles**

Overview of ethical theories: Utilitarianism, Deontology, Virtue Ethics, Applications of ethical principles in decision-making, Personal vs. societal ethics

**Unit III: Moral Development and Ethical Behavior**

Stages of moral development (Kohlberg, Piaget), Factors influencing ethical behavior, Case studies on moral dilemmas in various professions

**Unit IV: Contemporary Ethical Issues**

Ethics in technology, environment, and business, Workplace ethics and corporate social responsibility (CSR), Resolving ethical conflicts and dilemmas

**Suggested Books:**

• **Textbooks:**

1. "Ethics: Theory and Contemporary Issues" by Barbara MacKinnon
2. "Moral Values and Ethics: Theory and Practice" by K.K. Sharma

• **Reference Books:**

1. "Ethics in the Real World: 82 Brief Essays on Things That Matter" by Peter Singer
2. "Applied Ethics: A Multicultural Approach" by Larry May

**Unit I: Fundamentals of Leadership and Management**

Definitions, characteristics, and roles of leaders and managers, Differences between leadership and management, Importance of leadership and managerial skills in organizations

**Unit II: Leadership Theories and Styles**

Overview of leadership theories: Transformational, Transactional, Situational, Leadership styles: autocratic, democratic, laissez-faire, Matching leadership style with organizational needs

**Unit III: Key Managerial Skills**

Skills for effective management: decision-making, problem-solving, strategic planning, Importance of interpersonal and communication skills, Managing time and resources efficiently

**Unit IV: Challenges in Modern Leadership**

Managing diversity and inclusion in teams, Ethical leadership and social responsibility, Case studies on contemporary leadership challenges

**Unit V: Contemporary Challenges in Leadership**

Managing diversity, inclusion, and ethical leadership, Coping with global business challenges and crises, Case studies on ethical leadership and contemporary leadership issues

**Suggested Books:**

• **Textbooks:**

1. "Leadership: Theory and Practice" by Peter G. Northouse
2. "Management and Leadership in Organizations" by Alan Murray

• **Reference Books:**

1. "Developing Management Skills" by David A. Whetten and Kim S. Cameron
2. "The Art of Leadership" by George Manning and Kent Curtis

**Unit I**

**Atmosphere:** The Earth's Natural Greenhouse Effect: Greenhouse Gases, Global Warming, Ozone depletion, Acid rain, El Nina and La Nina Phenomenon.

**Unit-II**

**Pollution:** Air, Water, Noise and Soil pollutions and their quality parameters

**Unit-III**

**Waste Management:** Agricultural waste, Industrial waste and Other hazardous waste, Environment Impact Assessment.

**Unit-IV**

**Sustainable Development:** Conservation of natural resources watershed management, Rain water harvesting and storage; Application of Remote Sensing and GIS

**Unit-V**

**Environmental Management Systems:** ISO certification control policies, International and National legislations and acts related to environment.

**Reference:**

1. Miller, T.G. Jr. *Environmental Science*. Wadsworth Publishing Co.
2. Liu, David H.F. and Béla G. Lipták. *Environmental Engineers' Handbook*. 2<sup>nd</sup> edition. Lewis Publishers, New York, 1997.
3. Jadhav, H. and V.M. Bhosale. *Environmental Protection and Laws*. Himalaya Publishing House, Delhi. 1995.
4. Rajagopalan, R. *Environmental Studies: From Crisis to Cure*. Oxford University Press, New Delhi.
5. Joseph, B. *Environmental Studies*. Tata McGraw-Hill, New Delhi.

**Unit-I: Logic gates & Boolean algebra**

Basic laws of Boolean algebra, Conversion between bases (Binary, Octal, Hexadecimal & Decimal); Logic gates: Inverters, OR, AND, NAND, NOR, XOR & X-NOR gates.

Simplification of Boolean equations using Boolean algebra, universal gates & K-maps (up to 6 variables). Code Conversion: BCD, Gray and Excess-3 codes.

**Unit-II: Combinational Circuits**

Half adder, Full adder, Binary adder, Signed binary numbers,  $1^{\text{'s}}$  &  $2^{\text{'s}}$  complements adder – subtractor. Binary multiplier and divider.

Multiplexers/Demultiplexers, encoder / decoders, decimal adders & amplitude comparators.

**Unit-III: Sequential Logic Circuits (I) – Flip-flops**

SR, D, JK, T, & JK master-slave flip-flops and their conversions, excitation table, state table & state diagram. Shift registers: SISO, SIPO. PISO & PIPO. Bidirectional shift registers.

**Unit-IV: Sequential Logic Circuits (II) – Counters**

Design procedure, Synchronous and Asynchronous counters, Ripple counters, modulo counters, twisted ring & Johnson counters.

**Unit-V : Memories**

ROMs, PROMs, EPROMs, EEPROMs, RAMs, Hard Disk, Floppy Disk and CD-ROM.

PAL & PLA.

**Text Books :**

1. Digital Design by M. Mano, 2nd Edn. PHI
2. Introduction to Digital Microelectronic Circuits, by Gopalan, TMH

**Reference Books :**

1. Switching Circuit & Logic Design by Hill & Peterson, Wiley
2. Digital Circuit & Logic Design, by Holsworth.

**Unit I: Advanced Business Writing**

- **Professional Emails:** Effective email formatting, clarity, and tone.
- **Reports and Proposals:** Structure and essentials of writing concise business reports and proposals.

**Unit II: Oral Communication in Business**

- **Presentation Skills:** Organizing and delivering impactful presentations.
- **Meetings and Negotiations:** Basics of running or participating in meetings and negotiation techniques.

**Unit III: Interpersonal Skills for Business**

- **Team Communication:** Building trust and clear communication in team settings.
- **Networking:** Basics of professional networking and relationship building.

**Unit IV: Public Speaking and Listening Skills**

- **Public Speaking Techniques:** Confidence-building strategies and engaging audiences.
- **Active Listening:** Techniques to improve listening and respond effectively.

**Unit V: Digital Communication**

- **Digital and Social Media Communication:** Basics of professional communication on platforms like LinkedIn.
- **Etiquette for Online Communication:** Tone, clarity, and professionalism in virtual interactions.

**Textbooks:**

1. *Business Communication* by Asha Kaul
2. *Effective Business Communication* by Herta A. Murphy



**Unit I: Basics of Communication**

- **Introduction to Communication:** Types, channels, and barriers in communication.
- **Role Play Exercises:** Practicing communication in real-life scenarios.

**Unit II: Business Writing Skills**

- **Email Writing:** Structure and tone for professional emails.
- **Memo and Report Writing:** Simple formats for internal and external communication.

**Unit III: Presentation Skills**

- **Developing Presentations:** Organizing content and visuals.
- **Public Speaking Practice:** Techniques to build confidence and engage audiences.

**Unit IV: Listening and Feedback**

- **Active Listening Skills:** Exercises to improve listening comprehension.
- **Constructive Feedback:** Learning how to give and receive feedback effectively.

**Unit V: Interview Skills**

- **Mock Interviews:** Practicing answering common interview questions.
- **Resume Building:** Basics of creating a professional resume.

**Textbooks:**

1. *Essentials of Business Communication* by Rajendra Pal and J.S. Korlahalli
2. *Business Communication Today* by Courtland Bovee and John Thill

**Unit I: Self-Awareness and Growth**

- **Personal Strengths and Weaknesses:** Identifying areas of improvement.
- **Goal Setting and Motivation:** Techniques for personal and professional goal setting.

**Unit II: Communication and Social Skills**

- **Verbal Communication:** Basics of clear and effective verbal interactions.
- **Non-Verbal Communication:** Understanding body language and eye contact.

**Unit III: Building Confidence**

- **Self-Confidence:** Exercises to improve self-belief and assertiveness.
- **Overcoming Fear and Anxiety:** Simple relaxation techniques.

**Unit IV: Time and Stress Management**

- **Prioritizing Tasks:** Techniques to organize and manage time effectively.
- **Managing Stress:** Identifying stress triggers and coping strategies.

**Unit V: Personal Grooming and Etiquette**

- **Professional Appearance:** Basics of personal grooming.
- **Social and Workplace Etiquette:** Simple rules of professional and social etiquette.

**Textbooks:**

1. *Personality Development and Soft Skills* by Barun Mitra
2. *The Power of Positive Thinking* by Norman Vincent Peale

## CCAC-158B

## Behaviour Skill II

### Unit I: Interpersonal Skills Development

- **Emotional Intelligence:** Basics of recognizing and managing emotions.
- **Empathy and Understanding:** Exercises to improve empathy.

### Unit II: Conflict Resolution

- **Types of Conflict:** Basics of personal and professional conflict.
- **Conflict Management Techniques:** Practical approaches to resolve disagreements.

### Unit III: Decision Making and Problem Solving

- **Steps in Decision Making:** Basics of identifying and evaluating options.
- **Problem-Solving Skills:** Structured approach to solving problems.

### Unit IV: Adaptability and Flexibility

- **Adaptation to Change:** Exercises for improving flexibility in various situations.
- **Overcoming Resistance:** Techniques to embrace new challenges.

### Unit V: Teamwork and Cooperation

- **Roles in a Team:** Understanding roles and responsibilities.
- **Collaboration Skills:** Basics of effective teamwork and collaboration.

### Textbooks:

1. *Behavioral Skills in Management* by R.K. Sahu
2. *Emotional Intelligence* by Daniel Goleman

## CCAC-158C

## Language Proficiency and English II

### Unit I: Advanced Grammar and Vocabulary

- **Grammar Skills:** Complex sentence structures and advanced usage.
- **Vocabulary Development:** Synonyms, antonyms, and usage in context.

### Unit II: Writing Skills

- **Essay Writing:** Structuring ideas clearly and concisely.
- **Summarizing and Paraphrasing:** Techniques for effective summarization.

### **Unit III: Reading and Comprehension**

- **Reading for Information:** Strategies for quick comprehension.
- **Analyzing Texts:** Understanding context and main ideas.

### **Unit IV: Speaking and Listening**

- **Pronunciation and Accent Neutralization:** Basic techniques.
- **Conversational English:** Engaging in meaningful conversations.

### **Unit V: Presentation and Public Speaking**

- **Short Presentations:** Basics of organizing and delivering presentations.
- **Audience Interaction:** Techniques for engaging with listeners.

### **Textbooks:**

1. *High School English Grammar & Composition* by Wren and Martin
2. *Word Power Made Easy* by Norman Lewis

**Unit I:**

Nature of Communication: Process of Communication, Types of Communication (verbal & Non Verbal), Importance of Communication, Different forms of Communication Barriers to Communication Causes, Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers

**Unit II:**

Business Correspondence: Letter Writing, presentation, Inviting quotations, Placing order, Memorandum, Memo, Notices, Job application letter, Resume:FormulatingCareerPlans,PlanningyourResumeStructuringtheResume,Contentofthe Resume, ElectronicResumes

**Unit III:**

Report Writing: Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft and check lists for reports.

**Unit IV:**

Vocabulary: Words often confused Words often misspelt, common errors in English.

**Unit V:**

Oral Presentation: Importance, Characteristics, Presentation Plan, Power point presentation, Visual aids.

**Suggested Readings:**

1. Bovee, and Thill, Business Communication Today, Pearson Education
2. Lesikar, R.V. & Flatley, M.E. Kathryn Rentz; Business Communication Making Connections in Digital World, 11th ed., McGraw Hill Education.
3. Shirley Taylor, Communication for Business, Pearson Education
4. Locker and Kaczmarek, Business Communication: Building Critical Skills, TMH

**Unit-1**

Database Systems: Introducing the database and DBMS, Files and File Systems, Problems with File System and advantages of Database Management systems. Data Models: The importance of Data models, Data Model Basic Building Blocks, Business Rules, The evaluation of Data Models, Degree of Data Abstraction.

**Unit-II**

The Relational Database Model: A logical view of Data, Keys, Integrity Rules, Relational Set Operators, The Data Dictionary and the system catalog, Relationships within the Relational Database, Data Redundancy revisited, Indexes, Codd's relational database rules. Entity Relationship Model: The ER Model, Developing ER Diagram.

**Unit-III**

Normalization of database tables: Database Tables and Normalization, The need for Normalization, The Normal forms and High level Normal Forms, denormalization.

**Unit-IV**

Introduction to SQL: Data Definition Commands, Data Manipulation Commands, Select queries, Advanced Data Definition Commands, Advanced Select queries, Virtual Tables, Joining Database Tables. Advanced SQL: Relational Set Operators, SQL Join Operators, Subqueries and correlated queries, SQL Functions, Oracle Sequences, and Procedural SQL.

**Unit-V**

Transaction Management and Concurrency Control: What is transaction, Concurrency control, Concurrency control with locking Methods, Concurrency control with time stamping methods, concurrency control with optimistic methods, database recovery management.

**Reference Books:**

1. Peter Rob, Carlos Coronel, Database Systems Design, Implementation and Management, Seventh Edition, Thomson (2007)
2. Elimasri / Navathe, Fundamentals of Database Systems, Fifth Edition, Pearson Addison Wesley (2007).
3. Raman A Mata – Toledo/Panline K Cushman, Database Management Systems,

## **CCA-251      DATABASE MANAGEMENT SYSTEM LAB**

Perform the following operations in SQL

1. Creating and managing tables.
2. Manipulating data.
3. Defining constraints
4. Functions
5. Joins
6. Aggregate Functions
7. Sub-queries
8. Views
9. Set operators
10. Procedures

### **References**

1. NidhiTyagi, MridulVaish, "Oracle 9i-Laboratory Manual", ShobhitUniversity Publications,2010.
2. Ivan Bayross, "SQL, PL/SQL: The programming language with oracle"BPB,2007.

**I –Unit**

operating Introduction: Definition of operating systems, Operating System Design Issues, types of time-sharing parallel, distributed and real-time systems, Batch Systems, multi programming, time systems, Operating system structure, Operating system components and services  
 ses, Interprocess Process Management: Process concept, Process scheduling, Cooperating process scheduling, -communication, CPU scheduling criteria, Scheduling algorithms, Multiple time scheduling and Algorithm evaluation-Real

**II -Unit**

ardware, Section problem, synchronization h-Process Synchronization and Deadlocks: The Critical System model, -Semaphores, Classical problems of synchronization, Critical regions, Deadlocks Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, .Combined approach to deadlock handling

**III -Unit**

Logical and Physical Address Space, Swapping, -ment: Memory ManagementStorage management Contiguous Allocation, Paging, Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, .rasing, Page Size and other considerations, Demand segmentationTh

**IV –Unit**

File systems, secondary Storage Structure, File concept, access methods, directory ,implementation, Efficiency and performance, recovery  
 Disk management, Recovery, Disk structure, disk ,Disk structure, Disk scheduling methods .Space management, Disk reliability-scheduling methods, Disk management, Swap

**V –Unit**

Goals of protection, Domain of protection, Access -Security & Case Study: Protection and Security f access Matrix, Revocation of Access Rights, language based protection, matrix, Implementation o The Security problem, Authentication, One Time passwords, Program threats, System threats, .Threat Monitoring, Encryption. Case Study: Linux

**Books:**

1. Abraham Siberschatz and Peter Baer Galvin, "*Operating System Concepts*", Addison-Wesley, 8<sup>th</sup> edition, 2009.
2. Milan Milenkovic, "*Operating Systems, Concepts and Design*", McGraw-Hill Fifth Edition, 2000.
3. Richard Peterson, "*Linux: The Complete Reference*", McGraw-Hill, sixth edition, 2007.
4. Harvey M Deital, "*Operating Systems*", Addison-Wesley Pub. Co., Second Edition, 2007.



**List of experiments:**

1. Simulate the following CPU scheduling algorithms
  - a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate all file allocation strategies
  - a) Sequential b) Indexed c) Linked
3. Simulate MVT and MFT
4. Simulate all File Organization Techniques
  - a) Single level directory b) Two level c) Hierarchical d) DAG
5. Simulate Bankers Algorithm for Dead Lock Avoidance
6. Write a C program to create a child process and allow the parent to display “Hello” and the child to display “Welcome” on the screen.
7. Simulate all page replacement algorithms
  - a) FIFO b) LRU c) LFU Etc...
8. Simulate Paging Technique of memory management.
9. Write C programs that make a copy of a file using i) standard I/O and ii) system calls.
10. Write C programs that count the number of blanks in a text file using i) standard I/O and ii) system calls.

**Unit-I** Introductory Concepts Goals and Applications of Networks, the OSI reference model and Network Architecture, TCP/IP Architecture, Networks topology, Types of Networks, Physical Layer Transmission Media, Switching methods, ISDN.

**Unit-II** Connecting Devices Repeaters, Active & Passive Hubs, Head End, Bridges, Switches, Routers, Gateway. Medium access sub layer Channel allocations, Random Access overview, LAN protocols, Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, FDDI.

**Unit-III** Data Link Layer Elementary data link protocols, sliding windows protocols, error handling, Parity Bit Check, CRC, Checksum, Hamming Code, Hamming Distance. High Level Data Link Control (HDLC), Overview of Ethernet. Network Layer Point-to-Point networks, X.25, Layers of X.25, Routing algorithms, Congestion control algorithms, internetworking, TCP/IP packet, IP addresses, Ipv6. Internet Control Protocol ICMP, ARP, RARP, Interior Gateway routing Protocol OSPF, Exterior Gateway Protocols BGP.

**Unit-IV** Transport Layer: Design issues, connection management, User Datagram Protocol: UDP protocol & Header, Transmission Control Protocol: TCP protocol, TCP segment Header Format, TCP window Management, TCP Timer Management), Data Compression techniques.

**Unit-V** Application Layer WWW, Hyper Text Transfer Protocol, Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, TFTP, RTP, RTCP, Telnet Virtual Terminal and terminal handling, Internet and Public networks.

Reference Books:

1. A. S. Tanenbaum, Computer Networks, Prentice Hall Inc., 3<sup>rd</sup> Edition, 2000.
2. Forouzan, A. Behrouz, Data Communication and Networking, Tata Mc-Graw Hall, Special Indian Edition, 2006.
3. Comer, Computer Networks & Internet, Prentice Hall Inc., 3<sup>rd</sup> Edition, 2002.

LIST OF PRACTICALS

1. Implementation of the Data Link layer framing method such as character stuffing and bit stuffing in C.
  2. Implementation of CRC algorithm in c.
  3. Implementation of hamming code in C.
  4. Implementation of LZW compression algorithm in C.
  5. Implementation of Checksum in C.
  6. Implementation of Client –Server.
  7. Performance analysis of following over LAN Trainer Kit
    - i) Token bus
    - ii) Token ring
    - iii) Ethernet
    - iv) Flow Control
- a. Stop-and-wait
  - b. Go-back-n
  - v) File transfer Protocol

**Unit-I: Introduction:** Internet Basics communicating on the internet, internet domains, establishing connection on the internet, TCP/IP and its services, transmission control protocol, WWW, intranet, extranet.

**Unit-II: The Basics:** Commonly used HTML commands, text formatting, text styles, The Head, the Body, Colors, Attributes, Lists, ordered and unordered

**Unit-III: Links:** Introduction of links, Hyperlinks, Internal document references, External document references

**Images:** Putting an Image on a Page, Using Images as Links, Putting an Image in the Background

**Unit IV: – Tables:** Introduction, Creating a Table, Table Headers, Captions, Spanning Multiple Columns, Styling Table

**Unit V – Forms:** Basic Input and Attributes, Other Kinds of Inputs, Styling forms with CSS, Where to Go from Here

**Book Recommended:**

1. Virginia DeBolt , Integrated HTML and CSS A Smarter, Faster Way to Learn  
Wiley / Sybex , 2006
2. Cassidy Williams, Camryn Williams Introduction to HTML and CSS, O'Reilly, 2015
3. Ivan Bayross, “HTML, DHTML, Java Script, Perl cgi”, BPB publication,

Q.1 Create an HTML document with the following formatting options:

I. Bold, II. Italics, III. Underline, IV. Headings (Using H1 to H6 heading styles), V. Font (Type, Size and Color), VI. Background (Colored background/Image in background), VII. Paragraph, VIII. Line Break, IX. Horizontal Rule, X. Pre tag

Q.2 Create an HTML document which consists of:

I. Ordered List, II. Unordered List III.

Q.3 Create an HTML document which implements Internal linking as well as external linking.

Q.4 Create a table using HTML which consists of columns for Roll No., Student's name and grade.

Q.5 Create a table using colspan and rowspan.

Q.6 Create a form using HTML which has the following types of controls:

I. Text Box, II. Option/radio buttons, III. Check boxes, IV. Reset and Submit buttons

Q.7 Create HTML documents having multiple frames.

**UNIT I : Introduction to PHP** -Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression. **Decisions and loop** Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.

**UNIT II Function:**What is a function, Define a function, Call by value and Call by reference, Recursive function, String Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function. **Array** Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function.

**UNIT III: Handling Html Form with Php:** Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission. **Working with file and Directories:** Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

**UNIT IV: Session and Cookie** -Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.

**UNIT V: Database Connectivity with MySql:** Introduction to RDBMS, Connection with MySql Database, Performing basic database operation(DML) (Insert, Delete, Update, Select), Setting query parameter, Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins.) **Exception Handling** Understanding Exception and error, Try, catch, throw. Error tracking and debugging.

**Unit I**

**Introduction to Multimedia** Evolution of Multimedia and its objects, Scope of multimedia in business & work, Production and planning of Multimedia applications. Multimedia Application.

**Unit-II**

**Multimedia Hardware & Software** Macromedia products, Basic drawing techniques, Basic tools , painting and drawing tools , OCR software, sound editing programs, animation devices Multimedia requirements-Hardware, software, and training Macintosh verses PC, the Macintosh platform, PC platform connections, memory and storage devices, input devices output hardware communication devices.

**Unit-III**

**Production Building blocks** Text using text in multimedia , computer and text font editing and design tools , hyper media and hyper text , sound multimedia system sounds MIDI verses Digital audio, audio file formats , working with sound in windows, notation interchange file format , adding sound

**Unit-IV: Production tips**

Image creation , making stiff images, images color, image file format, animation-principles of animation, making workable animation video using video, Broad cast video, standard integrating computers and TVS shooting and editing video using recording formats , video tips , video compression

**Unit-V : Multimedia project development and case studies**

Planning Costing, Proposal preparation Project planning estimating, RPFs and bid proposals designing, producing acquiring and CD-ROM technology and standards  
Designing for the World Wide Web working on the web, Text for the web, images for the web, sound for the web, animation for the web.

**References**

1. 1.Multimedia Making it work TMH by Tay Vaughan
2. 2.Andreas Haizinger “Multimedia Basics”,Vol-1 to Vol-III Firewall Media , New Delhi
3. 3.Sleinreitz, Multimedia Systems”, Addison Wesley

**Unit-I**

**Computer System:** Basics of computer systems, Generations and history, Classification of computers, capability and limitations of computer systems

**Hardware Organization:** Anatomy of a digital computer, CPU, Accumulator and instruction characteristics.

**Memory Units:** Hierarchy, primary memory-RAM, ROM, cache; Auxiliary storage devices: magnetic tapes and disks, hard disks, floppy disks, CD-ROM.

**Unit-II**

**Input and Output Devices:** Input devices: Keyboard, MICR, OCR, OMR, Digitizer, mouse, light pen, and offline input devices; Output Devices: Printers-impact printers: line-character printers, Non impact printers -ink-jet, laser printers; Display devices.

**Number System:** Decimal , binary, octal, hexadecimal numbers and their inter-conversions; Representation of information inside the computers, Integer representation- Signed 1's and signed 2's complement representation, Floating point representation, Codes: BCD, ASCII, ISCII.

**Unit-III**

**Basics of Programming Languages and Operating Systems:** Low level programming languages: Machine and Assembly languages, High level languages-procedure oriented languages, Translation process- Assembler, Compiler, Interpreter.

**Graphical User Interface and Windows-** Working with windows operating systems, Introduction to system software systems, Operating System Principles. Memory Management, Types of Operating Systems.

**Unit-IV**

**Introduction to 'C' :** History, Characters used in C, Structure of a C program, Data types, C tokens, Basic input output through printf( ) and scanf( ), Comments, Escape sequence, Use of Editor, Compiling and Linking.

**Operations and Expressions:** Operators- arithmetic, relational and logical, Order of evaluation of expression, Special Operators: assignment, bitwise shift Operators.

**Problem Solving and Programming Methodology:** Algorithms, Programming methodology, Debugging,

**Flow of Control and I/O Functions:** Compound statement, Selective execution, Repetitive execution, Single character functions, String-based Functions, More discussion on scanf( ) & printf( ) functions.

**Unit-V**

**Loop Constructs:** For loop, While loop, go to break, switch statement, Arrays and Structures: One dimensional array, Strings, Array initialization; Structure, User defined data types.

Introduction of functions and library functions.

**References:**

1. Sharma, A.K. *Fundamentals of Computers and Programming with C*. DhanpatRai Publications, New Delhi, 2005.
2. Williams, Brian K. and Stacy C. Sawyer. *Using Information Technology*. TMH, New Delhi, 2003.
3. Curtin, Dennis P., Kim Foley, KunalSen, and Cathleen Morin. *Information Technology* TMH, 1998.
4. King, K.N. *C Programming – A Modern Approach*. WW Norton & Co., 1996.



5. Ritchie, Dennis M. and Brian W. Kernigham. *The C Programming Language*. PHI, New Delhi, 1988.

**UNIT – I**

**Introduction:** Software engineering definition and paradigms, Program Vs Software ,Software Crisis, Software Characteristics, Software life cycle models: Why use a Life Cycle Model, Waterfall Model; Iterative Model; Prototyping Model; Evolutionary Model; Spiral Model;

**UNIT – II**

**Software Requirements analysis & specifications:** Requirement engineering, requirement elicitation techniques like Interview & Brainstorming, requirements analysis using DFD, Data dictionaries & ER Diagrams.

**UNIT-III**

**Software Project Planning:** Size Estimation: LOC & Function Count, Risk Management.

**Software Design:** Modularity: Cohesion & Coupling, Function Oriented Design, Object Oriented Design.

**UNIT-IV**

**Software Testing:** Definition, Types of Testing, Verification vs Validation testing , Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing.

**UNIT –V**

Software Quality: **Software Quality, CMM and ISO 9000;**

**Software Maintenance:** Types of Maintenance, Maintenance Process, Reverse Engineering, Software Re-engineering, Configuration Management.

***References***

1. Software Engineering Pressman
2. System Analysis and Design Jalote.
3. Software Engineering Sommerville
4. System Analysis & Design Elias Awad
5. Object Oriented Modeling & Design James Rumbaugh
6. Analysis & Design of Information System James Senn
7. Analysis & Design of Information System V. Rajaraman
8. Software Engineering Concepts Richard Fairley

The student has to select one of the project listed below:

1. Health Care Insurance
2. Attendance Management System
3. Paylogs
4. Air Ticketing System
5. E-Banking
6. Online Recruitment System
7. Online Trading System
8. Resource Manager
9. Warehouse Management System
10. Grievance Handling System.

Perform the different phases of software development life cycle on the selected project.

- a. Feasibility study and requirement analysis
- b. Design (students are advised to use object oriented approach)
- c. Coding
- d. Testing
- e. Installation and Maintenance ( optional).

### Unit-I

**Introduction to Algorithms** Analysis of algorithm, Design of algorithm, complexity of algorithm, asymptotic notations, Recurrences. Sorting in polynomial time: Insertion sort, Merge sort, Quick sort, heap sort. Sorting in linear time: counting sort, bucket sort, radix sort. Medians and order statistics.

### Unit-II

**Elementary data structure** binary search tree. **Advanced data structure** Red Black tree, Augmenting data structure, binomial heaps, B-tree, Fibonacci heap and data structure for disjoint sets.

### Unit-III

**Advanced design and analysis techniques** Dynamic programming, Greedy algorithm, Backtracking, Amortized analysis.

### Unit-IV

**Graph algorithm** Breadth first search, Depth first search, Minimum spanning tree, Kruskal's algorithms, Prim's algorithms, Single source shortest path, All pair shortest path, Maximum flow and Traveling salesman problem.

### Unit-V

**String matching:** The naïve String Matching algorithm, The Rabin-Karp Algorithm, String Matching with finite automata, The Knuth-Morris Pratt algorithm.

Randomized algorithms, string matching, NP-hard and NP-completeness, Approximation algorithms.

### References Books :

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, *Introduction to Algorithm*, Tata Mc-Graw Hill, 2<sup>nd</sup> Edition, 2003.
2. Horowitz Sahani, *Fundamentals of Computers Algorithm*, Golgotia Publications, 1998.
  3. Parag H. Dave, Himanshu B. Dave, *Design and Analysis of Algorithms*, Pearson

1. Write a program showing the implementation of selection sort algorithm using recursively problem solving approach.
2. Write a program showing the implementation of insertion sort algorithm using recursively problem solving approach.
3. Write a program showing the implementation of merge sort algorithm using divide-conquer-combine problem solving approach.
4. For a given array  $A = \{234, 233, 455, 423, 567, 656\}$ , arrange the elements of the array A in increasing order using radix sort algorithm.
5. Write the implementation of the searching algorithm as described below-  
First of all arrange the elements of the given array in increasing order, then find the median element, if the key element is smaller than the median element then perform the searching on the left of the median element else perform the searching on the right of the median element as described above.
6. Create a linked list and show all the operations on the linked list such as – insertion, deletion and traversing.
7. Create a doubly linked list and show all the operations on the doubly linked list such as – insertion, deletion and traversing.
8. Create a binary search tree and perform the searching operation on binary search tree.
9. Consider the string  $s = \text{"abcdabcerfabcd erabc"}$ , write a program using naïve string matching to find out how many times the pattern  $p = \text{"abc"}$  found in the string s.
10. Given a text string t and a pattern string p, find all occurrences of p in t using rabin-krap algorithm.

**Unit I**

**Introduction to OOPs and C++** Introduction to OOPs, Features & Advantages of OOPs, Different element of C++ (Tokens, Keywords, Identifiers, Variable, Constant, Operators, Expression, String).

**Unit II**

**Program Control Statements** –Sequential Constructs, Decision Making Construct, Iteration / Loop Construct, Arrays, Functions (User defined Function, Inline Function, Function Overloading), User Defined Data Types (Structure, Union and Enumeration).

**Unit III**

**Class, Object, Constructor & Destructor** Class, Modifiers (Private, Public & Protected), Data Member, Member Function, Static Data Member, Static Member Function, Friend Function, Object, Constructor (Default Constructor, Parameterized Constructor and Copy Constructor), Destructor.

**Unit IV**

**Pointer, Polymorphism & Inheritance** Pointer (Pointer to Object, this Pointer, Pointer to Derive Class), Introduction to Polymorphism (Runtime Polymorphism, Compiletime Polymorphism), Operator Overloading, Virtual Function, Inheritance (Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance), Virtual Base Class, Abstract Class.

Unit V - File Handling, Exception Handling - 10 Hrs (15 Marks)

Files I/O, Exception Handling (Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism, Re-throwing an Exception).

**BOOKS SUGGESTED**

1. E. Balaguruswami – Object Oriented programming with C++
2. Kris James – Success with C++
3. David Parsons – Object Oriented programming with C++

**UNIT I:**

Introduction to Unix/Linux Operating System, Difference between Linux, Unix and other operating System. Functions of OS

**UNIT II:**

Features and Architecture of Unix/Linux Operating System, Various Distribution available in market, Installation, Booting and Shut down process.

**UNIT III:**

System Process, External and Internal Command, Creation Of Partition in Operating System, Process and its creation phases for fork(),exec(),wait().

**UNIT IV:**

User Management and File System, Types of users, creating users, Granting rights , user management commands, files quota and various file system available, File system management and layout, file permissions ,login process ,managing disk quota, Links(rad links, symbolic inks)

**UNIT V:**

Shell introduction and Scripting , What is Shell and various types of Shells, Various Editors present in Linux, Different modes of Vi editor , What is Shell Script, Writing and Executing Shell Scripting, shell variable, system calls , Using System calls, pipes and filters, Decision making in shell script, loops I shell. Functions utility program,(cut,copy,paste,join),Pattern Matching Utility

**Text Books:**

- 1.Deitel&Deitel, JAVA : How to Program, Pearson education , 7e (2008)
- 2.Deitel&Deitel, Internet and World Wide Web How to Program, Pearson education, 3e ,(2005)

**Reference Books:**

- 1.Ivan BayRoss, Web Enabled Commercial Application using Java 2, bpb publication (1998)
- 2.David Flanagan , Java Script The Definitive Guide, O'relly, 5e (2006)

**UNIT – I**

**Visual Basic:** Introduction, Variable Names, Data Types, constants, Assignment, statements, Object oriented concept, Object and classes, If-then, If-then-else, if then-else if else, expression, print statement, arrays, variable declaration, built-in & User defined types, Subroutine and functions, Boolean Operators, Arithmetic Operator, For- .next, do loop, while-wend, procedure/Public, Private and Static & Dim Statement.

**UNIT – II**

Structure of VB program, Forms & built in controls, Properties and events, Code Module, Scale Modes, Printer Object (Printing text, setting Fonts, graphics), Common dialog Boxes, picture controls, image-controls, send keys, MS-Common Controls, Error Handling, Classes, Control Arrays, MDI, SDI. **File Handling** – Text and Binary Files, Files System Orbit Object.

**UNIT – III**

**Database Interface:** Review of ANSI SQL, ODBC, Pass through ODBC, DAO, MS-Jet Engine, DB-Engine, Workspaces, Databases, record sets, Data bound controls, ActiveX controls, ADO, Active X Data controls, RDO Data view Window, Data Environment Designer, Crystal Report and Data Report Utility Using Visual Basic (VB) for Transaction Management, Concurrency Control, Interfacing with RDBMS, Backend Stored procedure Usage.

**UNIT – IV**

**Help Writing:** Building a help, System, Building & Topics File, Labeling the topics, Creating a help project, primary & secondary help window, linking to internet, Adding Multimedia, Using HTML help workshop, content sensitive help, help file. Overview of COM/DCOM using Windows API Functions, MAPI interface, Microsoft Transaction Server, Visual source safe, VB Script.

**UNIT – V :Introduction to .NET framework** Introduction, Common language runtime, Common Type System, Common Language Specification, The Base class Library, The .NET class library intermediate language, Just in –time compilation, garbage collection, Application installation & Assemblies, WEB Services, Unified classes

**References**

1. .1998 ,BPB Publications ,”6.0Mastering Visual Basic “E. Petroustos,
2. .Techmedia, 1998 ,”Teach Yourself Visual Basic 6 in 21 Days“Perry, Greg,
3. (Microsoft),”Applied .Net framework programming”Jeffrey Richter,



4. ,”6Mastering Database Programming with Visual Basic “E. Petroutsos, BPBPublications, 2000
5. .Techmedia, 1998 ,”6s Guide to Visual Basic ’er NortonPet“Norton Peter,

**Unit-I**

**Set :** Definition of sets, countable and uncountable sets, Venn Diagrams, Power set, Partition of sets, cardinality, inclusion-exclusion principles, proofs on some general identities on sets. **Relation-**Definition, types of relation, composition of relations, pictorial representation of relation, equivalence relation, partial ordering relation. **Function-**Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions. **Theorem Proving Techniques** mathematical induction, pigeonhole principle, proves by contradiction.

**Unit-II**

**Algebraic Structures:** Definition, Properties, types: Semi Group, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, cosets, factor group, permutation groups, Normal subgroup, Homomorphism and isomorphism of groups, example and standard results, rings and fields.

**Unit-III**

**Posets, Hasse Diagram and Lattices:** Introduction, ordered sets, Hasse diagram of partially ordered set, isomorphic ordered sets, well ordered set, properties of Lattices, bounded lattices and Complemented lattices. **Boolean Algebra** Basic definitions, sum of products and product of sums forms, Logic gates and Karnaugh maps.

**Unit-IV: Propositional Logic:** Proposition, logic operators, first order predicate logic, truth tables, tautologies, arguments, contradictions, logical implications, logical equivalence, predicates, universal and existential quantifiers.

**Unit-V : Graphs & Combinatorics:** Recurrence Relation, Generating function, simple graph, multi graph, graph terminology, representation of graphs, Bipartite, Regular, Planar and connected graphs, Euler graphs, Hamiltonian path and circuits, Adjacency and Incidence Matrices Graph coloring number, chromatic number, **Tree** Definition, Rooted tree, properties of trees, binary search tree, tree traversal.

**Reference Books:**

1. Seymour Lipschutz & M.L. Lipson, *Discrete Mathematics*, Tata McGraw Hill, 2<sup>nd</sup> Edition, 1999.
2. Trembley, J.P & R. Manhor, *Discrete Mathematical Structure with Application to Computer Science*, McGraw Hill, 1997.

3. Kenneth H. Rosen, *Discrete Mathematical and its applications*, McGraw Hill, 4<sup>th</sup> Edition, 2002.
4. JL Morr, A Kandal and TP Baker, *Discrete Mathematics for Computer Scientists and Mathematics*, PHI, 1999.
5. Deo, Narsingh, *Graph Theory With application to Engineering and Computer Science*, PHI, 2007

**Unit 1: Differential Equations**

- **Ordinary Differential Equations (ODEs):** Basic concepts and solutions.
- **Applications:** Real-world problems modeled with ODEs.

**Unit 2: Partial Differential Equations (PDEs)**

- **Introduction:** What PDEs are and their classifications.
- **Solution Methods:** Basic techniques like separation of variables.

**Unit 3: Vector Calculus**

- **Vector Functions:** Understanding vector fields.
- **Integrals:** Line and surface integrals, including Green's and Stokes' Theorems.

**Unit 4: Complex Variables**

- **Complex Functions:** Introduction and properties of complex numbers.
- **Integration:** Basic techniques for integrating complex functions.

**Unit 5: Numerical Methods**

- **Root Finding:** Simple methods like Bisection and Newton-Raphson.
- **Numerical Integration:** Basic methods such as the Trapezoidal and Simpson's rule.

**Unit 6: Laplace Transforms**

- **Definition:** Understanding the Laplace transform.
- **Applications:** How to use Laplace transforms in solving differential equations.

**Textbooks:**

1. *Advanced Engineering Mathematics* by Erwin Kreyszig
2. *Engineering Mathematics* by B.S. Grewal

**Reference Books:**

1. *Higher Engineering Mathematics* by B.V. Ramana
2. *Engineering Mathematics* by John Bird

**Unit 1: Graph Theory**

- **Basic Concepts:** Definitions of graphs, vertices, edges, and types of graphs (simple, directed, weighted).
- **Graph Traversal:** Depth-First Search (DFS) and Breadth-First Search (BFS).

**Unit 2: Trees**

- **Tree Basics:** Definitions and properties of trees.
- **Binary Trees:** Types (full, complete, binary search trees) and traversal methods (in-order, pre-order, post-order).

**Unit 3: Combinatorics**

- **Counting Principles:** Basic counting techniques, permutations, and combinations.
- **Binomial Theorem:** Understanding the binomial coefficients.

**Unit 4: Boolean Algebra**

- **Basics of Boolean Algebra:** Definitions and operations (AND, OR, NOT).
- **Applications:** Use of Boolean algebra in logic circuits and simplifying expressions.

**Unit 5: Relations and Functions**

- **Relations:** Types (reflexive, symmetric, transitive) and properties.
- **Functions:** Definitions, types (injective, surjective, bijective), and compositions.

**Unit 6: Recurrence Relations**

- **Definition:** Understanding recurrence relations and their solutions.
- **Applications:** Use in algorithm analysis and computer science.

**Textbooks:**

1. *Discrete Mathematics and Its Applications* by Kenneth H. Rosen
2. *Discrete Mathematics* by Richard Johnsonbaugh

**Reference Books:**

1. *Discrete Mathematics* by D. S. Malik and J. M. Mordechai
2. *Mathematics for Computer Science* by Eric Lehman, F. Thomson Leighton, and Albert R. Meyer

**Unit 1: Algebra**

- **Basic Algebraic Operations:** Simplifying expressions, solving linear equations, and inequalities.
- **Polynomials:** Operations on polynomials, factoring, and solving quadratic equations.

**Unit 2: Trigonometry**

- **Trigonometric Ratios:** Understanding sine, cosine, tangent, and their applications.
- **Trigonometric Identities:** Fundamental identities and solving basic trigonometric equations.

**Unit 3: Calculus**

- **Differentiation:** Basic rules of differentiation, application of derivatives to find slopes and rates of change.
- **Integration:** Understanding definite and indefinite integrals and their applications.

**Unit 4: Matrices and Determinants**

- **Matrices:** Definitions, types of matrices, and basic operations (addition, subtraction, multiplication).
- **Determinants:** Calculation of determinants and their properties, and applications in solving linear equations.

**Unit 5: Statistics and Probability**

- **Basic Statistics:** Measures of central tendency (mean, median, mode) and measures of dispersion (range, variance, standard deviation).
- **Probability:** Basic concepts of probability, counting principles, and conditional probability.

**Textbooks:**

1. *Basic Mathematics* by Serge Lang
2. *Elementary Algebra* by Harold R. Jacobs

**Reference Books:**

1. *College Mathematics* by Robert H. Bartle

2. *Mathematics for Class XI & XII* by R.D. Sharma

**GCAC 204**

**Information Security and Cyber Law**

**L T P 4 0 0**

**Unit I INTRODUCTION** 1. Basic concept of Technology and Law : Understanding the Technology, Scope of Cyber Laws, Cyber Jurisprudence 2. Understanding Electronic Contracts : The Indian Law of Contract, Types of Electronic Contracts, Construction of Electronic Contracts

**Unit II IPR IN CYBER SPACE** 1. Copyright in Information Technology: Copyright in internet, Software Piracy, Multimedia and copyright issues. 2. Patents : Indian position on computer related patents, International context of patents. 3. Trademarks : Trade mark Law in India, Infringement and passing off.

**Unit III INFORMATION TECHNOLOGY ACT 2000** : Digital Signature, E-Governance, Regulation of Certifying Authorities, Duties of Subscribers, Penalties and Adjudication, Offences under the Act, Making of Rules and Regulation.

**Unit IV CYBER CRIMES** 1. Understanding Cyber Crimes : Crime in context of Internet, Types of Crime in Internet 2. Indian Penal Law & Cyber Crimes : Fraud, Hacking, Mischief, Trespass, Defamation, Stalking, Spam

**Unit V Issues of Internet Governance** : Freedom of Expression in Internet, Issues of Censorship, Hate Speech, Seditious Libel, Subversion, Privacy Issues, International position on Free Speech in Internet **BOOKS**

**REFERENCES**

1. Gerold R.Ferresc, Cyber Law(Text & Cases)
2. Prof. S.R. Bhansali, Information Technology Act Rodney
3. D.Ryder, Guide to Cyber Law
4. Vakul Sharma , Cyber Crime.



### Unit-I

**Internet Basics** communicating on the internet, internet domains, establishing connection on the internet, client IP address, TCP/IP and its services, transmission control protocol, WWW, intranet, extranet.

### Unit-II

**Introduction to HTML** commonly used HTML commands, text formatting, text styles, Lists – types of lists, adding graphics to HTML documents, tables, links – external document references, internal document references, frames.

### Unit-III

**Javascript** javascript in web pages, the advantages of javascript, building javascript syntax – data types, type casting, creating variables, javascript array, operators and expressions, conditional checking, functions – build in functions, user defined functions, dialog boxes – alert dialog box, prompt dialog box, confirm dialog box, javascript document object model – understanding objects, forms object methods.

### Unit-IV

**JSP** jsp execution model, components of jsp, using java beans in jsp, directives in jsp-page directive, include directive, taglib directive, standard action tags- <jsp:include>, <jsp:forward>, <jsp:init>, implicit objects in jsp-application, session, pagecontext, out, request, response, error handling in jsp, database connectivity using jsp.

### Unit-V

**Active Server Pages:** Basics, Integrating Script, ASP Objects and Components, configuring and troubleshooting, Request and response objects, Retrieving the contents of a an HTML form, Retrieving a Query String, Cookies, Creating and Reading Cookies. Using application Objects and Events.

### References

1. Ivan Bayross, “HTML, DHTML, Java Script, Perl cgi”, BPB publication,
2. James Godwill, “Pure JSP”, Sams publications, edition-2000
3. Bryan Basham, “Head First in Servlets and Jsp”, O’Rielly publications, March 2008.

## INTERNET TECHNOLOGY LAB

### CCAC-351

1. Create a registration form in html containing student name, student roll no, branch, session, email id, phone no., address etc.
2. Create a document with two links to an external document. The first link should lead to the beginning of the external document. The second link should lead to a particular section in the external document.
3. Create a specimen of corporate web page. Divide the browser screen into two frames, The frame on the left will be a menu consisting of hyper links. Clicking on one of these links will lead to a new page, which must open in the target frame, which is on the right hand side.
4. Using scripting language validate a registration form whether the user enter character in the username textfield, in the password filed the no. of characters not more than 6.
5. Create a web page using two image files, which between one another as the mouse pointer moves over the images.
6. Create a web page which accepts user information and user comments on the web site. Design the web page using form elements and check if all the text fields have begin entered with data else display an alert.
7. Create a JSP for inserting a employee information in a database.
8. Create an application which displays how many times a JSP is visited.
9. Create a JSP showing the use of application implicit object.
10. Create a jsp showing the use of jsp error handling.

**Unit - I****Introduction and Software Project Planning**

Fundamentals of Software Project Management (SPM), Need Identification, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework,

**Unit – II**

Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation models.

Work Breakdown Structure (WBS), Scheduling techniques, Network Diagrams: PERT, CPM and Gantt Charts.

**Unit - III**

Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators.

**Unit - IV**

Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM) and SQA Activities.

**Unit - V**

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control.

**Reference Books:**

1. Bob Hughes and Mike Cotterell, “*Software Project Management*”, Tata McGraw-Hill, Fifth Edition, 2008.

2. Roger S. Pressman, "*Software Engineering – A Practitioner's approach*", McGraw-Hill, Seventh Edition, 2009.
3. Walker Royce, "*Software Project Management*", Addison Wesley, Seventh Edition, 2003.
4. M. Cotterell, "*Software Project Management*", Tata McGraw-Hill, Fourth Edition, 2005.
5. S. A. Kelkar, "*Software Project Management*", Prentice-hall Of India, Fourth Edition ,2007.

## KNOWLEDGE MANAGEMENT & EXPERT SYSTEM

DCAC 301

Cr. L T P

4 3 10

### Unit - I

Introduction to knowledge Management Distinction between data , information & knowledge. Concept of knowledge creation, Intellectual Capital Creation, Human Capital, Customer Capital and Organizational Capital

### Unit-II

Socio-cultural aspects & organizational aspects Tacit & Explicit knowledge & Knowledge Organization . Knowledge Storage and Distribution, KM tools, Data warehouse, Data mining, knowledge management evaluation & Valuation of Knowledge.

### Unit-III

K- Sharing Practices and Barriers. K – culture, KM In Indian organizations and MNC. Learning Organizations & Organizational Learning

### Unit – IV

**Expert System** Existing Expert Systems (DENDRAL, MYCIN), Architecture of expert system, Features of Expert system, Genetic algorithm, Fuzzy logic, Neural Networks, Intelligent Agents, Meta Knowledge, Expertise Transfer, Self Explaining System, User and expert systems.

### Unit-V

K-Initiative, K-Strategic issues in knowledge management, K-Commerce

### Reference Books:

1. SudhirWarrier, “*Knowledge Management*”, Vikas publishing House, New Delhi, First edition, 2007.
2. Thotharti Raman, “*Knowledge Management*”, Excel Books ,New Delhi, First Edition,2004.
3. Stuart Barnes “*Knowledge Management Systems: Theory & Practice*”, Thomson Learning Press, New Delhi, First Edition, 2002.
4. Ronald Maier, “*Knowledge Management System*”, Springer, Germany, Second Edition,2002.

**Unit 1: Foundations of Knowledge Management**

- Definition and Importance of Knowledge Management
- Types of Knowledge: Explicit and Tacit
- Key Concepts and Principles of KM

**Unit 2: Knowledge Management Processes**

- Knowledge Creation
- Knowledge Sharing
- Knowledge Application

**Unit 3: Tools and Technologies for KM**

- Information Systems in KM
- Technology Support: Databases, Intranets
- Collaborative Tools and Social Media

**Unit 4: Organizational Culture and Knowledge Management**

- Role of Organizational Culture in KM
- Knowledge Management Strategies
- Building a Learning Organization

**Unit 5: Challenges and Future of KM**

- Barriers to Effective KM
- Trends in KM: AI, Big Data, and Emerging Technologies
- Future Directions in Knowledge Management

**Textbooks:**

1. *Knowledge Management: An Evolutionary View* by David J. Skyrme
2. *The New Knowledge Management* by Chris C. C. Wong

**Reference Books:**

1. *Knowledge Management in Organizations* by Michael A. J. Cowan
2. *The Knowledge-Creating Company* by Ikujiro Nonaka and Hirotaka Takeuchi

**Unit 1: Introduction to Information Systems**

- Definition and Types of Information Systems
- Components of Information Systems
- Role of Information Systems in Organizations

**Unit 2: Data Management**

- Data Collection, Storage, and Retrieval
- Database Management Systems (DBMS)
- Data Warehousing and Data Mining

**Unit 3: Information Technology Infrastructure**

- IT Components: Hardware, Software, Networks
- Network Architecture and Security
- Cloud Computing and Virtualization

**Unit 4: Systems Development and Implementation**

- System Development Life Cycle (SDLC)
- Agile and Waterfall Methodologies
- Testing, Deployment, and Maintenance

**Unit 5: Emerging Technologies in Information Systems**

- Impact of Artificial Intelligence and Machine Learning
- Internet of Things (IoT) and Big Data
- Future Trends in Information Systems

**Textbooks:**

1. *Management Information Systems* by Kenneth C. Laudon and Jane P. Laudon
2. *Information Systems for Managers* by Gabe Piccoli

**Reference Books:**



1. *Information Technology for Management* by Efraim Turban
2. *Systems Analysis and Design* by Alan Dennis and Barbara Wixom

**Unit 1: Understanding Organizational Learning**

- Definition and Importance of Organizational Learning
- Theories of Learning in Organizations
- Learning Organizations vs. Traditional Organizations

**Unit 2: Knowledge Creation and Sharing**

- Knowledge Management Frameworks
- Knowledge Creation Processes: SECI Model
- Sharing Knowledge: Best Practices and Tools

**Unit 3: Learning Culture and Leadership**

- Role of Leadership in Fostering Learning
- Creating a Learning Culture
- Assessing Organizational Learning

**Unit 4: Training and Development**

- Employee Development Strategies
- Learning and Development Programs
- Evaluating Training Effectiveness

**Unit 5: Measuring and Managing Organizational Learning**

- Metrics for Assessing Learning Outcomes
- Tools and Techniques for Evaluation
- Continuous Improvement in Learning Processes

**Textbooks:**

1. *The Fifth Discipline: The Art and Practice of the Learning Organization* by Peter M. Senge
2. *Organizational Learning: Creating, Retaining, and Transferring Knowledge* by William H. Starbuck

**Reference Books:**

1. *The Learning Organization: A Cultural Change Agenda* by David A. Garvin
2. *The Knowledge-Creating Company* by Ikujiro Nonaka and Hirotaka Takeuchi

**Unit 1: Current Trends in Knowledge Management**

- Overview of Emerging Trends
- Impact of Technology on KM Practices
- AI and Machine Learning in KM

**Unit 2: Social Media and Knowledge Sharing**

- Role of Social Media in Knowledge Management
- Building Communities of Practice
- Collaboration Tools and Platforms

**Unit 3: Big Data and Knowledge Management**

- Understanding Big Data in the Context of KM
- Data Analytics for Knowledge Management
- Case Studies on Big Data Applications

**Unit 4: Knowledge Management Frameworks and Models**

- Popular KM Models and Frameworks
- Implementing a KM Framework
- Best Practices in KM Implementation

**Unit 5: Future Directions and Challenges**

- Ethical Considerations in KM
- Challenges in Implementing KM Systems
- The Future of Knowledge Management

**Textbooks:**

1. *Knowledge Management: A New Challenge for Tomorrow's Managers* by Michael J. Stankosky
2. *Emerging Trends in Knowledge Management* by Klaus North

**Reference Books:**

1. *The New Knowledge Management: The Challenge of Change* by David J. Skyrme
2. *Knowledge Management: Systems and Processes* by David J. Pauleen

**Unit - I**

**Data Warehousing:** Data-ware housing: Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Stars, Snow Flakes, Fact Constellations, Data marts, 3 Tier Architecture of Data Warehouse, Introduction to OLAP servers.

**Unit - II**

**Data Mining:** Motivation(for Data Mining), Definition & Functionalities, knowledge discovery steps,Architecture , Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description.

**Data Processing:** Requirement for pre processing, Data Cleaning and its various techniques, Data Integration and Transformation,Data Reduction:- Data Cube Aggregation, attribute subset selection, Numerosity Reduction, Concept hierarchy generation.

**Unit - III**

**Data Generalization and Frequent Patterns:** Attribute oriented induction Concept Description and Data Generalization, implementation of AOI, presentation of derived generalization and class description, Mining Class comparisons. Mining frequent patterns, A priori Algorithm, F P Growth, Mining various kind of Association rule.

**Unit - IV****Classification and Predictions:**

Introduction, Classification by Decision tree induction, Bayesian Classification, Rule- based Classification, Classification methods K-nearest neighbor classifiers. **Cluster analysis:** requirement of clustering in data mining, Data types in cluster analysis, Categories of clustering methods, Partitioning methods: K-mean and K- mediods. Hierarchical Clustering: agglomerative and divisive clustering, brief introduction to different clustering techniques.

**Unit - V**

**Applications and Trends in data mining:** Benefits of data mining, Data Mining Applications: in retail industry banking and finance, and telecommunication industry Social impact on data mining, trends in data mining. Data mining interface,

**Reference Books:**

1. Jiawei Han, MichelineKamber, "*Data Mining Concepts & Techniques*" Elsevier,2<sup>nd</sup> edition 2010.
2. M.H.Dunham, "*Data Mining :Introductory and Advanced Topics*", Pearson Education,1<sup>st</sup> edition ,2007.

3. Sam Anahory, Dennis Murray, “*Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems* “, Pearson Education, 1<sup>st</sup> edition, 2008

## SYSTEM PROGRAMMING

DCAC 305

Cr L-T-P

4 3-1-0

### Unit - I

Introduction To PC Architecture (Intel Pentium, PC Hardware, segments and addressing, Registers, Assembly Language Basics, Machine Addressing, special DEBUG features, Data Definition Directives, Addressing Formats, COM Programs.

**Unit – II:** Program Logic And Control Imp, Loop and conditional jump Instructions, Boolean operations, Shifting, Rotating, Keyboard And Screen Processing, String Operations, Arithmetic Operations and Table Processing, Searching, sorting.

### Unit - III

Macro Working and Linking, Macro Definition, The LOCAL Directive, Reception Directives, Conditional Directives, Intra-segment and Inter-segment calls, passing parameters, Advanced Screen and Keyboard Processing, BIOS Interrupt 16H for Keyboard input, Extended Function Keys.

**Unit – IV:** Disk Processing Disk Organization, File allocation Table, File Control Block, Sequential Reading of a Disk File, Random Processing, Miscellaneous disk Processing Features, File Handlers and Extended DOS functions, BIOS Disk Operations, Dos Memory Management, Program Segment Prefix, DOS Memory Control, Program loader, program overlays, Resident programs.

**Unit – V :**Assemblers And Macroprocessor, Design of Assembler, Data Structure, format of Databases, Algorithm, Macro instructions, Features of a macro facility, Atwopass algorithm and a single pass algorithm. LOADERS, Compile-and-go Loaders, General Loader Schemes, Absolute Relocating and Direct-Linking loaders.

### Reference Books:

1. Peter Abel, “*IBM PC Assembly Language and Programming*”, Pearson Education, 5<sup>th</sup> Edition, 2009.
2. John J. Donovan,” *Systems Programming*”, Tata McGraw-Hill, Fourth Edition,6<sup>th</sup> reprint, 2009.
3. Leland L.Beck, D. Manjula, “*System Software - An Introduction to System Programming*”, Pearson Education, 3<sup>rd</sup> Edition, 2009.



4. D. M. Dhamdhere, "*System Programming and Operating Systems*", Tata McGraw-Hill, 2nd Edition, 2008.

**Unit - I**

Introduction and Fundamentals, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.. Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

**Unit - II**

Image Enhancement in Frequency Domain Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

**Unit - III**

Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering– Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

**Unit - IV**

Color Image Processing: Color Fundamentals, Color Models, and Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

**Unit - V**

Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting

Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector performance, Line Detection, Corner Detection. Feature Extraction: Representation, Topological, Geometrical attributes.

**Reference Books:**

1. Rafael C. Gonzalvez and Richard E. Woods, "Digital Image Processing", Pearson Education 2nd edition, Pearson Education 2009.
2. R.J. Schalkoff, "Digital Image Processing and Computer Vision", John Wiley and Sons NY, 2nd edition, reprint 2009.

3. A.K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall, Upper Saddle River, NJ, 2nd edition 2002.

1. Create a simple web page using HTML.
2. Design a web page using CSS for layout and styling.
3. Implement basic JavaScript functions to manipulate HTML elements.
4. Create a responsive webpage using media queries.
5. Design a form using HTML and validate it using JavaScript.
6. Implement an AJAX request to fetch data from an API and display it on the webpage.
7. Create a simple PHP script that displays "Hello, World!"
8. Connect to a MySQL database and retrieve/display data using PHP.
9. Develop a simple RESTful API using PHP.
10. Host a simple website on a cloud server (like Heroku or AWS).
11. Create a responsive webpage using the Bootstrap framework.
12. Integrate a third-party API (like Google Maps or Weather API) into a webpage.
13. Install and set up a basic CMS (like WordPress).
14. Implement basic security measures in a web application (input validation, sanitization).
15. Deploy a simple web application on a cloud server.

1. Create a project charter and define project goals.
2. Develop a WBS for a sample project.
3. Use software tools to create a Gantt chart for project scheduling.
4. Identify and assess risks for a project.
5. Prepare a budget for a project using estimation techniques.
6. Simulate an Agile sprint planning session.
7. Create and manage a Scrum board for a small project.
8. Develop a quality management plan for a project.
9. Identify stakeholders and perform a stakeholder analysis.
10. Develop a change management plan for a project.
11. Use software tools to track project progress and update status.
12. Create a communication plan for stakeholders.
13. Prepare a final report for a completed project.
14. Explore and use tools like JIRA, Trello, or MS Project for project management.
15. Conduct a retrospective meeting to capture lessons learned from a project.

1. Submit a proposal for a minor project including objectives and scope.
2. Conduct a literature review related to the chosen project topic.
3. Gather requirements through interviews or surveys.
4. Create system architecture and design diagrams.
5. Implement the project as per the design specifications.
6. Develop and execute test cases for the project.
7. Prepare project documentation including user manuals.
8. Create a presentation summarizing the project.
9. Conduct peer reviews of the project with classmates.
10. Submit the final project report and all related documents.
11. Use version control (like Git) for project management.
12. Deploy the minor project on a platform.
13. Gather user feedback on the project for future improvements.
14. Conduct a meeting with stakeholders to review project outcomes.
15. Write a reflection on lessons learned during the project development process.

1. Write and execute a simple assembly language program.
2. Create and use macros in assembly programming.
3. Implement system calls in C/C++.
4. Write programs for file handling in system programming.
5. Implement dynamic memory allocation in C/C++.
6. Use IPC mechanisms like pipes or message queues.
7. Write programs to create and manage processes.
8. Implement multithreading in C/C++.
9. Write a program to demonstrate signal handling.
10. Create a client-server application using socket programming.
11. Use debugging tools to troubleshoot system programs.
12. Implement a simple shell in C.
13. Understand and implement basic linker and loader concepts.
14. Write a simple device driver program.
15. Use system calls to monitor system performance.

1. Load and display an image using a programming language (e.g., Python with OpenCV).
2. Apply histogram equalization to improve image contrast.
3. Implement low-pass and high-pass filters.
4. Perform image transformations (scaling, rotation).
5. Convert images between RGB and grayscale.
6. Implement basic image segmentation techniques (thresholding, clustering).
7. Apply edge detection algorithms (Sobel, Canny).
8. Implement morphological operations (dilation, erosion).
9. Apply image compression techniques (JPEG, PNG).
10. Implement basic image restoration techniques (inpainting).
11. Extract features from images using techniques like SIFT or SURF.
12. Implement a basic face detection algorithm using OpenCV.
13. Create a panorama by stitching images together.
14. Apply watermarking techniques to images.
15. Use machine learning for image classification tasks.



**Unit - I**

**Introduction:** Introduction to Artificial Intelligence, History, What is AI, Importance of AI, Issues, AI Examples ,problem solving in games, Search algorithms: Informed search, Uninformed search, Depth first search, Best first search, And or graph , Intelligent Agent.

**Unit - II**

**Processing and understanding Natural Languages:** Understanding Natural Languages: Applications of Natural Languages, Natural Language processing,Parsing techniques: Rules of parsing, Top down parsing, Bottom up parsing, , Transition networks, Fillmore's grammars, Shanks Conceptual Dependency.

**Unit - III**

**Knowledge Representation:** Graphs, Frames structures and related structures, Semantic Nets and Partitioned Nets,Scripts, Production Rules, Knowledge Based systems, Inference engine, Forward deductions and backward deductions,

**Unit - IV**

**Expert System** Existing Expert Systems (DENDRAL, MYCIN), Architecture of expert system, Features of Expert system, Intelligent Agents, Meta Knowledge, Expertise Transfer, Self Explaining System, User and expert systems.

**Unit - V**

**Pattern Recognition** Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine perception, Speech Recognition. **Programming Language** Introduction to programming Language, Introduction to PROLOG.

**Reference Books :**

1. Char Nick, "*Introduction to Artificial Intelligence*", Addison Wesley, 2007.
2. Stuart Russell and Peter Norvig, "*Artificial Intelligence: A Modern Approach.*", Prentice Hall, Third Edition, 2010.
3. Elaine Rich, Kevin Knight and Shivashankar B.Nair, "*Artificial Intelligence*", Tata McGraw-Hill, Third edition, 2009.

**Unit I**

CRT Monitor ,Line generation: Points lines, Planes, Pixels and Frame buffers, vector and character generation. Graphics Primitives: Display devices, Input devices, Display control text.

**Unit-II** Polygon: Polygon Representation, Entering polygons, Filling polygons. Segments: Segments table, creating deleting and renaming segments, visibility, image transformations.

**Unit-III** Transformations: Matrices transformation, transformation routines, displays procedure. Windowing and Clipping: Viewing transformation and clipping, generalize clipping, multiple windowing.

**Unit-IV** Three Dimension: 3-D geometry primitives, transformations, projection clipping. Interaction: Hardware input devices handling algorithms, Interactive techniques.

**Unit-V** Hidden Line and Surface: hidden line methods. Rendering and Illumination: Introduction to curve generation, Bezier,and B-spline algorithms and their comparisons.

**References:**

1. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
2. Asthana, Sinha, "Computer Graphics", Addison Wesley Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill
3. Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition
4. Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill.

**Unit-I**

Management Information System( MIS): Concept & definition, Role of MIS, Process of Management, MIS-A tool for management process, Impact of MIS, MIS & computers, MIS & the user, IMS- a support to the Management.

**Unit-II**

Concept of organizational planning, The Planning Process, Computational support for planning, MIS planning, Characteristics of control process, the nature of control in an organization.

**Unit-III**

Internet & electronic commerce, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage.

**Unit-IV**

Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes. Define the problems, set system objectives, establish system constraints, determine information needs, determine information sources, develop alternative conceptual designs.

**Unit-V**

Plan the implementation, organize for implementation, develop procedures for implementation, computer related acquisitions, develop forms for data collection and information, dissemination, test the system, document the system.

**References**

1. O Brian, "Management Information System", TMH
2. Gordon B. Davis & Margrethe H. Olson, "Management Information System", TMH.
3. O Brian, "Introduction to Information System", MCGRAW HILL.
4. Murdick, "Information System for Modern Management", PHI.
5. Jawadekar, " Management Information System", TMH.
6. Jain Sarika, "Information System", PPM
7. Davis, "Information System", Palgrave Macmillan

**Unit 1: Introduction to Business Intelligence**

- Overview of Business Intelligence (BI)
- Importance and Benefits of BI
- Components of BI Systems

**Unit 2: Data Warehousing**

- Concepts of Data Warehousing
- ETL Process (Extract, Transform, Load)
- Data Warehouse Architecture

**Unit 3: Data Mining Techniques**

- Introduction to Data Mining
- Classification, Clustering, and Regression Techniques
- Applications of Data Mining in Business

**Unit 4: Business Analytics**

- Descriptive, Predictive, and Prescriptive Analytics
- Tools and Techniques for Business Analytics
- Case Studies in Business Analytics

**Unit 5: Implementation of BI Solutions**

- BI Implementation Strategies
- Challenges in BI Implementation
- Future Trends in Business Intelligence

Textbooks:

1. "Business Intelligence: A Managerial Approach" by Ramesh Sharda, Dursun Delen, and Efraim Turban.
2. "Data Warehousing for Dummies" by Thomas C. Hammergren.

Reference Books:

1. "Data Mining: Concepts and Techniques" by Jiawei Han, Micheline Kamber, and Jian Pei.
2. "Business Analytics: Data Analysis & Decision Making" by S. Christian Albright and Wayne L. Winston.

**Unit 1: Strategic Role of Information Systems**

- Importance of Information Systems in Organizations
- Alignment of IT with Business Strategy
- Types of Information Systems

**Unit 2: Information Systems Planning**

- Information Systems Strategic Planning Process
- Developing an Information Systems Plan
- Tools for IS Planning

**Unit 3: Information Systems Governance**

- Concepts of IT Governance
- Frameworks for IT Governance
- Risk Management in Information Systems

**Unit 4: Evaluation of Information Systems**

- Methods for Evaluating IS Performance
- Cost-Benefit Analysis of Information Systems
- Measuring ROI for Information Systems

**Unit 5: Future Trends in Information Systems**

- Emerging Technologies and Their Impact on IS Strategy
- Cloud Computing, Big Data, and AI in IS
- Ethical Considerations in Information Systems

**Textbooks:**

1. "Information Systems: A Manager's Guide to Harnessing Technology" by John Gallaughier.
2. "Information Systems for Managers: With Business Strategy Games" by George W. Reynard.

**Reference Books:**

1. "Strategic Information Systems: Concepts, Frameworks and Applications" by Paul M. T. van der Meer and Andrew R. T. C. Tay.
2. "IT Strategy: Issues and Practices" by James D. McKeen and Heather Smith.

**Unit 1: Introduction to ERP**

- Overview of ERP Systems
- Importance and Benefits of ERP
- Key Components of ERP

**Unit 2: ERP Implementation Process**

- Phases of ERP Implementation
- Change Management in ERP Projects
- Best Practices for Successful Implementation

**Unit 3: ERP Modules and Functions**

- Overview of Common ERP Modules (Finance, HR, Supply Chain)
- Integration of Modules within ERP
- Customization vs. Standardization in ERP

**Unit 4: ERP Systems and Business Process Reengineering**

- Relationship between ERP and Business Processes
- Concepts of Business Process Reengineering (BPR)
- Case Studies on ERP and BPR

**Unit 5: Future Trends in ERP**

- Cloud-Based ERP Solutions
- Role of AI and Machine Learning in ERP
- Challenges and Trends in ERP Systems

**Textbooks:**

1. "Enterprise Resource Planning: Fundamentals of Design and Implementation" by K. S. Rajasekaran and M. K. Ganesh.
2. "ERP: Making It Happen" by Thomas F. Wallace and Michael A. Kremzar.

**Reference Books:**

1. "Modern ERP: Select, Implement, and Use Today's Advanced Business Systems" by Marianne Bradford.
2. "Enterprise Resource Planning (ERP): The Dynamics of Operations Management" by N. A. El-Masri and P. E. H. B. de Lange.

**Unit 1: Introduction to Information Security**

- Importance of Information Security
- Basic Concepts of Information Security
- Information Security Policies and Procedures

**Unit 2: Risk Management**

- Risk Assessment and Analysis
- Risk Mitigation Strategies
- Business Continuity Planning

**Unit 3: Security Technologies and Tools**

- Overview of Security Technologies (Firewalls, Intrusion Detection Systems)
- Encryption and Cryptography Basics
- Secure Network Design

**Unit 4: Security Governance and Compliance**

- Frameworks for Information Security Governance
- Legal and Regulatory Requirements
- Auditing and Compliance in Information Security

**Unit 5: Emerging Trends in Information Security**

- Cybersecurity Challenges and Threats
- Future Trends in Information Security
- The Role of AI in Cybersecurity

**Textbooks:**

1. "Information Security Management Principles" by Andy Taylor, Andrew Burnett, and Chris K. Walker.
2. "Security in Computing" by Charles P. Pfleeger and Shari Lawrence Pfleeger.

**Reference Books:**

1. "Managing Information Security" by Michael E. Whitman and Herbert J. Mattord.
2. "Principles of Information Security" by Michael E. Whitman and Herbert J. Mattord.

**Unit-I**

**Basic concepts:** Basic Testing Vocabulary, Quality Assurance versus Quality Control, The Cost of Quality, Software Quality Factors, How Quality is Defined, Defect, The Multiple Roles of the Software Tester(People Relationships), Scope of Testing

**Unit-II**

When Should Testing Occur?Testing Constraints, Life Cycle Testing, Independent Testing, What is a QA Process?Levels of Testing, The “V” Concept of Testing

**Unit-III**

**Testing Techniques:**Structural versus Functional Technique Categories, Verification versus Validation, Static versus Dynamic Testing, Examples of Specific Testing Techniques

**Unit-IV**

**Test Administration:** Test Planning, Customization of the Test Process, Budgeting, Scheduling, Prerequisites to test planning, Understand the Characteristics of the Software Being Developed, Build the Test Plan, Write the Test Plan

**Unit-V**

Test Cases:Test case Design, Building test cases, Test data mining, Test execution, Test Reporting, Defect Management, Test Coverage – Traceability matrix

**Test Metrics** – Guidelines and usage

**Test reporting:**Guidelines for writing test reports

**Reference Books:**

1. Bob Hughes and Mike Cotterell, “*Software Project Management*”, Tata McGraw-Hill, Fifth Edition, 2008.
2. Roger S. Pressman, “*Software Engineering – A Practitioner’s approach*”, McGraw-Hill, Seventh Edition, 2009.
3. Jain Sarika, “Information System”, PPM
4. Davis, “Information System”, Palgrave Macmillan



**Unit-I****Neural Networks-1(Introduction & Architecture)**

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.

**Unit-II****Neural Networks-II (Back propogation networks)**

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

**Unit-III****Fuzzy Logic-I (Introduction)**

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

**Unit-IV****Fuzzy Logic –II (Fuzzy Membership, Rules)**

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfication&Defuzzificataions, Fuzzy Controller, Industrial applications.

**Unit-V****Genetic Algorithm(GA)**

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

**Text Books:**

1. S. Rajsekarand G.A. VijayalakshmiPai, "Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India.
2. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.

**Reference Books:**

3. SimanHaykin, "Neural Netowrks" Prentice Hall of India
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
5. Kumar Satish, "Neural Networks" Tata McGraw Hill

**Unit – I**

Introduction, issues and challenges in mobile computing, overview of wireless telephony: cellular concept, UMTS, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, policy based handoff process, channel allocation in cellular systems, CDMA, GPRS.

**Unit – II:** ISM band, Spread Spectrum, physical layer accessing techniques – FHSS, DSSS, OFDM, (IEEE 802.11a) HR-DSSS, OFDM (IEEE 802.11g) Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, Wireless applications, data broadcasting, Mobile IP-entities and terminology, IP Packet delivery, Agent discovery, Registration, Tunneling and encapsulation, optimization and reverse tunneling WAP: Architecture, protocol stack, application environment, applications.

**Unit – III:** Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system-consistency, CODA, Ficus, MIO-NFS, Rover, Disconnected operations.

**Unit – IV:** Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment, TCP over wireless-Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast recovery, Transmission-time out Freezing, selective retransmission, Transaction oriented TCP, TCP over 2 G and 3 G wireless network.

**Unit – V** Ad Hoc networks, localization, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS Parameters in Ad Hoc Networks-routing, bandwidth, delay, Jitter, Location management, handoff and energy management, fault tolerance in MANET, MANET applications.

**Reference Books:**

1. Jochen Schiller, “*Mobile Communications*”, Pearson Education, Second Edition, Second Impression, 2007.
2. Asha Mehrotra, “*GSM System Engineering*”, Artech House, Second Edition Illustrated, 1997.
3. M. V. D. Heijden, M. Taylor, “*Understanding WAP Wireless Applications, Devices and Services*”, Artech House, July 2000.
4. Raj Kamal, “*Mobile Computing*”, OxfordUniversity Press, First Published 2007.

Asoke K. Talukder, Roopa R. Yavagal, “*Mobile Computing: Technology, Applications and Service Creation*”, Tata McGraw-Hill Publishing Company Limited, New Delhi, Fifth Reprint, 2007.

## **ARTIFICIAL INTELLIGENCE LAB.**

### **CCAC-352**

1. Write a Prolog Program to count the numbers.
2. Write a Prolog Program for addition.
3. Write a Prolog Program for subtraction.
4. Write a Prolog Program multiplication.
5. Write a Prolog program for division.
6. Write a Prolog program to find smaller number.
7. Write a Prolog program to find greater number.
8. Write a Prolog program to find the factorial of a number.
9. Write a Prolog program to do the best first search.
10. Write a Prolog program to do the depth first search.
11. Write a Prolog program to make a family tree.

## COMPUTER GRAPHICS LAB.

CCAC-354

1. Write a program to draw a line using DDA.
  2. Write a program to draw a line using Bresenham's algorithm.
  3. Write a program to draw a circle using Bresenham's algorithm.
  4. Write a program to Translate a triangle using 2-D transformation.
  5. Write a program to Rotate a triangle by 45o using 2-D transformation.
  6. Write a program to Scale triangle using 2-D transformation.
  7. Write a program to Translate a triangle using 3-D transformation.
  8. Write a program to Rotate a triangle using 2-D transformation.
  9. Write a program to Scale a triangle using 2-D transformation.
  - 10 Write a program to clip the line whose co. ordinate (2, 3) and (8, 4) and whose lower left corner is (1, 2) and upper right corner (9,8).using Cohen-sutherland line clipping algorithm.
1. Write the program for pendulum using Bezier curve

1. Students choose a seminar topic and conduct preliminary research
2. Design a PowerPoint presentation based on the researched topic.
3. Practice verbal and non-verbal communication skills.
4. Simulate a group discussion on a current event or controversial topic.
5. Provide constructive feedback to classmates on their presentations.
6. Organize a panel discussion with select students as panelists and others as the audience.
7. Present a research paper summarizing findings on a specific topic.
8. Conduct a mock interview as an interviewer and interviewee.
9. Simulate a conflict scenario in a group setting and practice resolution techniques.
10. Experiment with creative presentation methods (e.g., storytelling, infographics).
11. Simulate a conflict scenario in a group setting and practice resolution techniques.
12. Create an infographic to summarize key information visually.
13. Engage in role-playing to explore different perspectives in a conflict scenario.
14. Develop presentation skills using visual aids effectively.
15. Practice giving and receiving constructive feedback.

1. Develop a detailed project proposal, including objectives, methodology, and expected outcomes.
2. Conduct a literature review on the selected project topic and summarize key findings.
3. Create a project plan using Gantt charts or project management software (e.g., MS Project).
4. Collect and analyze project requirements through interviews or surveys.
5. Prepare design documentation, including architecture diagrams and user interface mockups.
6. Implement a specific module of the project, ensuring code quality and functionality.
7. Develop testing strategies, perform testing, and document results for the implemented module.
8. Prepare a project budget, including resource allocation and cost estimation.
9. Identify potential risks and create a risk management plan with mitigation strategies.
10. Prepare and present a progress report on the project to stakeholders.
11. Collect relevant data for the project and perform statistical analysis.
12. Present the final project outcomes, including objectives met and future work.
13. Document each phase of the project, including challenges faced and lessons learned.
14. Create a user manual that guides end-users in utilizing the project deliverables.
15. Gather feedback from peers and mentors and evaluate project outcomes against objectives.



# **School of Biological Engineering & Sciences**



## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Biological Engineering & Sciences**

#### **Ordinances, Regulations & Syllabus**

**For**

**Master of Science in Microbiology (M.Sc.) Two Year Programme  
Semester Pattern  
(w.e.f. session 2017-18)**

**Revised and approved in the year 2020(13<sup>th</sup> meeting Board of Studies)**

**(Scheme & syllabus from 2020-2024)**

## **PEOs: Program Educational Objectives POs: Program Outcomes PSOs: Program Specific Outcomes**

**Name of the Department:** Department of Microbiology

**Name of the Program:** M.Sc. Microbiology

**Duration of the degree:** 2 Years

M. Sc. (Microbiology) course combines the concepts of biology and chemistry to understand living things and their relationship with the ecosystem. The course covers the study of microorganisms and their effect on human life. M.Sc. in Microbiology is an advanced course that helps students understand the microbes such as virus, bacteria, fungi, algae etc. at a deeper level. Students also learn the role of these microorganism in waste management and the production of fermented foods. Throughout M.Sc. Microbiology course, students study the detailed microbiology topics and interdisciplinary subjects.

M.Sc. Microbiology has a significant role in pharmaceuticals, agriculture, brewery and manufacturing of commercial products. The practical, research-based project and laboratory work throughout the M.Sc. Microbiology helps candidates excel at the workplace with required skills and knowledge.

### **Program Educational Objectives (PEOs)**

**PEO 1:** The objective of the Master's Program in Microbiology is to equip the students to gain bimolecular knowledge and analytical skills at an advanced level.

**PEO 2:** The program emphasizes to apply knowledge acquired about prokaryotic and eukaryotic cellular processes, interaction of microorganisms among themselves, with physical and chemical agents and higher order organisms in environment and biological systems to various conditions.

**PEO 3:** The laboratory training in addition to theory is included so that the students will acquire the skills to qualify for a broad range of positions in research, industry, consultancy, education and public administration, or for further education in a doctoral program.

**PEO 4:** Students will be able to address broad range of fields including biopolymer chemistry, marine biochemistry, environmental biotechnology, food science, microbiology, microbial genetics, molecular biology and systems biology.

### **Program Specific Outcomes (PSOs)**

**PSO 1:** Acquires and demonstrates competency in laboratory safety. Develops routine and specialized microbiological laboratory skills applicable to research, hospitals and industries.

**PSO 2:** Applies statistical and bioinformatics tools for interpretation of biological data and gains expertise in Computational Biology.

**PSO 3:** Acquires knowledge of structural and enzymatic properties of microbes and fermentation engineering, to develop human / environment friendly products or processes.

**PSO 4:** Gets familiarized with principles and techniques of various basic and analytical instruments used in laboratories.

**PSO 5:** Recognizes the importance of IPR and Patenting. Gain Entrepreneurial skills to initiate Startup.

**PSO 6:** Gets trained in bimolecular mechanisms involved in life processes, health and diseases.

**PSO 7:** Gains proficiency in related disciplines such as Molecular Biology, Pharmaceutical Sciences, Nano biotechnology and Immunology.

**PSO 8:** Explores the life forms at cellular, molecular and nano levels. Understands amazing properties of microbial world and appreciates the beauty of microbial life forms.

**PSO 9:** Assesses the role of microbes in improving soil quality and agricultural output through sustainable microbiological applications.

**PSO 10:** Work as Health care professionals in the fields of laboratory management, hospital and community services, in development & preparation of Study material for visually challenged.

### **Program Outcomes Objectives (POOs)**

**The Masters in Microbiology Program will address the increasing need for skilled scientific manpower with an understanding of research ethics involving microorganisms to contribute to application, advancement and impartment of knowledge in the field of microbiology and molecular biology globally. The laboratory training will empower them to prepare for careers in broad range fields. The M.Sc. Microbiology student will have:**

**POO 1:** State of art knowledge about various methodological and analytic approaches that are used within the specialization.

**POO 2:** Knowledge of the leading edge in a chosen specialized area of Microbiology, based on own research experience from a master's project and international literature.

**POO 3:** Can compete in national level competitive exams such as NET-JRF or GATE or International exams such as GRE-TOEFEL and can pursue career in higher studies.

**POO 4:** In-depth knowledge in the structure of a repertoire of microorganisms, metabolism in the cell, knowledge of the concepts of molecular genetics and biosynthesis of proteins, enzymology, physiology, microbial pathogenicity, environmental and agricultural microbiology, genetic engineering, bioengineering and a good theoretical and practical insight into methods used to obtain this knowledge.

**POO 5:** Demonstrate practical skills in the use of tools, technologies and methods common to microbiology, and apply the scientific method and hypothesis testing in the design and execution of experiments.

**POO 6:** Develop ability to independently carry out a complete scientific work process, including the understanding of theoretical background, hypothesis generation, collection and analysis of data, and interpretation and presentation of results.

**POO 7:** Has high competence and multidisciplinary project experience within selected topics related to microbiology and ability to contribute in a multidisciplinary team.

**POO 8:** Is capable to evaluate methods and results within the field of specialization critically.

**POO 9:** Is able to evaluate and apply relevant theory, methods and analytic approaches within the specialized field of microbiology, including statistical methods.

**POO 10:** Can assess and predict the technological, ethical and social effects of their own work /disciplines and of microbiology.

**POO 11:** Acknowledges health, safety and environment (HSE) issues in handling chemicals and biological materials; understands the environmental impacts associated with the activity; performs risk assessments and is familiar with safety instructions in his/her subject area.

**POO 12:** Can communicate scientific results to the general public and experts by writing well-structured reports and contributions for scientific publications and posters, and by oral presentations.

# Course Components of Academic Programme

## M.Sc. (Microbiology)

Minimum Duration : 4 Semesters (2 Years)

Maximum Duration : 6 Semesters (3 Years)

Total Number of Credits : 93 Credits

Course Components		Credits
<b>1.</b>	<b><u>Compulsory Course</u></b>	
I.	Foundation Course (FC)	00
II.	Core Course (CC)	61
<b>2.</b>	<b><u>Elective Course</u></b>	
I.	Departmental Electives (DE)	06
II.	Interdepartmental Electives (IE)	00
<b>3.</b>	<b><u>Discipline-Centric Ability Enhancement Course</u></b>	
I.	Seminar (SM)	03
II.	Project (PJ)/ Dissertation (DS)	16
III.	Skill (SK) and Ability Enhancement Course (AEC)	04
IV.	Comprehensive (CM)	00
<b>4.</b>	<b><u>General Course</u></b>	
I.	Human Values, Health Care and Professional Ethics (HP)	00
II.	Healthy Living and Fitness (HF)	00
III.	Disaster Management (DM)	00
IV.	General Proficiency (GP)	03
<b>5.</b>	<b><u>Audit Course</u></b>	

**Requirement of Awards of Degree: - Total Credits: - 93; CGPA $\geq$ 4.5 and any other conditions as per regulation and ordinances.**

**Summary Sheet**  
**M.Sc. (Microbiology)**

<b>Semester</b>	<b>Credit</b>				<b>Total</b>
	<b>CC</b>	<b>DCAEC (AEC/SK/SM/PJ)</b>	<b>DE</b>	<b>GC</b>	
I	25	3	0	1	29
II	21	3	0	1	25
III	15	1	6	1	23
IV	00	16	0	0	17
<b>Total</b>	<b>61</b>	<b>23</b>	<b>6</b>	<b>3</b>	<b>93</b>

**Core Courses: CC**

**Discipline-Centric Ability Enhancement Course: DCAEC**

**Ability Enhancement Course: AEC**

**Skill Course: SEC**

**Departmental Electives: DE**

**General Course: GC**

**M.Sc. (Microbiology)**  
**PROGRAMME STRUCTURE (2020-21)**

**FIRST SEMESTER**

Course Code	Course Title	Category	(L)	(T)	(P)	Credits
<b>Core Courses</b>						
MMB-101/ MMB-101a/ MMB-101b/ MMB-101c	Cell & Developmental Biology/Human Pathology/Cytology/Toxicology & Forensic Science	CC	3	0	0	3
MMB-102/ MMB-102a/ MMB-102b/ MMB-102c	Biochemistry & Enzymology/Elements of Biochemistry/Concept in Medicinal Chemistry & Drug Development/Biophysics	CC	3	0	0	3
MMB-103	Bacteriology	CC	3	0	0	3
MMB-104	Virology	CC	3	0	0	3
MMB-105	Computer Applications & Biostatistics	CC	3	0	0	3
<b>Discipline-Centric Ability Enhancement Course</b>						
AEC-101/ AEC101a/ AEC101b/ AEC-101c	Professional communication/Public Speaking-I/Effective Writing Skills-I/English Grammar-I	AEC	2	0	0	2
SM-101/ SM-101 a	Seminar & Research Orientation/Research Ethics-I	SM	0	0	1	1
<b>General Course</b>						
GP-101/ GP-101a/ GP-101b/ GP-101c	General Proficiency/Entrepreneurship development & Business communication-I/Human Values & Moral Ethics-I/Life Management-I	GP	0	0	1	1
<b>LABS</b>						
MMB-151	Cell & Developmental Biology Lab	CC	0	0	2	2
MMB-152	Biochemistry & Enzymology Lab	CC	0	0	2	2
MMB-153	Bacteriology Lab	CC	0	0	2	2
MMB-154	Virology Lab	CC	0	0	2	2
MMB-155	Computer Applications & Biostatistics Lab	CC	0	0	2	2
	<b>TOTAL</b>					<b>24</b>

**SECOND SEMESTER**

Course Code	Course Title	Category	(L)	(T)	(P)	Credits
<b>Core Courses</b>						
MMB-201	Immunology & Immuno-technology	CC	3	0	0	3
MMB-202	Molecular Biology & Recombinant DNA Technology	CC	3	0	0	3
MMB-203	Mycology & Phycology	CC	3	0	0	3
MMB-204	IPR, Biosafety & Bioethics	CC	3	0	0	3
MMB-205	Bioinstrumentation Techniques	CC	3	0	0	3
<b>Discipline-Centric Ability Enhancement Course</b>						
AEC-201/ AEC-201a/ AEC-201 b/ AEC-201 c	Career Skills/Public Speaking-II/Effective Writing Skills-II/English Grammar-II	SK	2	0	0	2



SM-201/ <b>SM-201 a</b>	Seminar & Research Orientation/Research Ethics-II	SM	0	0	1	1
<b>General Course</b>						
GP-201/ <b>GP-201a/ GP-201b/ GP-201c/ GP-201d</b>	General Proficiency/Entrepreneurship development & Bussiness communication-II/Human Values & Moral Ethics-II/Life Management-II/Personality Development-II	GP	0	0	1	1
<b>LABS</b>						
MMB-251	Immunology & Immunotechnology Lab	CC	0	0	2	2
MMB-252	Molecular Biology & Recombinant DNA Technology Lab	CC	0	0	2	2
MMB-253	Mycology & Phycology Lab	CC	0	0	2	2
	<b>TOTAL</b>					<b>29</b>

### THIRD SEMESTER

Course Code	Course Title	Category	(L)	(T)	(P)	Credits
<b>Core Courses</b>						
MMB-301	Microbial Genetics	CC	3	0	0	3
MMB-302	Medical Microbiology	CC	3	0	0	3
MMB-303	Bioinformatics	CC	3	0	0	3
<b>Departmental Electives (DE) ( Select any one of the following from Elective-I and Elective-II)</b>						
<b>Elective-I</b>						
MMB-304 a	Environmental Microbiology	DE	3	0	0	3
<b>MMB-304 b/ MMB-304 c/ MMB-304 d</b>	Industrial Microbiology/Watershed and Wastland Managemant/Biochemical Engineering	DE	3	0	0	3
<b>Elective-II</b>						
MMB-305 a	Agriculture Microbiology	DE	3	0	0	3
<b>MMB-305 b/ MMB-305 c/ MMB-305 d</b>	Food Microbiology/Agricultural Journalism/Poultry Production & Management	DE	3	0	0	3
<b>Discipline-Centric Ability Enhancement Course</b>						
SM-301	Seminar & Research Orientation/Research Methodology	SM	0	0	1	1
<b>General Course</b>						
GP-301/ <b>GP-301a/ GP-301b/ GP-301c/ GP-301d</b>	General Proficiency/Entrepreneurship development & Business communication-III/Human Values & Moral Ethics-III/Life Management-III/Personality Development-III	GP	0	0	1	1
<b>LABS</b>						
MMB-351	Microbial Genetics Lab	CC	0	0	2	2
MMB-352	Medical Microbiology Lab	CC	0	0	2	2
MMB-353	Bioinformatics Lab	CC	0	0	2	2
	<b>TOTAL</b>					<b>23</b>

### FOURTH SEMESTER

Course Code	Course Title	Category	(L)	(T)	(P)	Credits
<b>Discipline-Centric Ability Enhancement Course</b>						
MMB-401	Project/Dissertation	PJ	0	0	16	16
	<b>TOTAL</b>					<b>16</b>

### Dissertation

**Note:** Students must submit their dissertation report immediately on return from summer vacation in

June /July and the same would be evaluated for 16 credit units, which would be included in the Fourth Semester marks.

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER I

### Cell and Developmental Biology

**Course Code: MMB-101**

**Credit Units: 03**

**Pre-requisite:** Basic information of Cell Biology

#### **Course Outcome:**

- Students will acquire knowledge about basics of cell biology.
- Students will learn about how various functions of organelles and their working.
- Students will gain an insight into microscopic structures and chemical components of various regions of cells.
- Students will attain a comprehensive knowledge of functioning of cell and synchronization of activities of various organelles.
- Students will be able to learn about various signaling mechanism involved in a cell which ultimately leads to a visible physiological response.
- Students will be able to understand the architectural components involved in making cells rigid and how cells are connected to each other.
- Students will learn about molecular events involved in cell cycle.
- Students will apply the information gained in understanding the issues and conditions encountered if things go wrong with cell cycle and how our understanding of cell signaling generate drug targets.

#### **Details of the Course:-**

#### **UNIT1**

Introduction to prokaryotes, eukaryotes & cell theory

Introduction to microscopy

Plasma Membrane: structure – organization, lipid bilayer, proteins & glycoconjugates, liposomes, functions – ionic transport, types of transport (symport, antiport, active & passive), channel proteins.

Intracellular compartmentalization: structure, organization and functions of nucleus, mitochondria, lysosome, golgi body, chloroplast, peroxisome, endoplasmic reticulum (rough and smooth)

#### **UNIT2**

Vesicular traffic in the secretory and endocytic pathway: transport from endoplasmic reticulum through the golgi network to lysosome, endocytosis, exocytosis, molecular mechanisms of vesicular transport and the maintenance of compartments diversity.

Cell signaling: general mechanistic principles

Types of signaling, GPCR, RTK with examples, Calcium Signaling, Mechanism of Chemotaxis, signal transduction and vision Significance of vesicular trafficking and cell signaling

#### **UNIT3**

Cell motility and shape: structure and functions, microfilaments microtubules and intermediate filament.

Integrating cell into tissue: cell-cell adhesion and communication, cell matrix adhesion, extra cellular matrix: collagen & non-collagen components. Cell cycle, molecular events and regulation.  
 Cell division: general strategy and regulation, molecular mechanism of mitosis and meiosis.  
 Regulation of cell cycle  
 Role of cyclins / cdks in the initiation of replication.

#### UNIT4

Cancer-Biology: Types of cancer, onset of cancer, proto- oncogenes and tumor suppresser genes, oncogenic mutations affecting cell proliferation, cell cycle and genome stability.  
 Programmed cell death & unprogrammed cell death.  
 Expression patterns of proteins & enzymes during cell proliferation  
 Molecular signaling of cancer Aetiology of Cancer

#### UNIT5

Introduction to Developmental Biology, History and Basic Concepts, Basics of model systems: Vertebrate Model Systems, Invertebrate and Plant Model Systems, basic patterning and development plan of model Plan, initial division pattern, evolution and development biology

#### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Molecular Biology of cell, 4 <sup>th</sup> ed. Alberts, Bruce ( <i>et.al</i> ) (2002) Garland Science Publishing, New York.	2002
2.	Cell Biology- Smith and Wood by Chapman and Hall. Cell Biology: Organelle structure and function, Sadava, D E. (2004) Panima pub., New Delhi. Cell and Molecular Biology, 8 <sup>th</sup> ed. Robertis, Edp De and Robertis Emf De (2002) Lippincott Williams and Wilkins Pvt. Ltd., (International Student Edition) Philadelphia.	2004, 2002

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

**SEMESTER I****Human Pathology****Course Code: MMB-101a****Credit Units: 03**

**Pre-requisite:** Basic understanding of diseases and their pathogenesis

**Course Outcome:**

Students will be able to learn and understand the concepts of how human system works in altered and diseased stage under the influence of various internal and external stimuli.

**Details of the Course:-****Unit I: Introduction:**

History of pathology, basic definitions and familiarization with the common terms used in pathology, techniques used in pathology.

**Cellular Adaptations, Cell Injury and Cell Death:**

Causes and mechanisms of cell injury: reversible and irreversible injury, Cellular responses: Hyperplasia, Hypertrophy, Atrophy, Metaplasia, Necrosis, Apoptosis, subcellular and intracellular response, (with suitable examples of diseases), Cellular ageing.

**Unit II: Role of Inflammation in diseases (with suitable examples):**

General features of acute and chronic inflammation: Vascular changes, cellular events, termination of acute inflammatory response. Cells and molecular mediators of inflammation, morphological effects and outcome of acute inflammation. Systemic effects of chronic inflammation, granulomatous inflammation.

**Unit III: Tissue Renewal And Repair, Healing And Fibrosis:**

Mechanism of tissue regeneration, role of ECM, repair by healing, scar formation and fibrosis, cutaneous wound healing, tissue remodelling in liver (mechanism of fibrosis and cirrhosis).

**Unit IV: Hemodynamic Pathology:**

Edema, hyperaemia, congestion, haemorrhage, haemostasis and thrombosis, Embolism, Infarction and shock and hypertension.

**Nutritional diseases:** Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc Iron and Calcium) and their deficiency diseases.

### Unit V: Cell proliferation: Cancer:

Definitions, nomenclature, characteristics of benign and malignant neoplasms, grading and staging of cancer, biology of tumor growth, mechanism of tumor invasion and metastasis, carcinogens and cancer, concept of oncogenes, tumor suppressor genes, DNA repair genes and cancer stem cells.

### Pathophysiology diseases:

- **Aetiology and Pathophysiology of:** Diabetes, Arteriosclerosis, Myocardial infarction, restrictive and obstructive respiratory diseases (COPD), Parkinson, Schizophrenia, Silicosis
- **Infectious Diseases:** Pathogenesis of diseases and overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Robbins and Cotran Pathologic Basis of Disease, 8th edition (2009), Vinay Kumar, Abul K. Abbas, Jon C. Aster, Nelson Fausto; Saunders Publishers, ISBN-13: 978-1416031215.	2009
2.	Medical Laboratory Technology Methods and Interpretations Volume 1 and 2, 6th edition (2009), Ramnik Sood; Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496.	2009
<b>Reference Books</b>		
1.	General and Systematic Pathology, 2nd edition (1996), J., Ed. Underwood and J. C. E. Underwood; Churchill Livingstone, ISBN-13: 978-0443052828.	1996
2.	Robbins Basic Pathology, 9th edition (2012), Kumar, Abbas, Fausto and Mitchell; Saunders Publication, ISBN-13: 978-1437717815.	2012

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

## **Cytology**

**Course Code: MMB-101b**

**Credit Units: 03**

**Pre-requisite:** Basic information of Cell Biology

### **Course Outcome:**

- Basic chemical composition of living matter.
- Structural characteristics of prokaryotic and eukaryotic cells.
- Taxonomy and characteristics of the major kingdoms.
- Mechanics of membrane transport.
- Basic concepts of bioenergetics, photosynthesis, and cellular respiration.
- Mechanics of cellular reproduction.
- Mendelian genetics and genetic change.
- Nucleic acids and basic concepts of protein synthesis and gene regulation.

### **Details of the**

#### **Course:-UNIT I:**

##### **Cell:**

Introduction and classification of organisms by cell structure, cytosol, Compartmentalization of eukaryotic cells, cell fractionation Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model

#### **UNIT II: Cell Membrane and Permeability:**

Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport. Sex-limited and sex-influenced inheritance, Transposons. Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments

#### **UNIT III: Endoplasmic reticulum:**

Endoplasmic reticulum: Structure, function including role in protein segregation.  
 Golgi complex: Structure, biogenesis and functions including role in protein secretion.  
 Lysosomes: Vacuoles and micro bodies: Structure and functions Ribosomes: Structures and function including role in protein Synthesis .

**UNIT IV: Mitochondria:**

Structure and function, Genomes, biogenesis. Chloroplasts: Structure and function, genomes, biogenesis. Nucleus: Structure and function, chromosomes and their structure. Extracellular Matrix: Composition, molecules that mediate cell adhesion

**UNIT V: Membrane receptors:**

For extra cellular matrix, macromolecules, regulation of receptor expression and function. Signal transduction. Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Molecular Biology of cell, 4 <sup>th</sup> ed. Alberts, Bruce ( <i>et.al</i> ) (2002) Garland Science Publishing, New York.	2002
2.	Cell Biology- Smith and Wood by Chapman and Hall. Cell Biology: Organelle structure and function, Sadava, D E. (2004) Panima pub., New Delhi. Cell and Molecular Biology, 8 <sup>th</sup> ed. Robertis, Edp De and Robertis Emf De (2002) Lippincott Williams and Wilkins Pvt. Ltd., (International Student Edition) Philadelphia.	2004, 2002

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
<b>Weightage (%)</b>	10	20	10	60



**SEMESTER I****Toxicology and Forensic Science****Course Code: MMB-101c****Credit Units: 03**

**Pre-requisite:** Basic information of molecular biology and medical laboratory techniques

**Course Outcome:**

- Students will become familiar with how forensic scientists work.
- Students will be able to learn the tools and techniques used in forensic science and how they reach the conclusions they present in court.
- Students will be familiarized with the creative, problem solving and inquiry based approach to investigate the crime scene.
- Students will be able to explain the characteristics of a fingerprint collect, process, and analyze fingerprint evidence and explain DNA analysis.

**Details of the Course:-****Unit I: Crime Scene Investigation:**

Introduction and principles of forensic science, Forensic science laboratory and its organization and service, tools and techniques in forensic science, branches of forensic science, causes of crime, role of modus operandi in criminal investigation.

**Unit II: Types of injuries and death:**

Classification of injuries and their medico-legal aspects, method of assessing various types of deaths.

**Forensic chemistry and Ballistics:**

Classification of fire arms and explosives, introduction to internal, external and terminal ballistics. Chemical evidence for explosives.

**Unit III: Forensic Graphology:**

General and individual characteristics of handwriting, examination and comparison of handwritings and analysis of ink various samples.

**Unit IV: Forensic Toxicology and Fingerprint analysis:**

Fundamental principles of fingerprinting, classification of fingerprints, development of finger print as science for personal identification. Principle of DNA fingerprinting, application of DNA profiling in forensic medicine.

## Unit V: Cyber Forensic Investigation:

Investigation Tools, eDiscovery, Evidence Preservation, Search and Seizure of Computers, Introduction to Cyber Security.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Forensic Science – An introduction to Scientific and Investigative Techniques, 3rd edition (2009), James SH, Nordby JJ and Bell S; CRC Press, ISBN-13: 978-1420064933.	2009
2.	Forensic Handwriting Identification: Fundamentals, Concepts and Principals 1st edition (2000) Ronald N. Morris, Academic press ISBN-13: 978-0125076401	2000
<b>Reference Books</b>		
1.	Principles of Forensic Medicine and Toxicology, 1st edition (2011) Rajesh Bardale; Jaypee Brothers Medical Pub, ISBN-13: 978-9350254936.	2011
2.	Fundamentals of Forensic Science, 2nd edition (2010), Houck, M.M. and Siegel, JA; Academic Press, ISBN-13: 978-0123749895.	2010

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

**SEMESTER I**

**Biochemistry & Enzymology**

**Course Code: MMB-102**

**Credit Units: 03**

**Pre-requisite:** Background information of biochemistry.

**Course Outcome:**

- Students will be able to define biomolecules and buffers.
- Students will understand the structure and functions of biomolecules.
- Students will be able to classify and explain the role of various biomolecules in human body.
- Students will be able to analyze the causes of diseases on biochemical basis.
- Students will be able to understand various biochemical process and cell metabolism.
- Students will be able to classify enzymes and will understand kinetic properties.
- Students will be able to understand  $K_m$  and  $V_{max}$  for enzymatic equations.
- Students will be able to understand the application of enzymes in daily life.

**Details of the Course:-**

**Unit : I Introduction:**

Importance of water, pH and buffer, cell structure and organelles, structure of biomolecules: structure of amino acids and proteins (primary, secondary, tertiary and quaternary structure, reverse turn), Ramachandran plot, peptide synthesis, protein sequencing, protein folding kinetics and cooperativity.

**Unit : II Lipids:**

Types, structure and function, oxidation of fatty acids- mitochondrial and peroxisomal oxidation, oxidation of unsaturated and odd chain fatty acids, ketone bodies, lipoproteins, rancidity, acid value, saponification value, iodine number, acetyl number, R.M. number. Biosynthesis of fatty acids, phospholipids and glycosphingolipids- synthesis.

**Unit : III Metabolic pathways and their regulation :**

Glycolysis/glycogenolysis, citric acid cycle, pentose phosphate pathway, oxidative phosphorylation, amino acid metabolism, basic nucleic acid structure, biosynthesis of purines and pyrimidines, glyoxalate cycle, CAM, and metabolomics.

**Unit : IV Enzymes:**

Classification of enzymes; quantification of enzyme activity and specific activity. Effect of pH and temperature on enzyme activity, estimation of Michaelis-Menten parameters, kinetics of inhibition. Mechanism of enzyme catalysis with reference to chymotrypsin, lysozyme, metalloenzyme and the role of metals in catalysis with reference to carboxypeptidases. Allosteric enzymes: kinetics and examples. Techniques of enzyme immobilisation-matrix entrapment, ionic and cross linking, column packing.

**Unit : V Enzyme Purification and Applications of Enzymes:**

Extraction of commercially important enzymes from natural sources; commercial applications of enzymes in food, pharmaceutical and other industries; enzymes for diagnostic applications. Industrial production of enzymes. Applications of enzymes in analysis; design of enzyme electrodes and case studies on their application as biosensors in industry, healthcare and environment.

**Suggested Books:**

<b>S. No.</b>	<b>Author/s/Book/Title/Publisher</b>	<b>Year</b>
<b>1.</b>	Blanch, H.W., Clark, D.S. Biochemical Engineering Marcel Dekker	1997
	Bailey J.E. & Ollis, D.F., Biochemical Engineering Fundamentals (2nd Ed.) McGraw Hill	1986
<b>2</b>	Wiseman, Alan, Hand book of Enzyme Biotechnology (3rd Ed.), Ellis Harwood	1995
<b>3</b>	A. Lehninger, revised by Nelson and Cox, Principles of Biochemistry	2002
<b>4</b>	Van Holde and Ahern by Mathews, Biochemistry,. (3rd Ed.)	2002
<b>5</b>	White, Handler and R.B.Smith, Biochemistry (7th Ed.)	1983
<b>6</b>	L.Stryer Biochemistry (3 <sup>rd</sup> Ed.)Freeman	1998
<b>7</b>	Voet and Voet Biochemistry	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

**SEMESTER I****Elements of Biochemistry****Course Code: MMB-102a****Credit Units: 03****Pre-requisite:** Basic understanding of biomolecules and concepts of general chemistry**Course Outcome:**

- Students will be able to define biomolecules and buffers.
- Students will understand the structure and functions of biomolecules.
- Students will be able to classify and explain the role of various biomolecules in human body.
- Students will be able to analyze the causes of diseases on biochemical basis.
- Students will be able to understand various biochemical process and cell metabolism.

**Details of the Course:-****Unit I:**

A historical prospective, Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular proteins.

**Unit II:**

Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines,. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA.

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.

**Unit III:**

Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.

#### Unit IV:

Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, enzyme specificity: types & theories, Biocatalysts from extreme thermophilic and hyperthermophilic archaea and bacteria.

Role of:  $\text{NAD}^+$ ,  $\text{NADP}^+$ , FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, lipoic-acid, Biotin vitamin B12, Tetrahydrofolate and metallic ions

#### Unit V:

Carbohydrates Metabolism: Reactions, energetics and regulation. Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle, Electron Transport Chain, Oxidative phosphorylation.  $\beta$ -oxidation of fatty acids.

#### Suggested Books:

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1	Biochemistry, Lubert Stryer, 8th Edition, WH Freeman, 2015	2015
2	Harper's illustrated Biochemistry by Robert K. Murray, David A Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell, P. Anthony Weil. 30th Edition, McGrawHill, 2015.	2015
3	Biochemistry by Mary K. Campbell & Shawn O. Farrell, 9th Edition, Cengage Learning, 2018.	2018
4	Biochemistry, Donald Voet and Judith Voet, 4th Edition, Publisher: John Wiley and Sons,	2010
<b>Reference Books</b>		
1	The Organic Chemistry of Enzyme-catalyzed Reactions Richard B. Silverman Academic Press	2002
2	Practical Enzymology Hans Bisswanger Wiley-VCH 2012.	2012
3	Fundamentals of Enzyme Kinetics Athel Cornish-Bowden Portland Press 4th edition, 2012.	2012
4	Fundamentals of Enzymology Nicholas Price and Lewis Steven Oxford University Press 3rd edition 2009.	2009

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



## **Semester I    Concept in Medicinal Chemistry & Drug Development**

**Course Code: MMB-102b**

**Credit Units: 03**

**Pre-requisite:** Basic information of chemistry and drug development

### **Course Outcome:**

After the successful completion of this course

- Students will be able to explain the relationship between structure and biological activity of various drug molecules.
- Students will be able to understand the most of various classes of drug molecules.

### **Details of the Course:-**

#### **Unit I: General Introduction and Drug target classification**

Definition and scope of drug design.

Proteins as drug targets: Receptors – receptor role, ion channels, membrane bound enzyme activation, agonist and antagonists, concept of inverseagonist, desensitization and sensitization of receptors, affinity, efficacy and potency. Enzymes – Enzyme inhibitors (competitive, non-competitive, suicide inhibitors), medicinal use of enzyme inhibitors. Nucleic acids as drug targets: Classes of drugs that interact with DNA: DNA intercalators and DNA alkylators.

#### **Unit II: Physicochemical principles of drug action**

Partition coefficient, drug dissolution, acid base properties, surface activity, bioavailability, stereochemical aspects of drug action.

#### **Unit III: Drug receptor interactions**

Kinetic analysis of ligand receptor interactions using scatchard plot, double reciprocal plot, Hill plot, forces involved, relationship between dose and effect (graded and quantal response).

#### **Unit IV: Principles of drug design**

Introduction to SAR, strategies in the search for new lead compounds, analogue synthesis versus rational drug design, concept of prodrugs.

## Unit V: Drug discovery and pharmainformatics

Drug discovery pipeline, drug target identification and validation for microbial pathogen, selection of gene unique to the pathogen, screening for its presence in other microbes and human host, Drug Databases, PubChem, Calculating drug-like properties, introduction to rational drug design methods, optimization of lead compounds, protein3D structure and bindings it analysis, similarity based virtual screening using online tools.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books/Reference Books</b>		
1.	Introduction to Medicinal Chemistry, 4th edition (2009), Graham I. Patrick, Oxford University Press. ISBN-13: 978-0199234479.	2009
2.	The Organic Chemistry of Drug Design and DrugAction, 2nd edition (2004), Richard B. Silvermann, Elsevier, Academic Press. ISBN-13: 978-0126437324.	2004

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## Semester I

## Biophysics

**Course Code: MMB-102c**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of physics, and biotechnology

### Course Outcome:

After completion of the course the students should be able

- To Learn understanding and appreciation of biophysics as an interdisciplinary research field;
- To Understand the link between the structure and functions of biological system from molecular to system level;
- To get insight on how experimental methods and theoretical approaches from physics can give answers related to the structure and functions of biological systems;
- To understand the diffusion processes and their role in the transport phenomena across the biological membrane;
- To understand the relationship of the membrane transport mechanisms and the electrical activity of the cell.

### Details of the Course:-

#### UNIT-I:

Introduction to biophysics, basic physics, mechanical properties of matter, newton's law, applications of newton's law of motion in one dimension, motion, force and energy in more than one dimension, momentum, rotational motion. Ideal fluids, viscous fluids. Waves and resonance. Molecules and matters. Phases, force between molecules, thermodynamics, pressure, surface tension, stress and strain. Gravity, laws of gravity. Applications of these in living system.

#### UNIT-II:

Intensity of sound, superposition of sound, echoes and diffraction of sound, Doppler's effect and applications in life sciences. The human ear-physiology and function. Frequency response. Echo-location, The Doppler's effect, ultrasound, angiodynography.

#### UNIT-III:

Light rays, lenses and mirrors, reflection and refraction, prisms, colours. Wave nature of light, polarization and their applications in life. The human eye-physiology and functions. Lens. Defects and loss of visual acuity, Principle of microscopy, different microscopy. Quantum optics and Image analysis.

## UNIT-IV:

Magnetic forces and field, electromagnetic induction, electromagnetic waves, applications in living world, magnets and medicines. Nuclear Magnetic Resonance, Electric charges, attractive and repulsive forces, Coulomb's law, Electric field and potential, Electric fields and sense organs, EMF and current, Ohm's law, resistance and capacitance. Membrane potential, conductance and capacitance. Cellular and electricity and electrophysiology. Biological motors.

## UNIT-V:

The atomic nucleus and the radiation spectrum, sources of radiation, interaction of radiations with matter, Biological effects of radiation. Radiobiological consequences of nuclear fission. Radiation detectors, autoradiography, introduction to PET and SPECT.

## Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	The Physics of Life Sciences by Jay Newman, Springer.	2008
2.	Introductory Biophysics: Perspectives on the Living State by James Claycomb and JQP Tran, Jones & Bartlett.	2017
<b>References</b>		
1.	Biophysics Demystified by Daniel Goldfrab, TMH. McGraw-Hill Education; 1 <sup>st</sup> edition.	2010
2.	Applied Biophysics by Tom Waigh, John Wiley.	2007
3.	Text Book of Biophysics by RN Roy, New Central Book Agency.	2001
4.	Essentials of Biophysics by P Narayanan, Anshan Publishing.	2010

## Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

# Bacteriology

**Course Code: MMB-103**

**Credit Units: 03**

**Pre-requisite:** Basic information of biology and microbiology.

**Course Outcome:**

Students will have knowledge of structure function and application of microorganism. On studying the subject students will be skilled to handle microorganisms in laboratory.

**Details of the Course:-**

**Unit I: History of Microbiology:**

Discovery of Microorganisms spontaneous generation: vs.biogenesis, Germ theory of disease. Scope of microbiology. Methods & basis of microbial classification.Modern trends of bacterial taxonomy.

**Unit II:Morphology and ultrastructure of bacteria.**

Cell wall of archaebacteria, Gram, negative and Gram-positive bacteria.Cell wall (Peptidoglycan) synthesis. Capsules- composition and function. Cell membranes-structure, composition and properties. Structure and function of bacterial cell organelles.

**Unit III:Cultivation of bacteria :**

Culture media, Microbial preservation techniques. Synchronous and diauxic growth, Batch and continuous cultures.Nutritional types, Growth curve. Measurement of growth, Sterilization: physical and chemical methods.

**Unit IV:Photosynthesis:**

Photosynthetic microorganisms, photosynthetic pigments,Electron transport chain in photosynthetic bacteria.Carbon dioxide fixation pathways.

**Unit V:Carbohydrate metabolism:**

Glycolysis, Pentose phosphate pathway, EDpathway, Kreb's cycle and glyoxalate pathway. Bacterial aerobic respiration, components of electron transport chain,ATP synthesis: substrate level and oxidative phosphorylation and un-couplers, inhibitors of oxidative phosphorylation.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Pelczar Jr., M.J., Chan, E.C.S. and Krieg, Noel R., Microbiology, McGraw Hill (2003) 5th ed.	2003
2.	Stanier, R.Y., Ingraham, J.L. and Wheelis, M.L., General Microbiology, MacMillan (2007) 5th ed.	2007
<b>References</b>		
1.	Microbiology 10 <sup>th</sup> Edition. Prescott, L.M.; Harley, J.P. and Klein, D.A. (2003) McGraw Hill, USA.	2016
2.	Foundations in Microbiology 10 <sup>th</sup> edition, Kathleen Park Talaro and Barry Chess.	2017
3.	Microbiology- An Introduction. Tortora, G.J., Funke, B.R., and Case, C.L., , Pearson Education (2015)12 <sup>th</sup> ed.	2015

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Virology**

**Course Code: MMB-104**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of Viruses

#### **Course Outcome:**

Students will be able to differentiate the nature of viruses, laboratory diagnosis of viruses using different techniques and classification of viruses.

#### **Details of the Course:-**

##### **Unit I:**

General Virology: Brief outline on discovery of viruses. Nomenclature and classification of plant, animal and bacterial viruses. Distinctive properties of viruses; morphology & ultrastructure of virus. Virus related agents (viroids, prions).

##### **Unit II:**

General Methods of Diagnosis and Serology: Cultivation of viruses in embryonated eggs, experimental animals, and cell cultures. Primary & secondary cell cultures. Monolayer cell cultures; cell strains, cell lines and transgenic systems. Serological methods – haemagglutination & HAI; complement fixation; immunofluorescence methods, ELISA and radioimmunoassays.

Assay of viruses – physical and chemical methods (protein, nucleic acid, radioactivity tracers, electron microscopy). Infective assay (plaque method, end point method).

##### **Unit III:**

Bacterial Viruses: Bacteriophage: structural organization and life cycle. Bacteriophage typing - application in bacterial genetics. Brief details on M13, Mu, T3, T4 and Lambda P1.

##### **Unit IV:**

Plant Viruses: Effects of viruses on histology, physiology and cytology of plants. Common viral diseases of plants; paddy, cotton, tomato and sugarcane. Common plant viruses: TMV, Cauliflower Mosaic Virus and Potato Virus X. transmission of plant viruses through vectors and without vectors. Control measures - virus-free planting material; vector control.

##### **Unit V:**

Animal Viruses: Epidemiology, lifecycle, pathogenicity, diagnosis, prevention and treatment of RNA Viruses Picorna, Ortho myxo, Paramyxo, Toga, Rhabdo, Rota, HIV - Oncogenic viruses. DNA viruses; Pox, Herpes, Adeno, SV 40, Hepatitis virus. Interferons, and antiviral drugs.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Conrat HF, Kimball PC and Levy JA. (1992). Virology. III <sup>rd</sup> edition. Prentice Hall, Englewood Cliff, New Jersey.	1992
2.	Dimmock NJ, Primrose SB. (2007) Introduction to Modern Virology VI <sup>th</sup> edition. Blackwell Scientific Publications, Oxford	2007
<b>Reference Books</b>		
1.	Flint, S.J., Enquist, L.W., Krung, R. Racaniello, VR. And Skalka, A.M. (2015). Principles of Virology, Molecular Biology, pathogenesis and control, ASM Press, Washinton D.C.	2015
2.	Maloy SR, Cronan Jr. JE, Freifelder D. (1998). Microbial genetics. Jones and Bartlett publishers.	1998

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## **SEMESTER I**

### **Computer Applications & Biostatistics**

**Course Code: MMB-105**

**Credit Units: 03**

**Pre-requisite:** Basic information of Computer Applications and Biostatistics

#### **Course Outcome:**

A student who successfully fulfills the course requirements will be able to

- define and appropriately use information technology terms;
- identify computer hardware components and describe their function;
- describe the essential elements of the computer's architecture and discuss how this architecture functions;
- describe the characteristics and representations of data, and interpret and compare data in different representations;
- identify and describe telecommunication components;
- describe the characteristics of operating systems and compare different operating systems;
- use a hypertext markup language to produce basic Web documents;
- discuss the general trends in technologies including examples of leading edge developments;
- Compare the roles of different sectors of the information technology.

#### **Details of the course:**

##### **Unit 1: Introducing Computer System**

Evolution Of Computers, Generations of Computer, Characteristics Of Computers, Functions Of Computers Advantages, Disadvantages Of Computers, Computer Applications, The parts of a Computer system, Types Of Computers. Storing Data: Types of storage devices, Memory Hierarchy. Essential computer hardware, software.

##### **Unit II: Computer Input Devices:**

Keyboard, Mouse, Webcam, Joystick and Output devices: Monitor, Printer, Plotters.

Data representation Using Operating System Operating system basics- The purpose of operating system, Type of operating system, providing a user interfaces. Networks and the Internet

Networking basics – The uses of a network, Common types of networks. Network topologies. What is the Internet? Internet's major services, Understanding the world wide web.

##### **Unit III: Algorithms and Flowcharts :**

Algorithms, Flowcharts, Divide and conquer strategy, Writing algorithms and drawing flowcharts for simple exercises – Swapping contents of 2 variables, Largest of given three numbers, Solving a given quadratic equation, Factorial Of a given integer Constants, Variable and Data types

Characters set, C tokens, Keywords and identifiers, Constants, Variables, Data types, Declaration of variables.

##### **Unit IV: Operators and Expressions:**

Decision making and branching Decision making with if statement, simple if statement, the if...else statement, nesting of if...else statements. The else...if ladder, the switch statement, the: operator, the go to

statement. Decision making and looping The while statement, the do statement, The for statement, jumps in loops.

### Unit V: Introduction of Bio statistics

Introductory Statistics, Measure of central tendency: Mean, Mode, Median. Measure of Dispersion: Standard Deviation, Variance, Moments, Skewness and Kurtosis.

Statistical methods

Sampling parameters Difference between sample and Population parametric and nonparametric statistics, Chi-square test.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books/ Reference Books</b>		
1.	Norton, Peter, "Introduction to Computers", McGraw-Hill.	2005
2.	Rajaraman, V., "Fundamentals of Computers", PHI.	2005
3.	PK SINHA "Computer Fundamentals", BPB	Fourth edition
4.	Yashwant Kanetker, "Let us C", BPB.	2004
5.	A. Edmondson and D, Druce: Advanced Biology Statistics, Oxford University Press	1996
6.	W. Danial Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons inc	2004
7.	Rajaraman, V., "Computer Programming in C", PHI.	2005

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER I

### Professional Communication

**Course Code: AEC-101**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language

#### **Course Outcome:**

- Exhibit competent writing that is reasonably proficient in correct grammar and sentence structure skills.
- Construct the vocabulary of the students to assist them acquire plethora of knowledge of foreign as well as indigenous languages.
- Maximize the capability of students pertaining to discussion initiation, carrying on and conclusion.
- Help demonstrate proficiency in written communication using appropriate style, structure and voice.
- Provide knowledge in the area of research.
- Utilize the already learnt grammar skills towards accurate usage of language.

#### **Details of the Course:-**

##### **UNIT I:**

Functional Grammar Tenses

Parts of speech

- a) Usage of parts of speech
- b) Spotting errors

##### **UNIT II:**

Articles Reported Speech

##### **UNIT III:**

Basic Vocabulary Building Prefixes, suffixes Homonyms

Idioms & Proverbs Phrasal verbs One word

substitution Role plays

##### **UNIT IV:**

Group Discussions Interview Skills Written communication

Paragraphing paraphrasing summarizing, Email writing,

**UNIT V:** Proof reading Scientific paper Writing Difference in scientific reports ,  
Research articles, review articles , book chapters, Reading a scientific

publication. literature review, writing research paper, review book chapter  
 .Research work Presentation (oral /poster)

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Spoken English For India by R.K. Bansal and J.B. Harrison	1983
2.	A practical English Grammar By Thompson and Martinet – Oxford University Press	1986
3.	English is Easy By Chetananand Singh	2009
4.	A source book for English Learners By M.L. Tickoo- Orient Longman	2013
5	Professional Communication by Rajhans Gupta –Pragati Prakashan	2003
6.	Professional Communication By R.P. Singh –Oxford	2001

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Public Speaking**

**Course Code: AEC-101a**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language

#### **Course Outcome:**

- Exhibit competent writing that is reasonably proficient in correct grammar and sentence structure skills.
- Construct the vocabulary of the students to assist them acquire plethora of knowledge of foreign as well as indigenous languages.
- Maximize the capability of students pertaining to discussion initiation, carrying on and conclusion.
- Help demonstrate proficiency in written communication using appropriate style, structure and voice.
- Provide knowledge in the area of research.
- Utilize the already learnt grammar skills towards accurate usage of language.

#### **Details of the Course:-**

##### **UNIT I:**

Functional Grammar Tenses  
Parts of speech  
c) Usage of parts of speech  
d) Spotting errors Voice

##### **UNIT II:**

Articles Reported Speech

##### **UNIT III:**

Basic Vocabulary Building Prefixes ,suffixes Homonyms  
Idioms & Proverbs Phrasal verbs One word  
substitution Role plays

##### **UNIT IV:**

Group Discussions Interview Skills Written communication  
Paragraphing paraphrasing summarizing, Email writing,

**UNIT V:** Proof reading Scientific paper Writing Difference in scientific reports ,  
 Research articles, review articles , book chapters, Reading a scientific  
 publication. literature review, writing research paper, review book chapter  
 .Research work Presentation (oral /poster)

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Reference Books</b>		
1.	Spoken English For India by R.K. Bansal and J.B. Harrison	1983
2.	A practical English Grammar By Thompson and Martinet – Oxford University Press	1986
3.	English is Easy By Chetananand Singh	2009
4.	A source book for English Learners By M.L. Tickoo- Orient Longman	2013
5	Professional Communication by Rajhans Gupta –Pragati Prakashan	2003
6.	Professional Communication By R.P. Singh –Oxford	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER I

### Effective writing skills I

**Course Code: AEC-101b**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language writing.

#### **Course Outcome:**

- Exhibit competent writing that is reasonably proficient in correct grammar and sentence structure skills.
- Construct the vocabulary of the students to assist them acquire plethora of knowledge of foreign as well as indigenous languages.
- Maximize the capability of students pertaining to discussion initiation, carrying on and conclusion.
- Help demonstrate proficiency in written communication using appropriate style, structure and voice.
- Provide knowledge in the area of research.
- Utilize the already learnt grammar skills towards accurate usage of language.

#### **Details of the Course:-**

#### **UNIT I:**

Functional Grammar Tenses

Parts of speech

- e) Usage of parts of speech
- f) Spotting errors

#### **UNIT II:** Articles Reported Speech

#### **UNIT III:** Basic Vocabulary Building Prefixes , suffixes

Homonyms Idioms & Proverbs Phrasal verbs One word substitution

Role plays

#### **UNIT IV:** Group Discussions Interview Skills Written communication

Paragraphing paraphrasing summarizing, Email writing,

#### **UNIT V:** Proof reading Scientific paper Writing Difference in scientific reports ,

Research articles, review articles , book chapters, Reading a scientific publication. literature review, writing research paper, review book chapter

.Research work Presentation (oral /poster)

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Reference Books</b>		
1.	Spoken English For India by R.K. Bansal and J.B. Harrison	1983
2.	A practical English Grammar By Thompson and Martinet – Oxford University Press	1986
3.	English is Easy By Chetananand Singh	2009
4.	A source book for English Learners By M.L. Tickoo- Orient Longman	2013
5	Professional Communication by Rajhans Gupta –Pragati Prakashan	2003
6.	Professional Communication By R.P. Singh –Oxford	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



## **SEMESTER I**

### **English Grammar I**

**Course Code: AEC-101c**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language

#### **Course Outcome:**

- Exhibit competent writing that is reasonably proficient in correct grammar and sentence structure skills.
- Construct the vocabulary of the students to assist them acquire plethora of knowledge of foreign as well as indigenous languages.
- Maximize the capability of students pertaining to discussion initiation, carrying on and conclusion.
- Help demonstrate proficiency in written communication using appropriate style, structure and voice.
- Provide knowledge in the area of research.
- Utilize the already learnt grammar skills towards accurate usage of language.

#### **Details of the Course:-**

##### **UNIT I:** Functional Grammar Tenses

Parts of speech, Usage of parts of speech, Spotting errors Voice

##### **UNIT II:** Articles Reported Speech

##### **UNIT III:** Basic Vocabulary Building Prefixes, suffixes

Homonyms, Idioms & Proverbs Phrasal verbs One word substitution

Role plays

##### **UNIT IV:** Group Discussions Interview Skills Written communication

Paragraphing paraphrasing summarizing, Email writing,

##### **UNIT V:** Proof reading Scientific paper Writing Difference in scientific reports,

Research articles, review articles, book chapters, Reading a scientific publication. literature review, writing research paper, review book chapter  
.Research work Presentation (oral /poster)

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Reference Books</b>		
1.	Spoken English For India by R.K. Bansal and J.B. Harrison	1983
2.	A practical English Grammar By Thompson and Martinet – Oxford University Press	1986
3.	English is Easy By Chetananand Singh	2009
4.	A source book for English Learners By M.L. Tickoo- Orient Longman	2013
5.	Professional Communication by Rajhans Gupta –Pragati Prakashan	2003
6.	Professional Communication By R.P. Singh –Oxford	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER I

### Seminar & Research Orientation

Course Code: SM-101

Credit Units: 02

#### Course Outcomes:

- Describe the measurable skills, abilities, knowledge or values.
- Students should be able to demonstrate as a result of a completing a course.
- They are student-centered rather than teacher-centered.
- They describe what the students will do, not what the instructor will teach.

#### Detail of the course

**Research methods:** Lectures, seminars, and practical exercises that cover themes like what constitutes scientific knowledge

**Research problems:** How to identify and work through research problems

**Primary and secondary sources:** How to become familiar with sources and critique them, and how to research secondary sources

**Research databases:** How to use research database tools

**Research proposals:** How to prepare preliminary interdisciplinary research proposals

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Research Methodology**

**Course Code: SM-101a**

**Credit Units: 02**

#### **Course Outcomes:**

- Students who complete this course will be able to understand and comprehend the basics in research methodology
- And applying them in research/ project work.
- This course will help them to select an appropriate research design.

#### **Detail of the course:**

##### **Unit I : Foundations of Research:**

Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis – Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance.

##### **Unit II : Research Design:**

Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.

##### **Unit III : Measurement:**

Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio. Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.

##### **Unit IV : Data Analysis:**

Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association. Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.

9. Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline.

**Unit V: Use of tools / techniques for Research:**

methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

**Suggested Books :**

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press.
3. Research Methodology – C.R.Kothari
4. Select references from the Internet

## SEMESTER I

### General Proficiency

**Course Code: GP-101**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language

**Course Outcome:**

- **Effective communication:** The ability to exchange ideas and information in a way that builds trust and respect
- **Critical and analytical thinking:** The ability to explore issues and ideas before forming a conclusion
- **Integrative thinking:** The ability to synthesize knowledge across different domains and perspectives
- **Preparing students to be engaged citizens:** Preparing students to participate in political culture and thrive in a rapidly evolving world

**Details of the Course:-**

General language proficiency is the ability to read, write, listen, and speak in real-life situations. To test this, a test is usually developed for each skill with questions that are designed to imitate real life.

A syllabus is a guide to a course that includes course policies, rules, regulations, required texts, and a schedule of assignments and seminar.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Enterprenuership Development and Business Communication I**

**Course Code: GP-101a**

**Credit Units: 02**

**Pre-requisite:** Basic information of Enterprenuership Development

#### **Course Outcome:**

- To familiarize the students, and make them understand with key concepts and processes in entrepreneurship and business communication.
- To provide context to the processes in the form of differences between small and large firms, and the economic environment.
- To introduce key debates around entrepreneurship and small businesses.
- To impart knowledge on different extension methods and approaches used for transfer of agricultural technology.
- To impart skills required for entrepreneurship development among the students for self-employment.

#### **Details of the Course:-**

##### **Unit-I**

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy, and programs & institutions for entrepreneurship development.

##### **Unit-II**

Impact of economic reforms on Agribusiness/Agri-enterprises, Entrepreneurial Development Process.

##### **Unit-III**

Business Leadership Skills; developing organizational skills (controlling, supervising, problem-solving, monitoring & evaluation).

##### **Unit-IV**

Developing Managerial skills, Business Leadership Skills ( Communication, direction, and motivation skills), Problem-solving skills

##### **Unit-V**

Supply chain management & Total quality management, Project Planning Formulation & report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship & rural enterprise.

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



## **SEMESTER I**

### **Human Values and Moral Ethics I**

**Course Code: GP-101b**

**Credit Units: 02**

#### **Course Outcome:**

- Understanding life's purpose: Students become aware of their life's mission, vision, and goals.
- Developing virtues: Students learn to cultivate virtues and avoid vices.
- Understanding ethical personalities: Students learn to understand the metaphors of ethical personalities from various domains.
- Developing a positive outlook: Students develop a personality that allows them to view life in a positive way.
- Building strong relationships:

#### **Unit I : Morals, values, and ethics:**

This unit may cover topics such as integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty, courage, valuing time, cooperation, commitment, empathy, self-confidence, character, and spirituality

#### **Unit II : Engineering ethics:**

This unit may cover topics such as the senses of engineering ethics, moral issues, types of inquiry, moral dilemmas, moral autonomy, models of professional roles, engineering as experimentation, research ethics, codes of ethics, industrial standards, and a balanced outlook on law

#### **Unit III : Engineering ethics:**

This unit may cover topics such as the senses of engineering ethics, moral issues, types of inquiry, moral dilemmas, moral autonomy, models of professional roles, engineering as experimentation, research ethics, codes of ethics, industrial standards, and a balanced outlook on law

#### **Unit IV :Peer pressure, alcoholism, and drug abuse:**

This unit may cover topics such as ethical values, causes, impact, laws, prevention, and the ill effects of smoking

#### **Unit V : Global issues:**

This unit may cover global issues  
Indian and global case studies: This unit may cover Indian and global case studies

## **SEMESTER I**

### **Life Management I**

**Course Code: GP-101c**

**Credit Units: 02**

- Goal setting: How to set SMART goals that are specific, measurable, achievable, realistic, and have a time frame.
- Prioritization: How to prioritize tasks and effectively manage time.
- Stress management: How to manage stress and improve work-life balance.
- Organization: How to organize work and use organization tools.
- Delegation: How to delegate tasks and assignments.

## SEMESTER I

### Cell & Developmental Biology Lab

**Course Code: MMB-151**

**Credit Units: 02**

**Pre-requisite:** Basic information of Cell Biology

#### **Course Outcome:**

- Students will acquire knowledge about basics of cell biology.
- Students will learn about how various functions of organelles and their working.
- Students will gain an insight into microscopic structures and chemical components of various regions of cells.
- Students will attain a comprehensive knowledge of functioning of cell and synchronization of activities of various organelles.
- Students will be able to learn about various signaling mechanism involved in a cell which ultimately leads to a visible physiological response.
- Students will be able to understand the architectural components involved in making cells rigid and how cells are connected to each other.
- Students will learn about molecular events involved in cell cycle.
- Students will apply the information gained in understanding the issues and conditions encountered if things go wrong with cell cycle and how our understanding of cell signaling generate drug targets.

#### **Details of the Course:-**

S. No.	Contents	Contact Hours
1	Use of fluorescence microscope and demonstration of nucleic acid by acridine orange or ethidium bromide.	2
2	Localization of Barr bodies.	2
3	Blood smear – differential staining.	2
4	Study of mitosis from onion root tips by making temporary squash preparation (staining with acetocarmine).	2
5	Vital staining of mitochondria.	2
6	Demonstration of cellular organelles including mitochondria, Golgi bodies etc.	2
7	Determination of absorption maximum of a solution.	2
8	Determination of relationship between absorption and various concentration of a solution using a colorimeter, spectrophotometer/spectrophotometer.	2
9	Isolation of Mitochondria.	2
10	Isolation of Chloroplast.	2
11	Determination of osmotic fragility of RBC membrane.	2

**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Reference Books</b>	
1.	Culture of Animal Cells – a manual of basic techniques 4 <sup>th</sup> Edition. Freshney, R. I. (2000) John Wiley & Sons, New York.	2000
2.	Animal Cell Biotechnology. Spier, R. E. and Griffiths, J. B. (1988) Academic Press.	1988

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER I

### Biochemistry & Enzymology Lab

**Course Code: MMB-152**

**Credit Units: 02**

**Pre-requisite:** Background information of biochemistry and enzymes.

#### Course Outcome:

- Students will be able to define biomolecules and buffers.
- Students will understand the structure and functions of biomolecules.
- Students will be able to classify and explain the role of various biomolecules in human body.
- Students will be able to analyze the causes of diseases on biochemical basis.
- Students will be able to understand various biochemical process and cell metabolism.
- Students will be able to classify enzymes and will understand kinetic properties.
- Students will be able to understand  $K_m$  and  $V_{max}$  for enzymatic equations.
- Students will be able to understand the application of enzymes in daily life.

#### Details of the Course:-

S. No.	Contents	Contact Hours
1	Preparation of various solution and preparation of buffer solution and calculation of pKa and buffer capacity.	2
2	Quantitative and qualitative estimation of reducing	2
3	Quantitative estimation of proteins	2
4	Method of DNA/ RNA detection and estimation.	2
5	Enzyme assay, partial purification and kinetic studies with reference to of $K_m$ and $V_{max}$ .	2
6	Polyacryamide gel electrophoresis.	2
7	Iodine value, saponification value and acid values.	2
8	Estimation of amino acids from biological samples with the help of standard curve.	2
9	Quantification of soluble proteins in biological samples in Bradford's method.	2
10	Isolation of casein from skimmed milk.	2
11	Determination of osmotic fragility of RBC membrane.	2

**Suggested Books:**

<b>S. No.</b>	<b>Author/s/Book/Title/Publisher</b>	<b>Year</b>
<b>1.</b>	Blanch, H.W., Clark, D.S. Biochemical Engineering Marcel Dekker	1997
	Bailey J.E. & Ollis, D.F., Biochemical Engineering Fundamentals (2nd Ed.) McGraw Hill	1986
<b>2</b>	Wiseman, Alan, Hand book of Enzyme Biotechnology (3rd Ed.), Ellis Harwood	1995
<b>3</b>	A. Lehninger, revised by Nelson and Cox, Principles of Biochemistry	2002
<b>4</b>	Van Holde and Ahern by Mathews, Biochemistry,. (3rd Ed.)	2002
<b>5</b>	White, Handler and R.B.Smith, Biochemistry (7th Ed.)	1983
<b>6</b>	L.Stryer Biochemistry (3 <sup>rd</sup> Ed.)Freeman	1998
<b>7</b>	Voet and Voet Biochemistry	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER I

### Bacteriology Lab

**Course Code: MMB-153**

**Credit Units: 02**

**Pre-requisite:** Basic information of biology and bacteriology.

#### Course Outcome:

At the end of the course, the students will be familiar with microbial technology. This would help students to launch themselves in industrial biotechnology which is the fastest growing industry in the developing country. After completion of the course the students should be able to

- Describe the cell organization of bacteria i.e. morphology, ultrastructure and organelles present in bacterial cells.
- Apply the knowledge of bacteriological techniques.
- Describe the nutritional and physical requirements for bacterial growth.
- Describe the principles involved in killing bacteria, and make recommendations on use of physical and chemical methods used to control microbial growth.
- Describe the dynamics of the growth of a bacterial population and how this growth can be measured.

#### Details of the Course:-

S. No.	Contents	Contact Hours
1	To prepare plates, butts, slants of sterilized culture media.	2
2	To demonstrate the technique for isolation of pure culture by streaking plate method, pour plate method, spread plate method and serial dilution method (Ten & Two fold).	2
3	To prepare the bacterial smear, fixation and demonstration of bacterial shape by simple and negative staining.	2
4	To study the bacterial morphology and its differentiation using Gram's stain.	2
5	To evaluate alcohol as a skin disinfectant and to study the effectiveness of hand washing.	2
6	To study the germicidal effect of UV on bacterial growth.	2
7	To isolate the Staphylococci from human skin on MSA media.	2
8	To test the antibiotic sensitivity of an organism by disc diffusion method.	2
9	To study the effect of dye(s) on bacterial growth.	2
10	To study the viable and nonviable organisms in given culture by Viable Staining Techniques.	2
11	To show the effect of given antibiotic on bacterial culture and to isolate the antibiotic resistant mutant by Gradient Plate Technique.	2
12	To isolate & differentiate Staphylococcus aureus on MSA from milk source.	2
13	To perform biochemical tests.	2
14	To determine the MIC & MBC of given antibiotic substance.	2
15	To demonstrate the motility of a bacteria by Hanging drop method and wet slide test.	2

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Experiments in Microbiology, Plant Pathology and Biotechnology. 4th Edition. Aneja, K.R. (2003). New Age International Publishers, New Delhi. 5th ed.	2017
	<b>References</b>	
1.	Microbiology: A Laboratory Manual. Benjamin Cummings. 10 <sup>th</sup> edition. Cappuccino J. and Sherman N. (2013)	2013
2.	Laboratory exercises in Microbiology by Harley Prescott. 7 <sup>th</sup> edition, McGraw-Hill Higher Education.	2008
3.	Benson's Microbiology Application, laboratory Manual Concise version (2016) McGraw Hill Publisher- 14 <sup>th</sup> ed	2016
4.	Applied Microbiology laboratory Manual (2016) Kendall Hunt Publisher- 5 <sup>th</sup> Edition, Frances Duncan	2016

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60



## SEMESTER I

### Virology Lab

**Course Code: MMB-154**

**Credit Units: 02**

**Pre-requisite:** Basic information of Virology

#### Course Outcome:

After completion of the course the students should be able to

- Differentiate the nature of viruses.
- Understand classification of viruses.
- Learn the methods of laboratory diagnosis of viruses using different techniques.
- Learn about different plant and animal viruses.

#### Details of the Course:-

S. No.	Contents	Contact Hours
1	Isolation of coliphages from sewage water sample.	3
2	One step growth curve for determination of virus titre.	3
3	Immunological assays for virus detection.	3
4	Screening of embryonated viable eggs and demonstration of virus cultivation.	6
5	Cultivation and morphological identification of animal cell lines.	3
6	Induction of lambda lysogen by UV radiations.	3
7	Studies on Specialized transduction .	3
8	Isolation of lambda DNA and their characterization.	3
9	Amplification of lambda DNA by PCR.	3
10	Phage typing of E.coli bacteriophages.	3

#### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Introduction to Modern Virology 4th Edition by Dimmock N J, Primrose S. B. 1994. Blackwell Scientific Publications. Oxford.	1994
<b>Reference Books</b>		
1.	Virology 3 rd Edition by Conrat H.F., Kimball P.C. and Levy J.A. 1994. Prentice Hall, Englewood Cliff, New Jersey.	1994

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER I

### Computer Applications & Biostatistics Lab

Course Code: MMB-155

Credit Units: 02

**Pre-requisite:** Basic knowledge of Computer Application and Biostatistics

**Course Outcome:**

- Students will learn to execute internal and external commands.
- Students will also be able to understand basic computer applications practically.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Execute "Internal & External Commands" in MS-DOS.	2
2	Create any 3 ".txt" files in MS-DOS and Copy the contents of two files in one single file.	2
3	Create the "directory structure" in MS-DOS.	2
4	In MS-DOS, Change the dos prompt: With your name, current date, current time, change the prompt to its original path.	2
5	Create one MS-word file having name "INTRODUCTION" and apply "center alignment", Make the heading bold, Italic and underlined and do apply font style of heading as —ALGERIAN   and size —24   by including fields like: Name, Permanent Address, Current Address, Educational Qualification, Hobbies, and Aim etc. Insert table for "educational Qualification".	2
6	Create one MS-Word File for drawing a flow chart to calculate "Simple Interest", using shapes.	2
7	Create a table in MS-Excel having name BCA having fields: S.No, Student Name, sub1_marks, sub2_marks, sub3_marks, sub4_marks. Calculate the "sum" and "percentage" of all the students. Also draw "pie chart" for showing the student percentage.	2
8	Create one MS-excel for a "Automobile Garage" by having fields like "year", "Sale", "Car Name". Draw a "column chart" for year and Sale.	2
9	Create "Attendance letter" for class MCA and send this letter at the address of all the MCA students using "Mail Merge" option.	2
10	Create a Power Point presentation with the main title "INTERNET ". Also add the following topics like: HISTORY OF THE INTERNET, INTERNET TERMS, and ADAVANTAGES OF THE INTERNET in Slides.	2

**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Norton, PESEr, -Introduction to Computersl, McGraw-Hill.	2011
2.	\Leon, Alexis & Leon, Mathews, -Introduction to Computersl, Leon Tech World.	2012
3.	Yashwant Kanetker, -Let us Cl,BPB.	2010
4.	Rajaraman, V., -Fundamentals of Computersl,PHI.	2011
5.	Rajaraman, V., -Computer Programming in Cl,PHI.	2012

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER II**

### **Immunology & Immunotechnology**

**Course Code: MMB-201**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of immunology and diseases, and host-parasite interactions

#### **Course Outcome:**

- Students will be able to understand and appreciate the contribution of various scientists in unraveling the various facets of immune system and responses in our body.
- The knowledge of various types of immune responses along with the key players in the form of cells and organs of immune system will be absorbed by the students.
- Students will become familiar with concept of antigenicity and immunogenicity along with contribution of structural variability of antibody in eliciting immune response.
- The role of MHC molecule in graft rejection along with structure and function of various types of MHC in body will be understood by the students.
- Students will be able to understand the structure and function of Complement protein along with various pathways of their activation.
- The knowledge of various kinds of Hypersensitivity reactions will be imparted to students.
- Students will be able to understand various factors responsible for causation of tumor and subsequently cancer in the body.
- Students will become familiar with practical applications of various immunological methods like ELISA, RIA, and Immunoelectrophoresis etc.
- Students will be able to understand the structure and function of various cells and organs of immune system.

#### **Details of the Course:-**

##### **UNIT 1 : Fundamentals of Immunology**

Components of innate and acquired immunity; phagocytosis; complement and inflammatory responses; haematopoiesis; organs and cells of the immune system- primary and secondary lymphoid organs; Lymphatic system; Lymphocyte circulation; Lymphocyte homing; mucosal and cutaneous associated lymphoid tissue.(MALT & CALT); Mucosal Immunity; Antigens - immunogens, haptens; Major Histocompatibility Complex - MHC genes, MHC and immune responsiveness and disease susceptibility, HLA typing. Molecular basis of Immune responses

##### **UNIT II :Humoral immune response:**

Immunoglobulins-basic structure, classes and subclasses of immunoglobulins, antigenic determinants; multigene organization of immunoglobulin genes; B-cell receptor; immunoglobulinsuperfamily; principles of cell signaling; immunological basis of self –non-self discrimination; Kinetics of immune response, memory; B cell

maturation, activation and differentiation; generation of antibody diversity; Cell-mediated immune responses: T-cell maturation, activation and differentiation and T-cell receptors; Functional T Cell Subsets, ADCC; cytokines-properties, receptors and therapeutic uses; antigen processing and presentation- endogenous antigens, exogenous antigens, non-peptide bacterial antigens and super-antigens; Cell-cell co-operation, Hapten-carrier system, plantibodies.

### **UNIT III :Antigen-antibody interactions and Immunotechniques**

Precipitation, agglutination and complement mediated immune reactions; Advanced immunological techniques - RIA, ELISA, western blotting, ELISPOT assay, immunofluorescence, flow cytometry and immunoelectron microscopy; Surface plasmon resonance, Biosenor assays for assessing ligand –receptor interaction, CMI techniques- lymphoproliferation assay, mixed lymphocyte reaction, cell cytotoxicity assays, apoptosis, microarrays, transgenic mice, gene knock out animals, hybridoma technology.

### **UNIT IV :Vaccinology**

Active and passive immunization; live, killed, attenuated, sub unit vaccines; vaccine technology- role and properties of adjuvants, recombinant DNA and protein based vaccines, edible vaccines, reverse vaccinology; peptide vaccines, conjugate vaccines; Antibody genes and antibody engineering- chimeric and hybrid monoclonal antibodies; catalytic antibodies and generation of immunoglobulin gene libraries. Clinical Immunology and human health Immunity to infection: bacterial, viral, fungal and parasitic infections (with examples from each group);

### **UNIT V :Hypersensitivity**

Type I-IV; autoimmunity; types of autoimmune diseases; Treatment of autoimmune diseases; Transplantation – Immunological basis of graft rejection; clinical transplantation and immunosuppressive therapy; Tumor immunology – Tumor antigens; Immune response to tumors and tumor evasion of the immune system, Cancer immunotherapy; immunodeficiency-primary immunodeficiencies, acquired or secondary immunodeficiencies.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/ Reprint</b>
<b>Text Books</b>		
1.	Immunology, Goldsby RA, Kindt TJ, Osborne BA. Kuby's. 6th edition W.H. Freeman and Company, New York, 2007.	2007
2.	Essential Immunology, 10 <sup>th</sup> ed Roitt, Ivon; Delves, Peter (2001) Blackwell Scientific Publications Oxford.	2017
<b>References</b>		
1.	Basic and Clinical Immunology, Peakman M, and Vergani D. 2nd ed). Immunology on Churchill Livingstone Publishers, Edinberg, 2009	2009
2.	Richard C and Geiffrey S. 6th edition. Wiley Blackwell Publication. 2009.	2009
3.	Janeway's Immunobiology, Murphy K, Travers P, Walport M., 7 <sup>th</sup> edition Garland Science Publishers, New York. 2008.	2008

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER II**

### **Molecular Biology & Recombinant DNA Technology**

**Course Code: MMB-202**

**Credit Units: 03**

**Pre-requisite:** Basic information of cell biology and molecular biology dogma (replication, transcription, translation, restrictions enzymes and plasmids etc.)

#### **Course Outcome:**

To impart theoretical and practical knowledge on, tools, techniques, scope and applications of recombinant DNA Technology or genetic engineering to prepare students ready for research, industry and higher studies.

- The student will be familiar with the historical background and important milestones, biosafety and bioethics in genetic engineering.
- The student will be acquainted with tools of RDT like enzymes, vectors and hosts.
- The student will be acquainted with technical knowhow of gene cloning and expression and factors for optimizing the heterologous gene expression.
- The student will be acquainted with the techniques required for gainful applications of genetic engineering.
- The student will be able to apply RDT in different domains of life science, medical, agriculture, forensic and allied fields for the welfare of living beings.

#### **Details of the Course:-**

##### **Unit I: Methods of Studying Biomolecules:**

Density gradient sedimentation, zonal centrifugation, electrophoretic separation, agarose, polyacrylaide, pulse field electrophoreses, southern blotting, northern blotting, labeling – radioactive and non-radioactive labeling, isopycnic separation. DNA sequencing direct sequencing, indirect sequencing, Maxam and Gilbert method, Sangers method, RNA sequencing.

##### **Unit II: Nucleic acid hybridization:**

Design and construction of probes, nick translation, chemical synthesis, hybridization, liquid hybridization, solid hybridization, determination of stringency conditions. Applications of nucleic acid hybridization. Systems that safeguard DNA – DNA repair mechanisms – photo reactivation, mismatch repair, recombination repair, SOS repair, DNA restriction and modification.

##### **Unit III: Plasmid vectors:**

Use of natural plasmids as vectors, artificial plasmid vectors, pSC 101, RI,pBR322, pUC 18/19, Tiplasmid vectors. Bacteriophage vectors – Insertion vectors, replacement vectors, cosmid vectors, phagemid vectors, shuttlevectors and M13 based vectors. Restriction endonucleases – Type, I, II & III, restriction mapping, RFLP and RAPD. Genome libraries – construction and screening of genome libraries, chromosome walking, cDNA libraries.



#### Unit IV: Recombinant DNA:

Isolation of gene of interest: Construction of recombinant DNA, selection of DNA fragments for cloning, cDNA synthesis, chemical synthesis, gene synthesizers, ligation with RES, homopolymer tailing, blunt end ligation, linkers, monitoring restriction and ligation. Gene transformation techniques- Direct method-Indirect methods, Screening of recombinant. PCR – principles, types and applications, primer design and applications.

#### Unit V: Applications of Genetic Engineering:

Transgenic animal and plants; Knockouts; Gene therapy; DNA finger printing and DNA bar-coding for phylogenetic relationship; Production of recombinant therapeutics (vaccines/insulin); Gene editing technology (CRISPR-CAS). Human Genome Project.

#### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Gene Cloning and DNA Analysis, An Introduction, T. A. Brown (7 <sup>th</sup> edition), Wiley-Blackwell	2015
2.	Recombinant DNA: Genes and Genomes - A Short Course, James D. Watson , Richard M. Meyers, Amy A. Caudy, Jan A. Witkowski, (3rd Edition), W.H. Freeman	2007
<b>Reference Books</b>		
1.	Molecular Cloning: A Laboratory Manual, Michael R. Green; Joseph Sambrook, (Fourth Edition), CSHL Press	2012
2.	Principles of Gene Manipulation and Genomics, Primrose, S.B. and Twyman, R.M., (7th ed.) Blackwell Publishing	2006

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER II

### Mycology & Phycology

**Course Code: MMB-203**

**Credit Units: 03**

**Pre-requisite:** Basic information of Fungus and Algae

#### **Course Outcome:**

After the successful completion of this course

- Students will be able to isolate fungi from soil.
- Students will be able to learn about the cultivation and preservation of fungi and algae.
- Students will be able to recognize the microscopic structure of fungi.
- Students will be able to recognize the microscopic structure of algae.

#### **Details of the Course:-**

##### **Unit I: Introduction to fungi:**

Occurrence and distribution, thallus structure, characteristics, nutrition, classification and reproduction. Introduction of fungi: Occurrence and distribution, somatic structure, hyphal growth, nutrition, heterothallism, sex hormones in fungi, physiological specialization in fungi, fungi and ecosystem; saprophytic parasitic, mutualistic and symbiotic relationship with plants and animals. Classification of fungi. Reproduction in fungi: asexual, sexual and parasexual.

##### **Unit II: Study of the different classes of fungi:**

Salient features of division and sub division of Myxomycota, mastigomycota, ztgomycota, ascomycotina, basidiomycotina and deuetromycotina. Structure and reproduction of: Dictyostelium, Allomyces, Pilobolus, Claviceps and Fusarium.

##### **Unit III: Economic importance of fungi:**

Economic importance of Mycorrhiza: ecto-, endo and ect-endo VAM, Fungi as insect symbionts, fungi as biocontrol agents, attack of fungi on other microorganisms, potential application in Agriculture, environment, industry, food. Role of fungi in bio deterioration of wood, paper, textile. Mycotoxins, quorum sensing in fungi.

##### **Unit IV: Salient Features of Algae:**

Distribution, morphology and classification of algae. Isolation from soil and water, algal ecology, media and methods used for cultivating algae. Measurement of algal growth, strain selection and large scale cultivation. Symbiotic algae: Lichens, coral reef and sea sponges. Structure and reproduction of important algae.

##### **Unit V: Economic importance of algae:**

Economic importance of algae as primary producers and commercial products. Uses of algae in heavy metal removal, algal blooms and toxins. Uses of algae with examples in agriculture, environment, industry and food.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Alexopoulos, C.J. and C.W. Mims 1979. Introduction to Mycology (3rd Ed.)Wiley Eastern Ltd., New Del	1979
2.	L. Barsanti, Paolo Gualtieri: Algae: anatomy, biochemistry, and biotechnology	2009
<b>Reference Books</b>		
1.	Linda E. Graham, James Graham, James M. Graham: Algae (2009)	2009
2.	Burnett J.H., Publisher: Edward, Arnold Crane Russak: Fundamentals of Mycology.	2002

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER II**

### **IPR, Biosafety & Bioethics**

**Course Code: MMB-204**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of Biology and Biotechnology

#### **Course Outcome:**

- Students will understand with the importance of intellectual property and its protection under the constitution, able to classify patentable subject matter under the realm of Biotechnology.
- Students will be able to understand the protection of traditional knowledge
- Students will be able to apply their knowledge to deal with hazards related to biotechnology and the importance of biosafety in research.
- Students will be familiar with the basic principles of bioethics & will be able to analyze ethical issues related to biotechnology research.
- Students will be able to understand the concept of lab biosecurity.

#### **Details of the Course:-**

##### **UNIT I : Introduction to Intellectual Property:**

Types of IP: Patents, Trademarks, Copyright, Industrial Design, Traditional Knowledge, Geographical Indications, IPs of relevance to Biotechnology and few Case Studies

##### **UNIT II : Agreements and Treaties:**

History of GATT & TRIPS Agreement; Madrid Agreement; Hague Agreement; WIPO Treaties; Budapest Treaty; PCT; Indian Patent Act 1970 & recent amendments

##### **UNIT III : Concept of biosafety**

Biorisk, Hazardous characteristics of the agent, Laboratory procedures, Good lab practices, Principles of biosafety, Biosafety levels to personnel, environment and Community

##### **UNIT IV : Biosafety guidelines:**

Definition of GMOs & LMOs; Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture; Environmental release of GMOs; Risk Analysis; Risk Assessment; Cartagena Protocol.

##### **UNIT V : Perceptions of ethical biotechnology**

Morality, Legality and ethics, Principles of bioethics, Ethical conflicts in biotechnology, , Social and ethical implications of biological weapons, Ethical limits of biotechnology

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Sateesh, M.K., Bioethics and Biosafety, IK International Publishers	2008
2	Fleming, D.A., Hunt, D.L, Biological Safety Principles and Practices, Fourth Edition, ASM Press, Washington.	2006
<b>Reference Books</b>		
1.	Srinivasan, K. and Awasthi, H.K., Law of Patents, Jain Book Agency	1997
2	Ganguli, P. Intellectual Property Rights: Unleashing the Knowledge. Tata McGraw-Hill Publishing Company.	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER II**

### **Bioinstrumentation Techniques**

**Course Code: MMB-205**

**Credit Units: 03**

**Pre-requisite:** Basic understanding of molecular biology, Physics and chemistry

#### **Course Outcome:**

- Students will be able to define and explain the fundamental principles of modern biological techniques.
- Students will be able to understand types of chromatography on the basis of different mobile and stationary phases.
- Students will acquire knowledge about principle and applications of different types of electrophoresis.
- Students will be able to understand the general account of centrifugation, types and applications for the separation of different types of biomolecules.
- Students will be able to learn about the general principles and applications of different types of microscopy.
- Students will be able to learn about the basic working principle of biosensor and their applications
- Students will be able to understand basic principle of different types of spectroscopy and their role in biological sciences.
- Students will be able to apply their basic knowledge in characterization of biomolecules.

#### **Details of the Course:-**

##### **UNIT I: Analytical separation methods:**

Principles and techniques. Chromatography – general principle, application and types. Adsorption chromatography, partition chromatography. Gas Chromatography, liquid chromatography, paper chromatography. Thin layer chromatography, gel filtration chromatography. Ionexchange chromatography, affinity chromatography. HPPL/High Performance/Pressure Liquid chromatography.

##### **UNIT II: Electrophoresis:**

General principles, application, and types: paper electrophoresis, moving boundary methods, gel electrophoresis (native, denaturing & reducing). Disc gel electrophoresis, slab gel electrophoresis. isoelectrofocussing (IEF) isoelectrophoresis, molecular weight estimation. Centrifugation: basic principles common centrifuges used in laboratory (clinical high speed & ultracentrifuges). Types of rotors (fixed angle, swing bucket). Types of centrifugation: preparative, differential & density gradient. Ultra centrifugation: sedimentation rate: zonal centrifugation, equilibrium density gradient centrifugation sedimentation constants.

##### **UNIT III: Basic knowledge of the principles and applications of microscopy:**

light, phase contrast, fluorescence, confocal microscopy scanning and transmission electron microscopy

(SEM, TEM).

**UNIT IV: Biosensors:**

introduction & principles. First, second & third generation instruments cell based biosensors, enzymeimmunosensors. Spectroscopic methods: principles and applications of UV-visible, IR, NMR, ES Round X-ray. Spectroscopy.

**UNIT V: Application of radioisotopes in biology:**

Properties and units of radioactivity. Radioactive isotopes and half life Measurement of radioactivity: (basic knowledge) GM Counter, gamma counter, liquid scintillation counter. Tracer techniques (basic knowledge): autoradiography, radioimmunoassay, pitfalls of immunoassays, radio receptor assay. Safety rules in handling of radioisotopes and hazardous chemical.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Wilson K and Walker J. Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.	2010
2	Karp, G. Cell and Molecular Biology: Concepts and Experiments. 8th Edition. John Wiley & Sons. Inc.	2010
3.	Cooper, G.M. and Hausman, R.E. The Cell: A Molecular Approach. 7th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.	2016
<b>Reference Books</b>		
1.	Swargiary, A. Biological Tools & Techniques (A textbook for UG/PG students of Life Sciences).	2017

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER II**

### **Career Skills**

**Course Code: AEC-201**

**Credit Units: 02**

**Pre-requisite:** English Language Skills & Sound Reasoning and Aptitude ability

#### **Course Outcome:**

- Exhibit competent writing that is reasonably proficient in correct grammar and sentence structure skills.
- Enhance the Vocabulary of the students to make them corporate ready.
- Improve the Logical ability among the students.
- Enhance the problem solving skills of the students.
- Improve the Quantitative ability of the students.
- Discover the key skills required to bridge the gap between campuses and corporate.

#### **Details of the Course:-**

##### **Unit I: Sentence Corrections based on Topics:**

Tenses & Concord

**Sentence completion** -Single word blank & Double blanks

##### **Unit II: Basic Vocabulary Building:**

Antonyms & synonyms

Idioms & Phrasal Verb

Advanced Analogy

##### **Unit-III: Logical Reasoning:**

Blood relation, seating/placing arrangements.

##### **Unit-IV: Logical Reasoning:**

Coding decoding, Direction sense test

##### **Unit V: Quantitative Aptitude:**

Percentage, Ratio, Ages, Profit& loss



**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
	<b>Reference Books</b>	
1.	Chetananand Singh “ English is Easy ,BSC Publishers 2 <sup>ND</sup> Edition	2009
2.	R.S Agarwal “Verbal and Non Verbal Reasoning”	2010
3	R.S Agarwal “Quantitative aptitude”	2012
4	Rawat & Rawat “Quantitative aptitude”	2017

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER II

### Public Speaking II

**Course Code:** AEC-201a

**Credit Units:** 02

**Pre-requisite:** Basic information of English Language

#### **Course Outcome:**

- Exhibit competent writing that is reasonably proficient in correct grammar and sentence structure skills.
- Construct the vocabulary of the students to assist them acquire plethora of knowledge of foreign as well as indigenous languages.
- Maximize the capability of students pertaining to discussion initiation, carrying on and conclusion.
- Help demonstrate proficiency in written communication using appropriate style, structure and voice.
- Provide knowledge in the area of research.
- Utilize the already learnt grammar skills towards accurate usage of language.

#### **Details of the Course:-**

##### **UNIT I:**

Functional Grammar Tenses

Parts of speech

g) Usage of parts of speech

h) Spotting errors Voice

##### **UNIT II:**

Articles Reported Speech

##### **UNIT III:**

Basic Vocabulary Building Prefixes, suffixes Homonyms

Idioms & Proverbs Phrasal verbs One word

substitution Role plays

##### **UNIT IV:**

Group Discussions Interview Skills Written communication

Paragraphing paraphrasing summarizing, Email writing,

**UNIT V:** Proof reading Scientific paper Writing Difference in scientific reports ,

Research articles, review articles , book chapters, Reading a scientific publication. literature review, writing research paper, review book chapter .Research work Presentation (oral /poster)

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Reference Books</b>		
1.	Spoken English For India by R.K. Bansal and J.B. Harrison	1983
2.	A practical English Grammar By Thompson and Martinet – Oxford University Press	1986
3.	English is Easy By Chetananand Singh	2009
4.	A source book for English Learners By M.L. Tickoo- Orient Longman	2013
5	Professional Communication by Rajhans Gupta –Pragati Prakashan	2003
6.	Professional Communication By R.P. Singh –Oxford	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER II**

### **Effective writing skills II**

**Course Code: AEC-201b**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language writing.

#### **Course Outcome:**

- Exhibit competent writing that is reasonably proficient in correct grammar and sentence structure skills.
- Construct the vocabulary of the students to assist them acquire plethora of knowledge of foreign as well as indigenous languages.
- Maximize the capability of students pertaining to discussion initiation, carrying on and conclusion.
- Help demonstrate proficiency in written communication using appropriate style, structure and voice.
- Provide knowledge in the area of research.
- Utilize the already learnt grammar skills towards accurate usage of language.

#### **Details of the Course:-**

##### **UNIT I:**

Functional Grammar Tenses

Parts of speech

- i) Usage of parts of speech
- j) Spotting errors

##### **UNIT II:** Articles Reported Speech

**UNIT III:** Basic Vocabulary Building Prefixes , suffixes

Homonyms Idioms & Proverbs Phrasal verbs One word substitution

Role plays

**UNIT IV:** Group Discussions Interview Skills Written communication

Paragraphing paraphrasing summarizing, Email writing,

**UNIT V:** Proof reading Scientific paper Writing Difference in scientific reports ,  
Research articles, review articles , book chapters, Reading a scientific  
publication. literature review, writing research paper, review book chapter  
.Research work Presentation (oral /poster)

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Reference Books</b>		
1.	Spoken English For India by R.K. Bansal and J.B. Harrison	1983
2.	A practical English Grammar By Thompson and Martinet – Oxford University Press	1986
3.	English is Easy By Chetananand Singh	2009
4.	A source book for English Learners By M.L. Tickoo- Orient Longman	2013
5	Professional Communication by Rajhans Gupta –Pragati Prakashan	2003
6.	Professional Communication By R.P. Singh –Oxford	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER II

### English Grammar II

**Course Code: AEC-201c**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language

#### **Course Outcome:**

- Exhibit competent writing that is reasonably proficient in correct grammar and sentence structure skills.
- Construct the vocabulary of the students to assist them acquire plethora of knowledge of foreign as well as indigenous languages.
- Maximize the capability of students pertaining to discussion initiation, carrying on and conclusion.
- Help demonstrate proficiency in written communication using appropriate style, structure and voice.
- Provide knowledge in the area of research.
- Utilize the already learnt grammar skills towards accurate usage of language.

#### **Details of the Course:-**

##### **UNIT I:** Functional Grammar Tenses

Parts of speech, Usage of parts of speech, Spotting errors Voice

##### **UNIT II:** Articles Reported Speech

##### **UNIT III:** Basic Vocabulary Building Prefixes, suffixes

Homonyms, Idioms & Proverbs Phrasal verbs One word substitution

Role plays

##### **UNIT IV:** Group Discussions Interview Skills Written communication

Paragraphing paraphrasing summarizing, Email writing,

##### **UNIT V:** Proof reading Scientific paper Writing Difference in scientific reports,

Research articles, review articles, book chapters, Reading a scientific

publication. literature review, writing research paper, review book chapter

.Research work Presentation (oral /poster)

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Reference Books</b>		
1.	Spoken English For India by R.K. Bansal and J.B. Harrison	1983
2.	A practical English Grammar By Thompson and Martinet – Oxford University Press	1986
3.	English is Easy By Chetananand Singh	2009
4.	A source book for English Learners By M.L. Tickoo- Orient Longman	2013
5.	Professional Communication by Rajhans Gupta –Pragati Prakashan	2003
6.	Professional Communication By R.P. Singh –Oxford	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## Semester II

### Seminar & Research Orientation II

Course Code: SM-201

Credit Units: 02

#### Course Outcomes:

- Describe the measurable skills, abilities, knowledge or values.
- Students should be able to demonstrate as a result of a completing a course.
- They are student-centered rather than teacher-centered.
- They describe what the students will do, not what the instructor will teach.

#### Detail of the course

**Research methods:** Lectures, seminars, and practical exercises that cover themes like what constitutes scientific knowledge

**Research problems:** How to identify and work through research problems

**Primary and secondary sources:** How to become familiar with sources and critique them, and how to research secondary sources

**Research databases:** How to use research database tools

**Research proposals:** How to prepare preliminary interdisciplinary research proposals

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## **SEMESTER II**

### **Research Methodology II**

**Course Code: SM-201a**

**Credit Units: 02**

#### **Course Outcomes:**

- Students who complete this course will be able to understand and comprehend the basics in research methodology
- And applying them in research/ project work.
- This course will help them to select an appropriate research design.

#### **Detail of the course:**

##### **Unit I : Foundations of Research:**

Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance.

##### **Unit II : Research Design:**

Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.

##### **Unit III : Measurement:**

Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio. Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.

##### **Unit IV : Data Analysis:**

Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association. Interpretation of

Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.  
9. Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline.

**Unit V: Use of tools / techniques for Research:**

methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

**Suggested Books :**

4. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
5. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press.
6. Research Methodology – C.R.Kothari 4. Select references from the Internet

## Semester II

## General Proficiency

**Course Code: GP-201**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language

### Course Outcome:

- **Effective communication:** The ability to exchange ideas and information in a way that builds trust and respect
- **Critical and analytical thinking:** The ability to explore issues and ideas before forming a conclusion
- **Integrative thinking:** The ability to synthesize knowledge across different domains and perspectives
- **Preparing students to be engaged citizens:** Preparing students to participate in political culture and thrive in a rapidly evolving world

### Details of the Course:-

General language proficiency is the ability to read, write, listen, and speak in real-life situations. To test this, a test is usually developed for each skill with questions that are designed to imitate real life.

A syllabus is a guide to a course that includes course policies, rules, regulations, required texts, and a schedule of assignments and seminar.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER II**

### **Enterprenuership Development and Business Communication II**

**Course Code: GP-201a**

**Credit Units: 02**

**Pre-requisite:** Basic information of Enterprenuership Development

#### **Course Outcome:**

- To familiarize the students, and make them understand with key concepts and processes in entrepreneurship and business communication.
- To provide context to the processes in the form of differences between small and large firms, and the economic environment.
- To introduce key debates around entrepreneurship and small businesses.
- To impart knowledge on different extension methods and approaches used for transfer of agricultural technology.
- To impart skills required for entrepreneurship development among the students for self-employment.

#### **Details of the Course:-**

##### **Unit-I**

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy, and programs & institutions for entrepreneurship development.

##### **Unit-II**

Impact of economic reforms on Agribusiness/Agri-enterprises, Entrepreneurial Development Process.

##### **Unit-III**

Business Leadership Skills; developing organizational skills (controlling, supervising, problem-solving, monitoring & evaluation).

##### **Unit-IV**

Developing Managerial skills, Business Leadership Skills ( Communication, direction, and motivation skills), Problem-solving skills

##### **Unit-V**

Supply chain management & Total quality management, Project Planning Formulation & report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship & rural enterprise.

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER II**

### **Human Values and Moral Ethics II**

**Course Code: GP-201b**

**Credit Units: 02**

#### **Course Outcome:**

- Understanding life's purpose: Students become aware of their life's mission, vision, and goals.
- Developing virtues: Students learn to cultivate virtues and avoid vices.
- Understanding ethical personalities: Students learn to understand the metaphors of ethical personalities from various domains.
- Developing a positive outlook: Students develop a personality that allows them to view life in a positive way.
- Building strong relationships:

#### **Unit I : Morals, values, and ethics:**

This unit may cover topics such as integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty, courage, valuing time, cooperation, commitment, empathy, self-confidence, character, and spirituality

#### **Unit II : Engineering ethics:**

This unit may cover topics such as the senses of engineering ethics, moral issues, types of inquiry, moral dilemmas, moral autonomy, models of professional roles, engineering as experimentation, research ethics, codes of ethics, industrial standards, and a balanced outlook on law

#### **Unit III : Engineering ethics:**

This unit may cover topics such as the senses of engineering ethics, moral issues, types of inquiry, moral dilemmas, moral autonomy, models of professional roles, engineering as experimentation, research ethics, codes of ethics, industrial standards, and a balanced outlook on law

#### **Unit IV :Peer pressure, alcoholism, and drug abuse:**

This unit may cover topics such as ethical values, causes, impact, laws, prevention, and the ill effects of smoking

#### **Unit V : Global issues:**

This unit may cover global issues  
Indian and global case studies: This unit may cover Indian and global case studies

## **SEMESTER II**

### **Life Management II**

**Course Code: GP-201c**

**Credit Units: 02**

- Goal setting: How to set SMART goals that are specific, measurable, achievable, realistic, and have a time frame.
- Prioritization: How to prioritize tasks and effectively manage time.
- Stress management: How to manage stress and improve work-life balance.
- Organization: How to organize work and use organization tools.
- Delegation: How to delegate tasks and assignments.

## SEMESTER II

### Immunology & Immunotechnology Lab

Course Code: MMB-251

Credit Units: 02

**Pre-requisite:** Basic knowledge of immunology

**Course Outcome:**

- Students will be able to understand/experience the immune system.
- Students will be able to understand related immunological techniques and apply them in medical laboratory profession.
- Students will be able to value role of immune system in different diseases.

**Details of the Course:-**

Sl. No.	Contents	Contact Hours
1	To make blood smear, stain and identify different leukocytes.	3
2	Separation of serum and plasma from blood.	3
3	To determine haemoglobin estimation	3
4	To determine blood group by haemagglutination test	3
5	To perform RPR test for detection of Syphilis infection	3
6	To perform immunoprecipitation techniques- a) Double immunodiffusion b) Radial immuno diffusion	3
7	Qualitative estimation of <i>Salmonella</i> infection	3
8	To perform Widal tube test for quantitative determination of <i>Salmonella</i> infection	3
9	Separation of lymphocytes from blood	3
10	To determine concentration of antigen by rocket immunoelectrophoresis	3
11	To perform different types of ELISA for determination of antigen or antibody titer a) Indirect ELISA b) Direct ELISA c) Competitive ELISA	3
12	To perform western Blotting.	3
13	To perform dot blot assay.	3
	Total	39



**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Using Antibodies: A Laboratory Manual. Harlow & Lane (1998) Cold Spring Harbor Lab Press.	1998
	<b>Reference Books</b>	
1.	Immunological Techniques Made Easy. Cochet, et al (1998) Wiley Publishers, Canada	1998

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER II

### Molecular Biology & Recombinant DNA Technology Lab

Course Code: MMB-252

Credit Units: 02

**Pre-requisite:** Basic experience of molecular biology techniques

**Course Outcome:**

- Students will be able to isolate and analyze DNA/plasmid DNA and protein.
- Students will be able to digest and ligate the DNA molecules.
- Students will be able to design primers and amplification of DNA by PCR.
- Students will be able to learn the techniques of cloning gene in plasmid vectors.
- Students will be able to screen the positive transformants with the gene cloned through reporter based assays.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Isolation of Vector/plasmid DNA and its analysis	3
2	RNaseA digestion of isolated plasmid/vector DNA	3
3	Restriction digestion of DNA	3
4	Primer designing	3
5	Amplification of DNA by polymerase chain reaction	6
6	Ligation of DNA molecules	3
7	Competent cell formation	3
8	Transformation in <i>E. coli</i> .	6
9	Reporter gene assay for plasmid vectors	3
10	Expression of cloned gene in prokaryotic system	6

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Methods in yeast genetics: a Cold Spring Harbor Laboratory course manual. David C. Amberg, Daniel Burke, Jeffrey Strathern Cold Spring Harbor Laboratory Press, c2005 2005 ed.	2005
2.	Departmental Laboratory Manual	2018
<b>Reference Books</b>		
1.	Molecular Cloning- A Laboratory Manual: 3 <sup>rd</sup> Edition, 2001, Vol. 1 -3 . Sambrook J and Russell D.W.(2001 ). Cold spring Harbor Laboratory Press, New York.	2001
2.	DNA cloning: A Practical Approach. Glover and Hames ( 2001) Oxford Univ. Press.	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER II

### Mycology & Phycology Lab

Course Code: MMB-253

Credit Units: 02

**Pre-requisite:** Basic information of Fungus and Algae

#### Course Outcome:

After the successful completion of this course

- Students will be able to isolate fungi from soil.
- Students will be able to learn about the cultivation and preservation of fungi and algae.
- Students will be able to recognize the microscopic structure of fungi.
- Students will be able to know various properties of fungi and algae.

#### Details of the Course:-

S. No.	Contents	Contact Hours
1	To study the colony morphology and microscopy of fungi.	3
2	Sampling of fungi from soil and air.	3
3	Various enzymatic assays of fungi.	3
4	DNA isolation of fungi.	9
5	Antimicrobial activity of some medicinal plants against certain isolated fungi.	3
6	Isolation of fungal pathogen from plants.	3
7	Isolation and partial purification of enzymes.	3
8	Study of the following genera through temporary and permanent slides: <i>Volvox</i> , and <i>Nostoc</i> .	2
9	Study of the following genera through temporary and permanent slides: <i>Coleochaete</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> , <i>Polysiphonia</i> .	2

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Reference Books</b>		
1.	Introduction to Fungi 3 <sup>rd</sup> Edition. John Webster and Roland W.S. Weber (2007). Cambridge.	2007
2.	Alexopoulos C.J, Mims C.W. and Blackwell M.I 1996. Introductory Mycology. John Wiley and Sons Inc.	1996
3.	Kumar HD. (1990). Introductory Phycology. 2nd edition. Affiliated East Western Press.	1990
4.	Microbiology 5 <sup>th</sup> Edition. Prescott, L. M.; Harley, J.P. and Klein, D.A. (2003) McGraw Hill, USA.	2003

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER III**

### **Microbial Genetics**

**Course Code: MMB-301**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of microbial genetics

#### **Course Outcome:**

- Students will be able to understand the current status of microbial genetics.
- Students will be able to understand the relevance of microbial genetics in Life Sciences.
- Students will be able explain different mechanisms of transfer of genetic materials in prokaryotes.
- Students will be able identify and distinguish genetic regulatory mechanisms at different levels.
- Students will be able to understand life cycles of different phages.
- Students will be able to know about transposons and transcription.

#### **Details of the Course:-**

##### **Unit I: Historical Preview of Genetics:**

Mendelian principles and classical genetics, Genetic concepts, use of microorganisms in genetic studies. Chemical basis of heredity – early concepts of genes – discovery of the chemical basis of heredity - experimental evidences – contributions of Griffith, Avery, Hershey and Chase, Fraenkel – Conrat. Structure of nucleic acids – Structure of DNA and its elucidation, types and different models of DNA, extra- chromosomal DNA. Structure of RNA. Organization of genetic material -Genome organization in viruses, bacteria and eukaryotes. Structure of nucleosome, chromatin and chromosome. Concept of phenotype and genotype, monohybrid (law of dominance and segregation), dihybrid (law of independent assortment). Applications of Mendel principles.

##### **Unit II: Chromosomes and Genes:**

Cell division and Cell Cycle, chromosomal aberrations, karyotype analysis- normal and abnormal karoyotype. Neurospora- Tetrad analysis and linkage detection - 2 point and 3 point crosses, chromatid and chiasma interference, Mitotic recombination in Neurospora and Aspergillus. B) Algal Genetics: Chlamydomonas - unordered tetrad analysis - Recombination and Mapping, Nucleocytoplasmic interactions and gene expression in Acetabularia. Extra nuclear (Cytoplasmic) inheritance. Heterothalism and Parasexuality.

##### **Unit III: Perpetuation of genetic information:**

Replication of DNA, evidence of semi-conservative replication. Mechanism and enzymology of DNA replication. Regulation of DNA replication. Replication of RNA. Co-linearity between genes and proteins - Central dogma, experimental evidences, components of protein synthesis.

##### **Unit IV: Transcription and Translation:**

Biosynthesis of RNA in prokaryotes and eukaryotes, DNA dependent RNA polymerase, initiation, elongation and termination of transcription. Post transcriptional processing - removal of intron transcripts, addition of 5' cap and 3' poly A tail, processing of mRNA, rRNA and tRNA. Reverse transcription. Genetic code and translation – Elucidation and salient features of genetic code, wobble concept, triplet codon usage. Involvement of ribosome in

translation, ribosome structure, initiation, elongation and termination of polypeptide chain synthesis, extra ribosomal factors, ribosome cycle, post translation modifications of proteins.

**Unit IV: Regulation of gene expression:**

Enzyme induction and repression, constitutive expression and housekeeping genes, Operon concept, negative and positive regulation, catabolite repression, regulation of lac Operon, trp Operon, arabinose Operon, divergent Operon, attenuator regulation, translational regulation, feedback inhibition. Genetic recombination – in bacteria; transformation, competence, lysogeny, generalized and restricted transduction, conjugation, sexduction, genetic and fine structure mapping. Transposable elements – recombination in bacteria, yeasts, maize and drosophila. Mutations – Nature and types, mutagenic agents –Physical, Chemical and biological. Phage  $\mu$  mutagenesis, site directed mutagenesis. Detection of mutation – Ame’s test, Mutation in – yeast, neurospora and chlamydomonas.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Snyder L. and Chapness W. Molecular Genetics of Bacteria 2007.2. Birge EA. 1981. Bacterial and Bacteriophage Genetics. Springer Verlag.	1981
2.	Gardner JE, Simmons MJ & Snustad DP. 1991. Principles of Genetics. John Wiley& Sons.	1991
<b>Reference Books</b>		
1.	Lewin B.1999. Gene. Vols. VI, IX. John Wiley & Sons.	1999
2.	Maloy A & Friedfelder D. 1994. Microbial Genetics. Narosa.	1994

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER III**

### **Medical Microbiology**

**Course Code: MMB-302**

**Credit Units: 03**

**Pre-requisite:** Basic information of Medical Microbiology

#### **Course Outcome:**

Upon successful completion of this course the student will be able to:

- This course provides learning opportunities in the basic principles of medical microbiology and infectious disease.
- It covers mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- It also provides opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.
- Helps to understand the use of lab animals in medical field.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganisms' control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

#### **Details of the Course:-**

##### **UNIT I: General Microbiology:**

Morphology and classification of microorganisms. Growth, nutrition and multiplication of bacteria. Sterilization and Disinfection - Principles and use of equipment's of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptics and disinfectants. Immunology - antigen, Antibodies, Immunity, vaccines, types of vaccine and immunization schedule. Hospital acquired infection - Causative agents, transmission methods, investigation, prevention and control of hospital Acquired infections.

##### **UNIT II: Bacteriology:**

Classification of bacteria, morphology, infections, lab diagnosis, treatment and prevention of common bacterial infections. Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacterium, diphtheriae, Clostridia, Enterobacteriaceae-Shigella, Salmonella, Klebsiella, E.coli, Proteus, Vibrio cholerae, Pseudomonas and Spirochetes.

##### **UNIT III: Mycobacteriology & Parasitology:**



Mycobacteria- classification, pathogenesis, lab diagnosis and prevention. Classification, infections and lab diagnosis of following parasites. Entamoeba, Giardia, Malaria, Hookworm, Roundworm and Filarial worms.

**UNIT IV: Mycology:**

Morphology, disease caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi (Aspergillus, Zygomycetes and Penicillium).

**Unit V: Virology:**

General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Dengue, Influenza, Chikungunya, Rabies and Poliomyelitis.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Microbiology by Lansing M. Prescott and John P. Harley and Donald Klein; Ed. 6th; McGraw-Hill Science, 2004.	2004
2.	Allen and William M Janda and Paul C Schreckenberger and Washington C Winn; Ed. 6th; Lippincott Williams & Wilkins, 2005.	2005
<b>Reference Books</b>		
1.	Essentials of diagnostic microbiology by Lisa Anne Shimeld and Anne T. Rodgers; Delmar Publishers, 1999.	1999
2.	Medical Microbiology by Geo. Brooks and Karen C. Carroll and Janet Butel and Stephen Morse; Ed. 24th; McGraw-Hill Medical, 2007.	2007

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER III

### Bioinformatics

**Course Code: MMB-303**

**Credit Units: 03**

**Pre-requisite:** Basic Knowledge of computer application

**Course Outcome:**

- Students will be able to understand the structure and function of computers along with its application in solving Biotechnology problems.
- Students will acquire the ability to retrieve, use and apply tremendous knowledge present in various databases for research purpose.
- Students will be able to perform interspecies genome analysis and also understand the phylogenetic relationship between different species.
- Students will become familiar with various application tools available for various purposes like protein structure prediction, primer designing, nucleic acid structure prediction and molecular mapping and imaging.
- The knowledge of various data generation techniques & intervention of Bioinformatics into it, in the form of softwares for generating restriction map, chromatograms etc. will be imparted to students.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Basics of computer, input/ output tools; Application of computer in Biotechnology, Biological Databases for nucleic acids and proteins; Pubmed, NCBI and EBI. Retrieval of data from public Databases.	6
2	Bioinformatics resources on the internet Computational methods for sequence analysis; various approaches to nucleic acids and protein sequence analysis, Local and Global Alignment.	8
3	Genome Analysis and Gene Identification, Genome comparison and analysis; Phylogenetic Analysis, Comparative genomics and computers, Structural analysis of Nucleic acids	8
4	Application tools: Primer designing. Molecular imaging and design, Tools for molecular mapping, Protein Information Sources, PDB, SWISSPROT, TREMBL, Understanding the structure of each source and using it on the web. Prediction of 3- dimensional structure of proteins.	8
5	Introduction to Data generation Techniques and Bioinformatics Problem Posed by them- Restriction Digestion, Chromatograms, Blots, PCR, Microarrays, Mass Spectrometry.	8

**Suggested  
Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text/Reference Books</b>		
1.	Bioinformatics: Principles and Applications. Ghosh Z. and Bibekanand M., Oxford University Press, 2008.	2015
2.	Genome analysis and bioinformatics: a practical approach. T.R. Sharma, I.K. International Publishing House Pvt. Ltd., 2009.	2009
3.	Bioinformatics and Functional Genomics, Pevsner J. II Edition, Wiley-Blackwell, (2009).	2015
4.	Discovering Genomics, Proteomics and Bioinformatics, Campbell A. M., Heyer L. J., II Edition. Benjamin Cummings, 2006.	2006
5.	Bioinformatics: A practical guide to analysis of genes and proteins, Andreas D. Baxevanis, Wiley Student edition,	2006
6.	Bioinformatics, Sequence and genome analysis by David W. Mount, Second Edition, CSHL Press, 2004	2004

**Examination  
Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
<b>Weightage (%)</b>	10	20	10	60

**SEMESTER III**

**Environmental Microbiology**

**Course Code: MMB-304 a**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of environmental science.

**Course Outcome:**

- Students will be able to acquire knowledge about environmental pollution- sources, effects and control measures.
- Students will understand the concept of BOD and analyze the need for different waste water treatment methods.
- Students will be able to understand and implement the methods and importance of solid waste management.
- Students will be able to understand the application of bioreactors.
- Students will be able to apply their knowledge about toxic compounds degradation using microbes.
- Students will understand the role of biopesticides.
- Students will analyze the national and international concern for environment for protecting the environment and sustainable development.
- Students will be able to understand the global issues related to environmental pollution.

**Details of the Course:-**

**UNIT-I: Introduction to Microbial Ecology:**

Evolution of Life on Earth; History and scope of ecology, Concept of autecology, synecology, population, community, biome. Ecological succession. Microorganism in aquatic Environment: major physical and chemical factors (light, temperature, gases, nutrients). Aquatic biota: phytoplankton, zooplankton, benthos, periphyton, macrophytes. Biofilms, Production in lakes, rivers, estuaries and wetlands. Nutrient dynamics in lakes, rivers, estuaries and wetlands.

**UNIT-II: Aquatic Microbiology:**

Fresh and marine ecosystem (estuaries, mangroves, deep sea, hydrothermal vents, salt pans, coral reefs). Zonation of water ecosystem; upwelling, eutrophication; food chain in aquatic ecosystems. Role of methanotrophs in ecosystem. Potability of water, microbial assessment of water, water purification. Ground water types and their contamination. Biofilm. Waste treatment: Sewage and effluent treatment; Primary, secondary and tertiary treatment, Solid waste treatment. Solid wastes as sources of energy and food.

**UNIT-III: Aerobiology:**

Airspora in different layers of the atmosphere, bioaerosol, assessment of air quality using air sampler based principles of sedimentation, impaction, impingement, suction and filtration. Brief account of transmission of airborne microbes, indoor and outdoor microbial quality. Allergy: Causes and tests for detection of allergy. Endotoxin in air and its hazards. Molecular methods for air quality assessment. Historical development of space microbiology, Life detection methods a) Evidence of metabolism (Gulliver) b) Evidence of photosynthesis (autotrophic and heterotrophic)

**UNIT-IV: Role of microbes in degradation:**

Biodegradation of xenobiotic – hydrocarbons, pesticides and plastics. Biodeterioration of wood, pulp and paper; Biosorption/ bioaccumulation of heavy metal. Bioremediation of soil, air and water: various methods, advantages and disadvantages. Bioleaching of iron, copper, gold and uranium.

**UNIT-V: Global environmental problems:**

Ozone depletion, UV-B, greenhouse effect and acid rain, their impact and biotechnological approaches for management. . Containment of acidmine drainage applying biomining [with reference to copper extraction from low grade ores].

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1	Alan Scragg, Environmental Biotechnology, Second Edition, Oxford University Press.	2005
2.	J., Pichtel, Waste Management Practices: Municipal, Hazardous and Industrial, Taylor and Francis.	2005
3.	B.C. Bhattacharya & Ritu Banerjee Environmental Biotechnology, Oxford Press.	2007
4.	Shree Nath Singh, Microbial Degradation of Xenobiotics, Springer Science & Business Media.	2011

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
<b>Weightage (%)</b>	10	20	10	60

**SEMESTER III**

**Industrial Microbiology**



**Course Code: MMB-304 b**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of Industrial Microbiology.

**Course Outcome:**

- Students will be able to understand the technologies for microbial cell maintenance.
- Students will learn about bioprocess technology.
- Students will be able to understand fermenters.

**Details of the Course:**

**UNIT -1 Technology of Microbial Cell Maintenance**

Principles of Microbial growth, Methods to increase yield of microbes, Batch, fed- batch and continuous cultures (definition and kinetics). Strain preservation, maintenance and strain improvement by mutation of gene transfer processes. Microbial culture selection with high yield potential. Commercial Production of Microorganisms.

**UNIT -2 Production of Primary Metabolites**

A brief outline of processes for the production of some commercially important organic acids (e.g. citric acid, lactic acid, acetic acid etc.); amino acids (glutamic acid, phenylalanine, aspartic acid etc.) and alcohols (ethanol, butanol etc.)

**UNIT -3 Production of Secondary Metabolites**

Study of production processes for various classes of secondary metabolites: antibiotics: betalactams (penicillin, cephalosporin etc.), aminoglycosides (streptomycin etc.), macrolides (erythromycin), vitamins and steroids.

**UNIT -4 Design and construction of a Fermentors:**

Body construction; construction material; Aeration and agitation systems; Stirrer glands and bearings; Baffles; Valves and steam traps; Pressure- control valves; computer applications in fermentation technology; specialized bioreactors; membrane bioreactors; tower bioreactors; fluidized bed bioreactors; Immobilized system and packed bed reactors and Photobioreactors.

**UNIT -5 Production Modern Biotechnology Products**

Production of recombinant proteins having therapeutic and diagnostic applications, production of vaccines. Production of monoclonal antibodies. Products of plant and animal cell culture.

**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	W. Crueger and A. Crueger. Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.	2000
2.	P.F. Stanbury and A. Whitaker-Principle of Fermentation Technology; Pergamon Press	1988
3	A.H. Patel. Industrial Microbiology. 1st edition, Macmillan India Limited.	1996
<b>Reference Books</b>		
1.	L.E. Casida. Industrial Microbiology. 1st edition. Wiley Eastern Limited.	1991
2	M. L. Shuler and F. Kargi-Bioprocess Engineering: Basic Concepts” by, 2nd Edition, Pearson Education	2001

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
<b>Weightage (%)</b>	10	20	10	60

# Watershed Wastland Management

**Course Code: MMB-304c**

**Credit Units: 03**

## **Course Outcomes:**

- Restoring ecological balance
- Promoting economic development
- Improving the socio-economic condition of disadvantaged sections
- Generating employment
- Alleviating poverty
- Empowering the community

## **Details of Course**

### **Unit I: Watershed management**

The process of improving the quality of water and other natural resources in a watershed through land use and water management practices.

### **Unit II: Soil conservation**

Measures such as terracing, contouring, and mulching can help reduce soil erosion, improve soil health, and increase agricultural productivity.

### **Unit III: Groundwater recharge methods**

Methods to improve and increase the production of timbers, fodder, and wildlife resources.

### **Unit IV: Integrated watershed management**

A holistic plan that combines different practices such as agronomic, engineering, forestry, and community-based practices.

### **Unit V: Runoff and floods**

Changes in land use and climate change can significantly influence watershed hydrologic processes and water quality.

**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Singh, R.V. (2000). (Ed.) Watershed planning and management. Yash Publishing House, Bikaner, Rajasthan, India.	2000
2.	Raju, K.V., Aziz, A., Sundaram, M.S.S., Sekher, M., Wani, S.P. and Sreedevi, T.K. (2008). Guildelines for Planning and Implementation of Watershed Development Program in India: A Review. Global Theme on Agroecosystems Report 48. Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics.	1988
3	Sharma, R. (2002). Watershed Development Adaptation Strategy for Climate Change. Paper presented in South Asia expert	2002
<b>Reference Books</b>		
1.	Darvishan, K., Gholami, L., Ghorghi, J.H., Spalevic, V., Kord, A.K., Amini, M. (2016). Effect of exclosure on runoff, sediment	2016

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER III**

### **Biochemical Engineering**

**Course Code: MMB-304d**

**Credit Units: 03**

- Problem solving: Identifying, formulating, and solving complex engineering problems
- Engineering design: Applying engineering design to create solutions that meet needs while considering safety, public health, and other factors
- Communication: Communicating effectively with a variety of audiences
- Ethics: Recognizing ethical and professional responsibilities in engineering situations
- Teamwork: Functioning effectively in a team to establish goals & plan tasks.

#### **Unit I : Material and Energy Balance:**

Students learn the fundamental concepts of chemical engineering design and calculations.

#### **Unit II : Pollution control:**

Topics include air pollution, water pollution, solid waste management, and radioactive pollution.  
Process control, Biochemical engineering

#### **Unit III : Thermodynamics:**

A core topic in chemical engineering. Mass transfer: A core topic in chemical engineering.  
Chemical reactions: A core topic in chemical engineering. Instrumentation and process control  
Plant design and economics

#### **Unit IV : Mathematics:**

A common subject in chemical engineering, as engineers use math to make important decisions.  
Fluid mechanics and mechanical operations, Heat transfer

#### **Unit V : Chemical Reaction Engineering:**

A course that involves designing and analyzing chemical reactors. Students often find this course challenging because of the complex mathematical models required.

#### **Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Soil Microbiology by Prof. N.S. Subba Rao, Fourth edition, Oxford and IBH Publishing Co. Pvt, Ltd., New Delhi	2000
2.	Introduction to soil microbiology. Alexander M. (1977) John Wiley & Sons, Inc., New York.	1977
<b>Reference Books</b>		
1.	Modern Soil Microbiology, Dirk J, Elias V, Trevors JT, Wellington, EMH (1997) Marcel Dekker INC, New York	1997

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER III

### Agriculture Microbiology

**Course Code: MMB-305 a**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of Agriculture Microbiology.

#### **Course Outcome:**

- Students will be able to understand the microorganisms of soil and nutrient cycle.
- Students will learn about the role of enzymes and toxins in pathogenesis.
- Students will understand about the physical and chemical control of plant diseases.
- Students will learn about Biofertilizers & Mycorrhizae.

#### **Details of the Course:**

##### **UNIT-1**

Microorganisms of soil. Rhizosphere and phyllosphere microflora. Brief account of Microbial interactions: antagonism, symbiosis, mutualism, commensalisms, synergism and parasitism. Nutrient cycle: Carbon cycle, nitrogen cycle, phosphorous cycle and sulphur cycle.

##### **UNIT-2**

Role of enzymes and toxins in pathogenesis. Fungal diseases of plants: Rusts of wheat, linseeds; late blight of potato; red rot of sugarcane. Bacterial diseases of plants: Citrus canker, blight of rice. Viral diseases of plants: Leaf curl of Papaya, vein clearing of lady's finger.

##### **UNIT-3**

Physical and chemical control of plant diseases. Bacterial control of insect pests: *Bacillus thuringiensis* as bacterial insecticide. Viral control of insect pests: Nuclear polyhedrosis viruses (NPV) and cytoplasmic polyhedrosis viruses (CPV). Fungal control of insect pests: *Entomopathogenic fungi* : *Metarhizium anisopliae*, *Beauveria bassiana*, *Verticillium lecani*, *Hirsutella thompsoni*

##### **UNIT-4**

Storage fungi: Categories of storage fungi, conditions during storage in relation to damage of seeds, harmful effects. Mycotoxins and their effect on human being. General idea about quarantine. Production of biogas and alcohol from agricultural wastes.

##### **UNIT-5**

Biofertilizers: Types, production and application. Mycorrhizae: Types and their application in agriculture and forestry. Vermicomposting. Reclamation of waste agricultural land by microorganisms.

**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Soil Microbiology by Prof. N.S. Subba Rao, Fourth edition, Oxford and IBH Publishing Co. Pvt, Ltd., New Delhi	2000
2.	Introduction to soil microbiology. Alexander M. (1977) John Wiley & Sons, Inc., New York.	1977
	<b>Reference Books</b>	
1.	Modern Soil Microbiology, Dirk J, Elas V, Trevors JT, Wellington, EMH (1997) Marcel Dekker INC, New York	1997

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



**SEMESTER III**

**Food Microbiology**

**Course Code: MMB-305 b**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of food microbiology.

**Course Outcome:**

- Students will be able to know about the microorganisms important in food microbiology.
- Students would know about the factors influencing microbial growth in food.
- Students will understand various food borne diseases.
- Students will also have knowledge of microbiology of milk.
- Students will understand microorganisms as source of food.

**Details of the Course:**

**UNIT-1**

Microorganisms important in food microbiology: molds, yeast and bacteria – general characteristics, classification and importance. Principles of food preservation, preservation by use of high temperature, low temperature, drying and dessication. Chemical preservatives and additives. Preservation by radiation.

**UNIT-2**

Factors influencing microbial growth in food: Extrinsic and intrinsic factors. Microbial spoilage of food. Chemical changes caused by the microorganisms during spoilage. Spoilage of fish, meat, poultry, eggs, fruits and vegetables. Detection of spoilage and characterization.

**UNIT-3**

Classification of food borne diseases. Food borne infections: Brucella, Bacillus cereus, Clostridium perfringens, Yersinia enterocolitica and Escherichia, Salmonella spp. Food intoxication: Staphylococcal intoxication, Clostridial poisoning (Clostridium Botulinum). Food adulteration and prevailing food standards in India.

**UNIT-4**

Microbiology of Milk: Sources of microorganisms in milk and types of microorganisms in milk. Microbiological examination of milk (standard plate count, direct microscopic count, reductase, and phosphatase test). Dehydration and pasteurization of milk. Dairy products from microorganisms: Butter, yoghurt and cheese.

**UNIT-5**

Microorganisms as source of food: Single Cell Protein (SCP). Mushrooms and food value of mushrooms. Food conversions: Lactic acid conversions, soyabean conversions and Bakery. Microbiological estimation of food: Sample collection, preparation and analysis techniques.

**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Food science By Norman N. Potler, Joseph H. Hotchkiss. Fourth edition, CBS Publishers and Distributors, New Delhi	2006
2.	Food Microbiology , by William C. Frazier and Dennis C. Westhoff, Fourth edition, Tata McGrawHill Publishing Company Limited, New Delhi	1997-1979
3.	Modern Food Microbiology by James M. Jay, Fourth Edition, CBS Publishers and Distributors, New Delhi.	1959
4.	Bains W. Biotechnology from A to Z. Oxford Univ. Press.	1993
<b>Reference Books</b>		
1.	Introduction to Food Biotechnology. Author; Perry Johnson.	2002

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
<b>Weightage (%)</b>	10	20	10	60

**SEMESTER III**

**Agricultural Journalism**

### **Course Outcomes**

- Students will understand and analyze the current events and issues that are occurring in agriculture.
- Students will understand and analyze how current events and issues affect your future in agriculture.
- Students will be able to recognize and examine the relationships between inputs and outputs in their agricultural field to make effective and profitable decisions.

### **Unit I: Print Journalism. Introduction to journalism:**

basic terminology: history of Indian press and printing: printing processes; attributes of a reporter: news syndicates and agencies: concept, sources and elements of news: press releases: flash messages: kinds of feature: feature, article and editorial writing: types and sources of editorials: principles of editing; heading writing; illustrations; principles of design and layout; brief introduction to recent trends in mass media; cultural imperialism, media activism, agenda setting, gate keepin.

### **Unit II: Online Journalism. Introduction to online journalism:**

basic terminology; a technical history of the web and early online media; comparative media characteristics (Print and online); online writing and story structure; issues in online research and information gathering; concept of interactive and its tools; ethical dilemmas in online journalism; blogging and participatory journalism; issues concerning blogging; online advertising; virtual community formation v/s atomization; massification v/s individuation of news; understanding difference between web edition and e-edition of newspapers; extensions of new media e.g. RSS feeds, podcasting and wireless paper; convergence.

### **Unit III: Media Planning and Advertising.**

Introduction to advertising, its origin and growth; terminology; advertising – its classification, objectives, strategies at different levels and its future; marketing mix, promotional mix and the communication process; structure of advertising industry – advertising agencies; advertising coverage; types of advertising media; advertising codes, regulations and ethics; consumer redressal forums; advertising and social issues; controversial advertising; issues concerning surrogate advertising; constructing an advertisement; types of consumers and buying motives; media selection and scheduling; difference between advertising and PR; media planning and buying; brand positioning.

### **Unit IV: Agricultural and Development Journalism.**

Meaning, scope and importance of development journalism; problems of rural development; development agencies; development media theory and 3 democratic participant theory; dominant paradigm v/s participatory approach; human development index; making sense of development statistics; determinates of development; nation building and uplifting quality of life; agriculture and rural development schemes; agricultural news story structure, agricultural media dynamics and ethics; editing scientific papers, policy reports; public understanding and media coverage of environmental issues; use of traditional media; rural press; contribution of vernacular press; role of IT in agricultural and rural development; Right to communicate and News World Communication Order; WTO.

### **Unit IV: Ethics.**

Ethical reporting, code of ethics; social responsibility; invasion of privacy; sting operations and ethical

issues; organizational pressures in media ethics; fundamental rights, especially freedom of speech and expression; freedom and accountability of press; laws in India; official secrecy; laws of sedition; defamation, libel and slander; contempt of court; contempt of legislature; privileges of the parliament and press; press council and press commission; copyright laws; registration of journals; Information Technology Act 2000 and cyber Right to Information Act 2005; media's role promotion of human right; editor's freedom; case studies.

### Suggested Readings:

1. Nelson, William; Doerfert, David; Meyers, Courtney; Baker, Matt; Akers, Cindy; Yamada, Masaru; Nanseki, Teruaki; Roberts, Owen (2014-12-01). "An Examination of the International Federation of Agricultural Journalists' Involvement in Agriculture Knowledge Mobilization". *Journal of Applied Communications*. 98 (4). doi:10.4148/1051-0834.1095. ISSN 1051-0834.
2. ^ Marti, Donald B. (1980). "Agricultural Journalism and the Diffusion of Knowledge: The First Half-Century in America". *Agricultural History*. 54 (1): 28–37. ISSN 0002-1482. JSTOR 3742591.
3. ^ Scruggs, C. G.; Moseley, Smith W. (1979). "The Role of Agricultural Journalism in Building the Rural South". *Agricultural History*. 53 (1): 22–29. ISSN 0002-1482. JSTOR 3742856.
4. ^ Shulman, Stuart W. (1999). "The Progressive Era Farm Press: A Primer on a Neglected Source of Journalism History". *Journalism History*. 25 (1): 26–35. doi:10.1080/00947679.1999.12062507. ISSN 0094-7679.
5. ^ Pawlick, Thomas (2001). *The Invisible Farm: The Worldwide Decline of Farm News and Agricultural Journalism Training*. Rowman & Littlefield. ISBN 978-0-8304-1582-3.
6. ^ Reisner, Ann; Walter, Gerry (1994-09-01). "Journalists' views of advertiser pressures on agricultural news". *Journal of Agricultural and Environmental Ethics*. 7 (2): 157–172. doi:10.1007/BF02349035. ISSN 1573-322X.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER III**

### **Poultry Production & Management**

**Course Code: MMB-305d**

**Credit Units: 03**

#### **Course Outcomes:**

- Students will be able to know about the importance and contribution of poultry in meat sector in India as well as whole world.
- Students will be able to recognize different characteristics Indian and foreign breeds of chicken.
- Student will be able to learn different aspects of poultry such as its management of chicks, broiler and layer, their feeding and water requirement and feed manufacturing.
- Student will be able to learn about various environmental conditions and different equipment used to maintain those conditions.
- Student will get information related to housing requirement of poultry such as floor space, different housing system their advantages and disadvantages.
- Student will be able to know about various disease and vaccination which are used for poultry at different stage of their life.

#### **Detail of the course:**

##### **Unit 1 Indian poultry Industry**

Importance of poultry farming and poultry development in India. Present status and future prospectus of poultry Industry. Classification of poultry based on genetics Utility

##### **Unit -2 Scientific Poultry Keeping**

Modern breeds of Chicken. Present day egg production lines- meat production lines. Mini breeds- dwarfism in mini-Leghorns

##### **Unit-3 Diversified Poultry**

Ducks and Geese-classification- rearing system-classification-advantage. Guinea fowls - guinea fowl farming in India-Production-varieties. Emu-rearing- Economical aspects-commercial products

##### **Unit-4 Desi Chickens:**

Indigenous breeds and economical aspects of desi chicken. Indigenous breeds-Aseel-Chittagong-Kadaknath-Bursa.Improved varieties in India Giriraja-Vanaraja-Girirani-Kalinga brown, Gramapriya,Swarnandhra

##### **Unit -5 Breeds from Central Avian Research Institute – Izatnagar**

CARI Nirbheek - CARI- Shyama-HITCARI (Naked Neck Cross).CARI- Priya Layer, CARI- Sonali Layer,

CARIBRO-VISHAL, CARI-RAINBRO, Nandanam chicken-I, Nandanam Chicken-II, Nandanm-Quail

**Suggested books:**

1. Text Book of Poultry Science, P V Sreenivasaiah, Write and Print Publications, ISBN No. 9788192970592, 8192970590
2. Poultry Science Practices, Nilothpal Ghosh, CBS Publication & Distributions, 2015
3. Principles of Poultry Science, 1996, CAB Publishers, ISBN 9780851991221
4. A Text Book of Animal Husbandry, C. C. Banerjee, Oxford and IBH, Publish Co, ISBN: 9788120412606

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

**Semester III**

## Seminar & Research Orientation III

Course Code: SM-301

Credit Units: 02

### Course Outcomes:

- Describe the measurable skills, abilities, knowledge or values.
- Students should be able to demonstrate as a result of a completing a course.
- They are student-centered rather than teacher-centered.
- They describe what the students will do, not what the instructor will teach.

### Detail of the course

**Research methods:** Lectures, seminars, and practical exercises that cover themes like what constitutes scientific knowledge

**Research problems:** How to identify and work through research problems

**Primary and secondary sources:** How to become familiar with sources and critique them, and how to research secondary sources

**Research databases:** How to use research database tools

**Research proposals:** How to prepare preliminary interdisciplinary research proposals

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

SEMESTER III



## Research Methodology III

**Course Code: SM-301a**

**Credit Units: 02**

### **Course Outcomes:**

- Students who complete this course will be able to understand and comprehend the basics in research methodology
- And applying them in research/ project work.
- This course will help them to select an appropriate research design.

### **Detail of the course:**

#### **Unit I : Foundations of Research:**

Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance.

#### **Unit II : Research Design:**

Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.

#### **Unit III : Measurement:**

Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio. Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.

#### **Unit IV : Data Analysis:**

Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association. Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism. 9. Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline.

## **Unit V: Use of tools / techniques for Research:**

methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

### **Suggested Books :**

7. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
8. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press.
9. Research Methodology – C.R.Kothari 4. Select references from the Internet

**Course Code: GP-301**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language

**Course Outcome:**

- Effective communication: The ability to exchange ideas and information in a way that builds trust and respect
- Critical and analytical thinking: The ability to explore issues and ideas before forming a conclusion
- Integrative thinking: The ability to synthesize knowledge across different domains and perspectives
- Preparing students to be engaged citizens: Preparing students to participate in political culture and thrive in a rapidly evolving world

**Details of the Course:-**

General language proficiency is the ability to read, write, listen, and speak in real-life situations. To test this, a test is usually developed for each skill with questions that are designed to imitate real life.

A syllabus is a guide to a course that includes course policies, rules, regulations, required texts, and a schedule of assignments and seminar.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER III**

### **Enterprenuership Development and Business Communication III**

**Course Code: GP-301a**

**Credit Units: 02**

**Pre-requisite:** Basic information of Enterprenuership Development

#### **Course Outcome:**

- To familiarize the students, and make them understand with key concepts and processes in entrepreneurship and business communication.
- To provide context to the processes in the form of differences between small and large firms, and the economic environment.
- To introduce key debates around entrepreneurship and small businesses.
- To impart knowledge on different extension methods and approaches used for transfer of agricultural technology.
- To impart skills required for entrepreneurship development among the students for self-employment.

#### **Details of the Course:-**

##### **Unit-I**

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy, and programs & institutions for entrepreneurship development.

##### **Unit-II**

Impact of economic reforms on Agribusiness/Agri-enterprises, Entrepreneurial Development Process.

##### **Unit-III**

Business Leadership Skills; developing organizational skills (controlling, supervising, problem-solving, monitoring & evaluation).

##### **Unit-IV**

Developing Managerial skills, Business Leadership Skills ( Communication, direction, and motivation skills), Problem-solving skills

##### **Unit-V**

Supply chain management & Total quality management, Project Planning Formulation & report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship & rural enterprise.

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER III**

### **Human Values and Moral Ethics III**

**Course Code: GP-301b**

**Credit Units: 02**

#### **Course Outcome:**

- Understanding life's purpose: Students become aware of their life's mission, vision, and goals.
- Developing virtues: Students learn to cultivate virtues and avoid vices.
- Understanding ethical personalities: Students learn to understand the metaphors of ethical personalities from various domains.
- Developing a positive outlook: Students develop a personality that allows them to view life in a positive way.
- Building strong relationships:

#### **Unit I : Morals, values, and ethics:**

This unit may cover topics such as integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty, courage, valuing time, cooperation, commitment, empathy, self-confidence, character, and spirituality

#### **Unit II : Engineering ethics:**

This unit may cover topics such as the senses of engineering ethics, moral issues, types of inquiry, moral dilemmas, moral autonomy, models of professional roles, engineering as experimentation, research ethics, codes of ethics, industrial standards, and a balanced outlook on law

#### **Unit III : Engineering ethics:**

This unit may cover topics such as the senses of engineering ethics, moral issues, types of inquiry, moral dilemmas, moral autonomy, models of professional roles, engineering as experimentation, research ethics, codes of ethics, industrial standards, and a balanced outlook on law

#### **Unit IV :Peer pressure, alcoholism, and drug abuse:**

This unit may cover topics such as ethical values, causes, impact, laws, prevention, and the ill effects of smoking

#### **Unit V : Global issues:**

This unit may cover global issues  
Indian and global case studies: This unit may cover Indian and global case studies

## **SEMESTER III**

### **Life Management III**

**Course Code: GP-301c**

**Credit Units: 02**

- Goal setting: How to set SMART goals that are specific, measurable, achievable, realistic, and have a time frame.
  - Prioritization: How to prioritize tasks and effectively manage time.
  - Stress management: How to manage stress and improve work-life balance.
  - Organization: How to organize work and use organization tools.
- Delegation: How to delegate tasks and as

### SEMESTER III

### Microbial Genetics Lab

**Course Code: MMB-351**

**Credit Units: 02**

**Pre-requisite:** Basic information of Microbial Genetics.

**Course Outcome:**

After completion of the course the students will be able to

- Learn about principle and working of laboratory instruments.
- Acquire a comprehensive knowledge on techniques followed in study of genetic mutation.
- Become familiar with technical requirements, concepts and general procedures in molecular biology and implement the knowledge in research work.
- Learn and implement different strategies to isolate genomic and plasmid DNA from cells.
- Learn the methods of DNA transformation, transduction and conjugation for future recombinant techniques.

**Details of the Course:-**

Note: A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by college according to facilities available.

S. NO.	CONTENTS	CONTACT HOURS
1	Inactivation of microorganisms by different mutagens.	3
2	Production, isolation and characterization of mutants.	3
3	Determination of mutation rate.	3
4	Isolation, characterization and curing of plasmids.	3
5	Preparation of competent cells.	3
6	Transformation of <i>E.coli</i> using plasmid DNA.	3
7	Demonstration of genetic recombination in bacteria by conjugation.	3
8	To isolate total RNA and mRNA from bacteria.	3
9	To isolate and produce UV induced auxotrophic mutants by replica plating method.	3



**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
	<b>Reference Books</b>	
1	Snyder L. and Chapness W. Molecular Genetics of Bacteria 2007.	2007
2	Birge EA. 1981. Bacterial and Bacteriophage Genetics. Springer Verlag.	1981
3	Maloy A & Friedfelder D. 1994. Microbial Genetics. Narosa.	1994

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER III

### Medical Microbiology Lab

**Course Code: MMB-352**

**Credit Units: 02**

**Pre-requisite:** Basic information of Medical Microbiology.

#### **Course Outcome:**

Upon successful completion of this course the student will be able to:

- This course provides learning opportunities in the basic principles of medical microbiology and infectious disease.
- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- It also provides opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

#### **Details of the Course:-**

S. No.	Contents	Contact Hours
1	Preparation and sterilization of different culture media (e.g. Blood agar, chocolate agar, nutrient agar, nutrient broth, McConkey agar).	3
2	To obtain pure cultures from the given microbial culture by streak plating and spread' plating techniques.	3
3	To carry out different Gram staining of the given bacterial culture.	3
4	To demonstrate motility in the given bacterial culture using the Hanging Drop method.	6
5	To carry out Zeihl-Nelson staining to detect acid fast bacteria in the given sputum sample.	3
6	To determine the antibiotic sensitivity profile of the given microbial culture using Kirby-Bauer method.	6
7	To carry out the following biochemical tests: Catalase test, Urease test, Indole test, Methyl red test, Voges-Prauskauer test, Citrate test, Lysine iron agar, Triple sugar iron, Sugar fermentation tests (glucose, maltose, sucrose).	6
8	To prepare temporary mounts from cultures/clinical specimens and observe permanent slides of the following: <i>Rhizopus, Mucor, Aspergillus fumigates, Aspergillus flavus, Candida albicans, Blastomyces dermatidis, Penicillium marneffeii, Nocardia, Histoplasma capsulatum</i>	3

**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Ananthanarayan R. and Paniker C.K.J. Textbook of Microbiology. 8th edition, University Press Publication	2009
2.	Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication	2013
3.	Goering R., Dockrell H., Zuckerman M. and Wakelin D. Mims' Medical Microbiology. 4 <sup>th</sup> edition. Elsevier	2007
4.	Willey JM, Sherwood LM, and Woolverton CJ. Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education	2013

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER III

### Bioinformatics Lab

**Course Code: MMB-353**

**Credit Units: 02**

**Pre-requisite:** Basic Knowledge of computer application.

**Course Outcome:**

- Students will be able to understand basics of internet and computers along with information on various databases.
- Students will be able to understand application of bioinformatics in biotechnology.
- Students will be able to understand sequence alignment and various algorithms for it.
- Students will be able to understand and interpret sequence annotation and its retrieval.
- The information about various biologically important databases will be made available to students.

**Details of the Course:-**

**Note:** A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by college according to facilities available.

S. NO.	CONTENTS	CONTACT HOURS
1	Introduction to various databases of proteins, nucleic acids. Primary, secondary and composite databases.	3
2	BLAST, FASTA, DOT PLOT.	3
3	MSA using various free tools.	3
4	Phylogenetic predictions.	3
5	Prediction of structure of proteins and nucleic acids.	3
6	ORF prediction and its validation.	3
7	Primer designing.	3
8	Restriction mapping.	3
9	Epitope prediction using various online tools.	3
10	Data mining tool and its practical applications in a case study.	3

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text/Reference Books</b>		
1.	Bioinformatics: Principles and Applications. Ghosh Z. and Bibekanand M., Oxford University Press, 2008.	2015
2.	Genome analysis and bioinformatics: a practical approach. T.R. Sharma, I.K. International Publishing House Pvt. Ltd., 2009.	2009
3.	Bioinformatics and Functional Genomics, Pevsner J. II Edition, Wiley-Blackwell, (2009).	2015
4.	Discovering Genomics, Proteomics and Bioinformatics, Campbell A. M., Heyer L. J., II Edition. Benjamin Cummings, 2006.	2006
5.	Bioinformatics: A practical guide to analysis of genes and proteins, Andreas D. Baxevanis, Wiley Student edition,	2006
6.	Bioinformatics, Sequence and genome analysis by David W. Mount, Second Edition, CSHL Press, 2004	2004

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER IV**

### **Project/Dissertation**

**Course Code: MMB-401**

**Credit Units: 16**

#### **Course Contents:**

- Six Months of Fourth Semester of the M.Sc. Curriculum is devoted to project/dissertation.
- Students, with the help of their mentor and faculty colleagues will identify a lab in India & abroad for the research work.
- The student should stay for a minimum prescribed Semester period at the place of work.
- Students not staying for the prescribed period will be marked absent as per the University Rules.
- At the end of their project the students shall submit the dissertation as per the Guidelines prescribed below.

#### **The Aims of the Project**

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award a M.Sc. Degree.

#### **Objectives**

- To provide the students an opportunity to demonstrate the ability to devise, select and use a range of methodologies appropriate to the chosen topic of research.
- To allow students to show the application of skills of data collection, critical analysis and concept synthesis necessary for formation of defensible conclusions and/or recommendations.
- To allow students the opportunity to demonstrate ability to draw appropriate conclusions argued from the evidence presented. [Should the research produce negative or inconclusive results, the conclusions should be critically examined to ascertain the reasons].
- To provide a forum to demonstrate the skills of structuring and present a balanced informed, complete, clear and concise written argument.

#### **Dissertation Guidelines**

##### **The Dissertation Topic**

It is important to distinguish here between „dissertation topic“ and „dissertation title“. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally the topic is expected to be:

- Relevant to Microbiology;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to the knowledge of students;
- Value and interest to the students and their personal and professional development.

### **Dissertation format**

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, name of the student, name of degree and the date of submission.
- Second page should contain the certificate received from the organization/University from where the student has completed his/her project work.
- The next page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of graphs, figures and tables giving legends and page numbers.
- Next to follow should be following in the sequence given below:
  - Abbreviations used (if any)
  - Introduction
  - State-of-Art
  - Material & Methods
  - Results
  - Discussion
  - Summary (approximately 500 words)
  - Conclusion
  - Future Prospects
- References: After this concluding chapter, students should give a list of all the references they have used. These should be cross - references with the text. For articles from journals, the following details are required e.g.

Schlöter M, Assmus B and Hartmann A (1995) the use of immunological methods to detect and identify bacteria in the environment. *Biotech Adv* 13: 75-90

For books, the following details are required

Bahera BK and Varma A (2003) Green Energy from Waste Biomass, Capital Book Company, New Delhi, India

For book chapter

Mukherji KG, Mandeep and Varma A (1998) Mycorrhizosphere microorganisms: screening and evaluation. (Ed) Varma A. In: Mycorrhiza Manual. Springer-Verlag, Germany, pp 85-97

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.
- List of Publications (if any) by the students should be attached in the end.

### **Guidelines for the assessment of the dissertation**

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the materials & methods employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?

### **Examination Scheme:**

<b>Components</b>	<b>Theme of Project</b>	<b>Quality of Project</b>
<b>Weightage (%)</b>	<b>30</b>	<b>70</b>





# **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

**School of Biological Engineering and Sciences**

**Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Science (B.Sc.) Three Year Programme**

**Semester Pattern**

**(w.e.f. session 2017-18)**

**Revised and approved in the year 2020 (13<sup>th</sup> meeting of Board of Studies)**

**(Scheme & syllabus from 2020-2024)**

## **PEOs: Program Educational Objectives POs: Program Outcomes PSOs: Program Specific Outcomes**

**Name of the Department:** Department of Microbiology

**Name of the Program:** B.Sc. Microbiology

**Duration of the degree:** 3 Years

Microbiology programme endeavors to instill in students the skills to identify individual microbial species, use aseptic techniques to grow them in pure culture, safely handle and examine them by microbiological methods. The knowledge of microbiology will enable the students to improve the quality of human lives in relation to environment, fighting disease and to exploit microbes in the production of food. Microbiology plays a key role in genetic engineering and other modern biotechnologies such as antibiotic production and the exploitation of new sources of food and energy. The regimens for this program are specifically designed to allow students to fulfill below program educational objectives:

### **Program Educational Objectives (PEOs)**

**PEO 1:** The graduates will learn the importance of microorganisms in environment, brewing, food processing and preservation, pharmaceuticals and biotechnology industries.

**PEO 2:** The graduates will be provided with understanding of healthcare systems especially in pathological, immunological and environmental monitoring laboratories.

**PEO 3:** The graduates will demonstrate the skills necessary to understand and apply scientific concepts and reasoning, including the analysis and interpretation of various types of data.

### **Program Specific Outcomes (PSOs)**

#### **Students who graduate with a Bachelor of Science in Microbiology will**

**PSO 1:** Acquire knowledge on fundamentals of Microbiology.

**PSO 2:** Understand details of bacterial, fungal, algal and viral morphology and physiology.

**PSO 3:** Competently be able to cultivate and characterize bacterial and fungal forms.

**PSO 4:** Grasp the fundamental concepts of immunity and the contribution of organs and cells in the development of immune response.

**PSO 5:** Gain insight into the various aspects of microbial genetics.

**PSO 6:** Be proficient on cloning vectors and rDNA technology.

**PSO 7:** Assimilate technical skills on microbial genetics and molecular biology.

**PSO 8:** Realize the application oriented aspects of Microbiology.

**PSO 9:** Understand the concepts and development of microbial diseases in animals & plants.

**PSO 10:** Realize the principles of prevention and treatment of microbial diseases.

## **Program Outcomes Objectives (POOs)**

**Upon completion of B.Sc. Microbiology programme, the students will be able to:**

**POO 1:** demonstrate advanced knowledge and understand the central facts and concepts of microbiology.

**POO 2:** acquire knowledge and understanding of organism biology and genetics, evolution, molecular biology and basic biological chemistry.

**POO 3:** instill the intellectual skills to analyze and solve biology-related problem, formulate and test hypothesis using experimental design.

**POO 4:** demonstrate an understanding of professional ethics in science and of the principles that can guide ethical decision-making in biological controversies.

**POO 5:** explore the scientific literature effectively and use computational tools.

**POO 6:** communicate ideas and principles effectively through oral presentations, computer based tools and written reports.

**POO 7:** manage resources, time and work independently as well as in multi-disciplinary team towards a common goal/outcome.

# Course Components of Academic Programme

## B.Sc. (Microbiology)

Minimum Duration : 6 Semesters (3 Years)

Maximum Duration : 8 Semesters (4 Years)

Total Number of Credits : 149 Credits

Course Components		Credits
<b>1.</b>	<b><u>Compulsory Course</u></b>	
I.	Foundation Course (FC)	00
II.	Core Course (CC)	86
<b>2.</b>	<b><u>Elective Course</u></b>	
I.	Departmental Electives (GE, DE)	34
II.	Interdepartmental Electives (IE)	04
<b>3.</b>	<b><u>Discipline-Centric Ability Enhancement Course</u></b>	
I.	Seminar (SM)	05
II.	Project (PJ)/ Dissertation (DS)	06
III.	Skill (SEC) and Ability Enhancement Course (AEC)	08
IV.	Comprehensive (CM)	00
<b>4.</b>	<b><u>General Course</u></b>	
I.	Human Values, Health Care and Professional Ethics (HP)	00
II.	Healthy Living and Fitness (HF)	00
III.	Disaster Management (DM)	00
IV.	General Proficiency (GP)	06
<b>5.</b>	<b><u>Audit Course</u></b>	

**Requirement of Awards of Degree: - Total Credits: - 149; CGPA $\geq$ 4.5 and any other conditions as per regulation and ordinances.**

**Summary Sheet B.Sc.**

**(Microbiology)**

<b>Semester</b>	<b>Credit</b>				<b>Total</b>
	<b>CC</b>	<b>DCAEC (AEC/SK/SM/PJ)</b>	<b>DE/IE</b>	<b>GC</b>	
I	12	03	08	01	24
II	12	03	06	01	22
III	18	03	04	01	26
IV	18	03	04	01	26
V	20	01	04	01	26
VI	06	06	12	01	25
<b>Total</b>	<b>86</b>	<b>19</b>	<b>38</b>	<b>06</b>	<b>149</b>

**Core Courses: CC**

**Discipline-Centric Ability Enhancement Course: DCAEC Ability**

**Enhancement Course: AEC**

**Skill Course: SEC Departmental**

**Electives: DE General Course: GC**

**Interdepartmental Electives: IE**

**B.Sc. (Microbiology)  
PROGRAMME STRUCTURE**

**FIRST SEMESTER**

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
BMB-101 / <b>BMB-101 a/ BMB-101 b</b>	Cell Biology/ Introductory Biology /Fundamentals of Biology	CC	3	1	0	4
BMB-102	Inorganic & Physical Chemistry	CC	3	1	0	4
BMB-103	Computer Fundamentals	GE	2	0	0	2
BMB-104	Ecology & Environment Management	GE	3	1	0	4
PC-101/ <b>PC-101 a/ PC-101 b</b>	Professional Communication/ Personality Development/Personal Grooming	AEC	2	0	0	2
BMB-151	Cell Biology Lab	CC	0	0	2	2
BMB-152	Inorganic & Physical Chemistry Lab	CC	0	0	2	2
BMB-153	Computer Fundamentals Lab	GE	0	0	2	2
SM-101/ <b>SM-101 a</b>	Seminar/Ethics of Research	SM	0	0	1	1
GP-101 / <b>GP-101 a/ GP-101 b</b>	General Proficiency-I/ Physical Education & Yoga/Health & Nutrition	GP	0	0	1	1
	<b>TOTAL</b>					<b>24</b>

**SECOND SEMESTER**

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
BMB-201/ <b>BMB-201 a/ BMB-201 b</b>	Organic & Analytical Chemistry/Observational Chemistry/Basic & Applied Chemistry	CC	3	1	0	4
BMB-202 / <b>BMB-202 a/ BMB-202 b/ BMB-202 c</b>	Elements of Biochemistry/ Fundamentals of Biochemistry/Introductory Human Physiology/Chemicals and Health	CC	3	1	0	4
BMB-203 / <b>BMB-203 a/ BMB-203 b/ BMB-203 c</b>	Introduction to General Microbiology/ Elements of Microbiology/Chemical Microbiology/Microbial Technology	GE	3	1	0	4
BMB-204 / <b>BMB-204 a</b>	Career Skills/ Life Skills	AEC	2	0	0	2
BMB-251	Organic & Analytical Chemistry Lab	CC	0	0	2	2
BMB-252	Elements of Biochemistry Lab	CC	0	0	2	2
BMB-253	Introduction to General Microbiology Lab	GE	0	0	2	2
SM-201	Seminar	SM	0	0	1	1
GP-201	General Proficiency-II	GP	0	0	1	1
	<b>TOTAL</b>					<b>22</b>

**THIRD SEMESTER**

<b>Course Code</b>	<b>Course Title</b>	<b>Component</b>	<b>(L)</b>	<b>(T)</b>	<b>(P)</b>	<b>Credits</b>
BMB-301/ <b>BMB-301a/</b> <b>BMB-301b/</b> <b>BMB-301c</b>	Microbial Genetics/Inheritance & Evolutionary Microbiology/Microbiological Basis of Inheritance/Food Engineering	CC	3	1	0	4
BMB-302/ <b>BMB-302a</b>	Bacteriology & Virology/Global Ecology	CC	3	1	0	4
BMB-303/ <b>BMB-303a</b>	Mycology & Phycology/Public health & pandemics	CC	3	1	0	4
BMB-304	Biofertilizers and Biopesticide	SEC	2	0	0	2
BMB-305/ <b>BMB-305a</b>	Biomathematics and Biostatistics/Elementary Mathematics	GE	3	1	0	4
BMB-351	Microbial Genetics Lab	CC	0	0	2	2
BMB-352	Bacteriology & Virology Lab	CC	0	0	2	2
BMB-353	Mycology & Phycology Lab	CC	0	0	2	2
SM-301	Seminar	SM	0	0	1	1
GP-301/ <b>GP-301a/</b> <b>GP-301b</b>	General Proficiency-III/Psychology/Sociology	GP	0	0	1	1
	<b>TOTAL</b>					<b>26</b>

**FOURTH SEMESTER**

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
BMB-401 / BMB-401a/ BMB-401b/ BMB-401c	Molecular Biology/Economic Biology/Gender Studies/International Business in Dairy Science	CC	3	1	0	4
BMB-402/ BMB-402a BMB-402b/ BMB-402c/ BMB-402d	Immunology/Anthropology/Neurobiology/Nanotechnology/Aerobiology	CC	3	1	0	4
BMB-403/ BMB-403a BMB-403b	Microbial Physiology & Metabolism/Entomology /Agrostology	CC	3	1	0	4
BMB-404/ BMB-404a/ BMB-404b	Pharmaceutical Microbiology/Medicinal Microbiology/Epidemiology	SEC	2	0	0	2
BMB-405 / BMB-405 a	I.P.R., Bioethics & Biosafety/ Biogeography	IE	3	1	0	4
BMB-451	Molecular Biology Lab	CC	0	0	2	2
BMB-452	Immunology Lab	CC	0	0	2	2
BMB-453	Microbial Physiology & Metabolism Lab	CC	0	0	2	2
SM-401	Seminar/	SM	0	0	1	1
GP-401/ GP-401a	General Proficiency-IV/Animal Behavior	GP	0	0	1	1
	<b>TOTAL</b>					<b>26</b>

**FIFTH SEMESTER**

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
BMB-501 / BMB-501 a	Medical Microbiology/ Medicinal Microbiology	CC	3	1	0	4
BMB-502 / BMB-502 a	Recombinant DNA Technology/ Microbial Technology	CC	3	1	0	4
BMB-503 BMB-503a	Bio-Analytical Tools/Instrumentation	CC	3	1	0	4
BMB-504 / BMB-504 a	Food and Dairy Microbiology/ Palaeontology	DE	3	1	0	4
BMB-551	Medical Microbiology Lab	CC	0	0	2	2
BMB-552	Recombinant DNA Technology Lab	CC	0	0	2	2
BMB-553	Bio-Analytical Tools Lab	CC	0	0	2	2
BMB-554	Food and Dairy Microbiology Lab	CC	0	0	2	2
SM-501	Seminar	SM	0	0	1	1
GP-501	General Proficiency-V	GP	0	0	1	1
	<b>TOTAL</b>					<b>26</b>

**SIXTH SEMESTER**

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
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<b>BMB-601/ BMB-601 a/ BMB-601 b</b>	Microbiological Analysis of Air and Water/Hospital Management/Soil & Water Microbiology	DE	3	1	0	4
<b>BMB-602/ BMB-602 a BMB-602 b</b>	Marine Microbiology/Veterinary Science/Biodiversity	CC	3	1	0	4
<b>BMB-603/ BMB-603a/ BMB-603b</b>	Bioinformatics/Developmental biology and embryology/Population biology	DE	3	1	0	4
BMB-651	Microbiological Analysis of Air and Water Lab	DE	0	0	2	2
BMB-652	Marine Microbiology Lab	CC	0	0	2	2
BMB-653	Bioinformatics Lab	DE	0	0	2	2
BMB-604	Project/Dissertation	PJ	0	0	6	6
GP-601	General Proficiency-VI	GP	0	0	1	1
	<b>TOTAL</b>					<b>25</b>

#### **Project/Dissertation**

**Note:** Students must submit their project report in June /July and the same would be evaluated for 6 credit units, which would be included in the Sixth Semester marks.

#### **Examination Scheme:**

<b>Components</b>	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	<b>EE</b>
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER I**

### **Cell Biology**

**Course Code: BMB-101**

**Credit Units: 04**

**Pre-requisite:** Basic information of Cell Biology

**Course Outcome:**

- Basic chemical composition of living matter.
- Structural characteristics of prokaryotic and eukaryotic cells.
- Taxonomy and characteristics of the major kingdoms.
- Mechanics of membrane transport.
- Basic concepts of bioenergetics, photosynthesis, and cellular respiration.
- Mechanics of cellular reproduction.
- Mendelian genetics and genetic change.
- Nucleic acids and basic concepts of protein synthesis and gene regulation.

**Details of the Course:-**

**UNIT I: Cell:**

Introduction and classification of organisms by cell structure, cytosol, Compartmentalization of eukaryotic cells, cell fractionation Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model

**UNIT II: Cell Membrane and Permeability:**

Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport. Sex-limited and sex-influenced inheritance, Transposons. Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments

**UNIT III: Endoplasmic reticulum:**

Endoplasmic reticulum: Structure, function including role in protein segregation.  
Golgi complex: Structure, biogenesis and functions including role in protein secretion.  
Lysosomes: Vacuoles and micro bodies: Structure and functions Ribosomes: Structures and function including role in protein synthesis.

**UNIT IV: Mitochondria:**

Structure and function, Genomes, biogenesis. Chloroplasts: Structure and function, genomes, biogenesis. Nucleus: Structure and function, chromosomes and their structure. Extracellular Matrix: Composition, molecules that mediate cell adhesion

**UNIT V: Membrane receptors:**

For extra cellular matrix, macromolecules, regulation of receptor expression and function. Signal transduction. Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Molecular Biology of cell, 4 <sup>th</sup> ed. Alberts, Bruce ( <i>et.al</i> ) (2002) Garland Science Publishing, New York.	2002
2.	Cell Biology- Smith and Wood by Chapman and Hall. Cell Biology: Organelle structure and function, Sadava, D E. (2004) Panima pub., New Delhi. Cell and Molecular Biology, 8 <sup>th</sup> ed. Robertis, Edp De and Robertis Emf De (2002) Lippincott Williams and Wilkins Pvt. Ltd., (International Student Edition) Philadelphia.	2004, 2002

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Introductory Biology**

**Course Code: BMB-101a**

**Credit Units: 04**

#### **Course Objectives:**

- To introduce students to the fundamental concepts of biology.
- To provide an understanding of the structure and function of cells and organisms.
- To explore the principles of genetics, evolution, ecology, and diversity of life.
- To develop an appreciation for the role of biology in everyday life and its applications in health, medicine, and environmental science.

#### **Unit 1: Introduction to Biology and the Scientific Method**

- Definition and scope of Biology
- Branches of Biology: Molecular Biology, Genetics, Ecology, Evolution, and Physiology
- The scientific method: Observations, Hypothesis, Experimentation, Data analysis, and Conclusion
- Basic laboratory techniques and safety measures

#### **Unit 2: Cell Biology**

- Structure of cells: Prokaryotic vs. Eukaryotic
- Functions of cellular components (e.g., nucleus, mitochondria, ribosomes, endoplasmic reticulum, Golgi apparatus)
- The Plasma Membrane: Structure and function
- Cellular processes: Diffusion, osmosis, active transport
- Cell division: Mitosis and Meiosis

#### **Unit 3: Biochemistry and Biomolecules**

- Atoms and molecules: Elements, compounds, and chemical bonds
- Water and its properties
- Major biological molecules: Carbohydrates, proteins, lipids, nucleic acids
- Enzyme structure and function
- Metabolism: Cellular respiration and photosynthesis

#### **Unit 4: Genetics**

- Mendelian genetics: Laws of inheritance, dominant and recessive traits
- DNA structure and function
- Gene expression: Transcription and translation
- Genetic variation: Mutations and genetic recombination
- Principles of heredity and modern genetics

## Unit 5: Evolution and Natural Selection

- The theory of evolution: Charles Darwin's contribution
- Mechanisms of evolution: Natural selection, genetic drift, gene flow, mutation
- Evidence for evolution: Fossils, comparative anatomy, molecular biology
- Speciation and adaptation

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Molecular Biology of cell, 4 <sup>th</sup> ed. Alberts, Bruce (et.al) (2002) Garland Science Publishing, New York.	2002
2.	Cell Biology- Smith and Wood by Chapman and Hall. Cell Biology: Organelle structure and function, Sadava, D E. (2004) Panima pub., New Delhi. Cell and Molecular Biology, 8 <sup>th</sup> ed. Robertis, Edp De and Robertis Emf De (2002) Lippincott Williams and Wilkins Pvt. Ltd., (International Student Edition) Philadelphia.	2004, 2002

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

# Fundamentals of Biology

Course Code: BMB-101b

Credit Units: 04

## Course Objectives:

- To provide students with a basic understanding of biological principles.
- To explore the structure and function of living organisms at the molecular, cellular, and systemic levels.
- To introduce fundamental concepts in genetics, evolution, ecology, and human biology.
- To foster scientific inquiry and an appreciation for the relevance of biology in daily life, health, and the environment.

## Unit 1: Introduction to Biology and the Scientific Method

- Overview of biology and its branches (molecular biology, genetics, ecology, physiology, etc.)
- The role of biology in understanding life and solving global challenges.
- The scientific method: Observation, hypothesis formation, experimentation, and data analysis.
- Laboratory safety and basic laboratory techniques.

## Unit 2: Basic Biochemistry

- Elements of life: Atoms, molecules, and chemical bonds.
- Water properties and importance in biological systems.
- Macromolecules: Carbohydrates, proteins, lipids, and nucleic acids.
- Enzymes: Structure, function, and their role in metabolism.

## Unit 3: Cell Structure and Function

- The cell theory: All living organisms are made up of cells.
- Prokaryotic vs. Eukaryotic cells.
- Organelles and their functions: Nucleus, mitochondria, ribosomes, endoplasmic reticulum, Golgi apparatus.
- The plasma membrane: Structure and function.
- Cellular transport: Diffusion, osmosis, active transport.

## Unit 4: Cell Division and Genetics

- Mitosis: Stages of cell division, significance, and regulation.
- Meiosis: Differences between meiosis and mitosis, genetic diversity.
- Basics of inheritance: Mendel's Laws, dominant and recessive traits.
- DNA structure and function: The double helix, replication, and transcription.
- Gene expression: Transcription and translation processes.

## Unit 5: Evolutionary Biology

- The theory of evolution by natural selection (Charles Darwin).
- Evidence supporting evolution: Fossil records, comparative anatomy, molecular biology.
- Adaptation and survival in changing environments.
- The concept of speciation and evolutionary processes.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Molecular Biology of cell, 4 <sup>th</sup> ed. Alberts, Bruce (et.al) (2002) Garland Science Publishing, New York.	2002
2.	Cell Biology- Smith and Wood by Chapman and Hall. Cell Biology: Organelle structure and function, Sadava, D E. (2004) Panima pub., New Delhi. Cell and Molecular Biology, 8 <sup>th</sup> ed. Robertis, Edp De and Robertis Emf De (2002) Lippincott Williams and Wilkins Pvt. Ltd., (International Student Edition) Philadelphia.	2004, 2002

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER I

### Inorganic & Physical Chemistry

**Course Code: BMB-102**

**Credit Units: 04**

**Pre-requisite:** Basic information of Chemistry

#### **Course Outcome:**

- Understand periodic properties and its application in the characterization of chemical compounds
- Understand the various properties of materials depending upon bond formation.
- Utilize the concept of hardness in the purification of water for industrial and domestic purpose
- Distinguish the rate laws and application to different chemical reaction mechanism
- Learn and apply the concepts of analytical chemistry for sample analysis by chemical methods
- Learn the basic concepts of Chemistry and its application in different fields

#### **Details of the Course:-**

##### **UNIT I: Periodic Properties:**

Position of elements in the periodic table, effective nuclear charge, atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination, trends in periodic table and applications in predicting and explaining the chemical behavior.

##### **UNIT II: Atomic and Molecular Structure:**

VSPER theory and its application for structure of  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{H}_2\text{O}$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SO}_2$  and  $\text{XeF}_4$   
Molecular Orbital Theory, Formation of homo and heteronuclear diatomic molecules  
Hydrogen Bonding and its application  
Metallic Bonding (Band theory); role of doping  
Coordination compounds: Introduction, Werner's coordination theory, naming of compounds.

##### **UNIT III: Water Chemistry:**

Hardness of water and its measurement, Softening of water by L-S process, Zeolite process and Reverse osmosis process, Ion Exchange process, Calgon Process, Numerical problems based on L-S Process, Zeolite Process and hardness of water.



**UNIT IV: Chemical Kinetics:**

Ionic reactions and molecular reactions, Molecularity and Order of reactions, Integrated equations of 1st, 2nd and zero order reactions, Activation Energy and Activated complexes, numerical problems based upon them.

**UNIT V: Analytical Chemistry:**

Qualitative and Quantitative Chemistry, Volumetric and Gravimetric Analysis; Principles of Volumetric Analysis; Concept of pH, buffer, Henderson equation, Concept of strength and concentration of solution; Normality, Molarity, Molality and interconversion of strength Titration-Principles and Classification: Redox, Acid-Base, Complexometric, Redox and Precipitation, Oxidation Number and calculation of oxidation number in compounds.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
	<b>Reference Books</b>	
1.	Inorganic Chemistry, J.D.Lee	2008
2.	Fundamentals of Analytical Chemistry, Skoog and West	2013
3.	Physical Chemistry, Atkins	2009

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Computer Fundamentals**

**Course Code: BMB-103**

**Credit Units: 02**

**Pre-requisite:** Basic knowledge of Computer application

#### **Course Outcome:**

A student who successfully fulfills the course requirements will be able to

- be able to define and appropriately use information technology terms;
- be able to identify computer hardware components and describe their function;
- be able to describe the essential elements of the computer's architecture and discuss how this architecture functions;
- be able to describe the characteristics and representations of data, and interpret and compare data in different representations;
- be able to identify and describe telecommunication components;
- be able to describe the characteristics of operating systems and compare different operating systems;
- be able to use a hypertext markup language to produce basic Web documents;
- be able to discuss the general trends in technologies including examples of leading edge developments;
- be able to compare the roles of different sectors of the information technology.

#### **Details of the course: -**

##### **Unit I: Computer Basics:**

Introduction, Characteristics of a Computer, Criteria for Using Computers, History of Computers, Generations of Computer, Classification of Computers, Applications of Computer, Basic Components of PC, Computer Architecture.

##### **Unit II: Number Systems:**

Introduction, Classification of Number System, Types of Number System, Conversions from One Base to Another, Conversion using Shortcut Method.

### Unit III: Hardware and Software:

Introduction, Computer Memory, Secondary Memory, Computer Peripherals, Output Devices, Software requirements.

Windows XP: Introduction, Features, Comparison between Professional and Home edition, Windows XP installation, Activating Windows XP, Security features of Windows XP, Accessing User Accounts, and Getting Help.

### Unit IV: MS Word:

Introduction, Windows 2007 Interface, Customizing the Word Application, Document Views, Basic Formatting in MS Word 2007, Advanced Formatting, Navigating through a Word Document, Performing a Mail Merge, A Quick Look at Macros, Printing Documents, Print Preview.

Excel 2007: Introduction, Workbook, Worksheet, Formatting in excel, Advanced formatting in Excel, Working with formulas, Printing worksheets.

MS PowerPoint: Introduction, Creating a Presentation, Basic Formatting in PowerPoint, Advanced Formatting, Using Templates, Inserting charts, Inserting tables, Printing presentations.

### Unit V: Security and Networking:

Introduction, Simple File Sharing, Internet Information Services, Peer to Peer Networking

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1	Norton, Peter, "Introduction to Computers", McGraw-Hill.	2005
2	Rajaraman, V., "Fundamentals of Computers", PHI.	2005
3	PK SINHA "Computer Fundamentals", BPB	Fourth edition
4	Yashwant Kanetker, "Let us C",BPB.	2005

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Ecology and Environment Management**

**Course Code: BMB-104**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of Environmental science

#### **Course Outcome:**

- Students will be able to understand the importance of environment.
- Be able to explain the development of ecosystem, concept of biodiversity and energy and nutrient pathway.
- Students will be able to understand ecological sustainability, ecological efficiencies, homeostasis and limiting factors.
- Students will gain new insights about different remediation procedures.
- Students will be able to use critical thinking skills related to hazardous wastes, pesticides, metals, radiations etc. and its impact on health.
- Students will be able to apply the knowledge of scientific methods to solve environmental problems.

#### **Details of the course:**

##### **UNIT-I:**

Our Environment: Geological consideration of Atmosphere, Hydrosphere, Lithosphere. Basic concepts of Ecology: Development of Ecosystem, major divisions of ecology, Auto ecology of species, population structure and dynamics.

##### **UNIT II:**

Structure and function of ecosystem. Strata of an ecosystem. Energy transfer in an Ecosystem. Food chain, food web, Energy budget, Production & decomposition in a system. Ecological efficiencies.

##### **UNIT III:**

Trophic structure & ecological pyramids, Bio-geochemical cycles (N, C, and P cycles). Cybernetics & Homeostasis, Environmental monitoring and impact assessment.

##### **UNIT-IV:**

Radiation and chemical toxicology: Radiation ecology, chemical toxicants, ecotoxicology. Detection of Environmental pollutant. Indicators & detection systems.

## UNIT-V:

Environmental biotechnologies, Biotechnologies in protection and preservation of environment- case studies. Bioremediation, Waste disposal.

### Suggested Books:

1. P.D. Sharma. (2011). Ecology and Environment. 11th edition.
2. Rastogi Publication. Chapman, J.L., Reiss, M.J. 1999. Ecology: Principles and applications (2<sup>nd</sup> edition) Cambridge, University Press.
3. Divan Rosencraz, Environmental laws and policies in India, Oxford Publication.
4. Ghosh, S.K., Singh, R. 2003. Social forestry and forest management. Global Vision Publishing House.
5. Joseph, B., Environmental studies, Tata Mc Graw Hill.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Professional Communication**

**Course Code: PC-101**

**Credit Units: 02**

**Pre-requisite:** Basic information of English Language & Communication

#### **Course Outcome:**

- Sharpen grammatical skills of the students, to facilitate easy choice of available options.
- Construct the vocabulary of the students to assist them acquire plethora of knowledge of foreign as well as indigenous languages.
- Demonstrating advanced relationship building skills through written communication.
- Exhibit competent writing that is reasonably proficient in correct grammar and sentence structure skills.
- Develop an understanding of effective nonverbal expressions, etiquette and interpersonal skills to instill confidence in students.
- Improve awareness regarding the factors at play when communicating with audience of diverse backgrounds in the global business environment.

#### **Details of the Course:-**

##### **Unit I: Functional Grammar:**

Parts of speech, Tenses, Voice.

##### **Unit II: Basic Vocabulary Building:**

List of commonly used conversational words. Indianism: Exposure to common words in Indian English and with natives of English. Pronunciation of some common words.

##### **Unit-III: Written communication:**

Application and Business letter, Memorandum & Report.

##### **Unit-IV: Analytical Skills:**

Para jumbles, Analogy

## Unit V: Basic Presentation Skills

Role plays based on body language, Role plays based on dining, telephone and social etiquette.

### Suggested Books:

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books/ Reference Books</b>	
1.	Michael Swan” Practice English Usage”, Oxford University press 3rd Edition	2006
2.	Chetananand Singh “ English is Easy ,BSC Publishers 2 <sup>ND</sup> Edition	2009

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Personality Development**

**Course Code: PC-101a**

**Credit Units: 02**

#### **Course Objectives:-**

The **Course Objectives** for a **Personality Development program** are designed to focus on the specific skills and attributes that students will develop throughout the course. These objectives guide students toward becoming well-rounded individuals, enhancing their personal, professional, and social capabilities. Below are key course objectives for a Personality Development program:

#### **Unit 1: Introduction to Personality Development**

- **Definition of Personality**
  - Nature vs. Nurture in Personality Development
  - Key factors influencing personality: Genetics, Environment, Experience
- **Importance of Personality in Life**
  - How personality affects personal and professional life
  - Building self-confidence and self-esteem
  - Role of first impressions

#### **Unit 2: Self-Awareness and Self-Improvement**

- **Understanding Self-Awareness**
  - Self-assessment tools (e.g., SWOT Analysis)
  - Identifying strengths and weaknesses
- **Personal Reflection**
  - Journaling exercises for introspection
  - Identifying personal values and goals
- **Setting Personal Development Goals**
  - SMART Goals (Specific, Measurable, Achievable, Relevant, Time-bound)
  - Action plan and progress tracking

#### **Unit 3: Communication Skills**

- **Verbal Communication**
  - Art of speaking clearly and effectively
  - Expanding vocabulary and improving pronunciation
  - Public speaking and addressing an audience
  - Developing persuasive communication skills
- **Non-Verbal Communication**
  - Importance of body language, posture, gestures, and facial expressions
  - Eye contact and its significance



- Developing emotional intelligence through non-verbal cues
- **Active Listening**
  - Techniques for effective listening
  - Overcoming barriers to listening
  - Empathy in communication

#### **Unit 4: Building Self-Confidence and Self-Esteem**

- **Confidence vs. Arrogance**
  - Understanding the difference
  - Exercises to boost self-confidence (positive affirmations, body language)
- **Handling Criticism and Rejection**
  - Developing resilience and emotional strength
  - Managing failure and learning from mistakes
- **Public Speaking and Presentation Skills**
  - Overcoming the fear of public speaking
  - Structuring effective presentations
  - Engaging the audience through storytelling

#### **Unit 5: Emotional Intelligence**

- **Understanding Emotional Intelligence (EQ)**
  - The five components of EQ: Self-awareness, Self-regulation, Motivation, Empathy, Social skills
- **Managing Emotions**
  - Techniques for emotional regulation (e.g., mindfulness, stress management)
  - Overcoming negative emotions (anger, anxiety, frustration)
- **Empathy and Social Skills**
  - Building empathy for better relationships
  - Understanding and responding to the emotions of others

#### **Unit 6: Interpersonal Skills and Relationships**

- **Building Positive Relationships**
  - The importance of trust and respect in relationships
  - Effective conflict resolution techniques
  - The art of networking and making connections
- **Teamwork and Collaboration**
  - Working effectively in teams
  - Understanding different personalities and adapting
  - Leadership vs. followership
- **Etiquette and Manners**
  - Basic manners and social etiquette
  - Professional etiquette for workplace and business settings
  - Dining etiquette and cultural sensitivity

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60

## SEMESTER I

### Personal Grooming

Course Code: PC-101b

Credit Units: 02

- **Objective:** Students will develop the necessary soft skills for career success, including networking, personal branding, interview techniques, and the ability to handle workplace challenges. They will also learn how to balance professional ambitions with personal fulfillment.
- **Outcome:** Graduates will be **career-ready**, equipped with the skills and confidence needed to succeed in their chosen professions, achieve career advancement, and maintain a fulfilling life balance.

#### Unit 1: Introduction to Personal Grooming

- Definition of Personal Grooming and its Importance
- Self-Image and Confidence
- Building a Grooming Mindset: How Grooming Affects Perception
- Psychological Aspects of Grooming: How Grooming Impacts Social and Professional Interactions
- The Role of Personal Grooming in Career Success

#### Practical Activities:

- Self-assessment exercises: Evaluate current grooming habits.
- Reflection: How grooming influences personal and professional life.

#### Unit 2: Personal Hygiene and Self-Care

- Basic Hygiene: Skincare, Haircare, Nailcare

- Oral Hygiene and Breath Care
- The Importance of Regular Baths and Clean Clothing
- Choosing the Right Skincare Products for Different Skin Types
- The Role of Sleep, Exercise, and Nutrition in Grooming

**Practical Activities:**

- Personal hygiene routine practice
- Demonstration of proper skincare, hair care, and nail care routines
- Discussing and practicing good sleep habits and nutrition for skin health

**Unit 3: Dress Code and Personal Styling**

- Dress Code: Understanding Different Occasions (Casual, Business Casual, Formal)
- Dressing for Your Body Type: Clothing Styles that Suit Different Figures
- Color Theory: Understanding the Right Colors for You
- Choosing the Right Fabrics and Accessories
- The Importance of Fit: Tailoring and Alterations
- Professional Dressing: How to Dress for Interviews, Office, and Business Meetings
- Casual Grooming: Dressing for Social and Informal Events

**Practical Activities:**

- Wardrobe assessment and organizing clothing
- Creating and evaluating outfits for different occasions
- Personal styling sessions: Understanding how to mix and match
- Makeup and grooming for different occasions

**Unit 4: Haircare and Hairstyles**

- Haircare Basics: Types of Hair and the Right Products
- Understanding Haircuts and Hairstyles for Different Face Shapes
- Hair Coloring, Conditioning, and Styling Techniques
- The Role of Hair in Personal Grooming: Professional vs Casual Styles
- Daily Hair Care Routine: How to Maintain Healthy Hair

**Practical Activities:**

- Hair consultation and analysis (types of hair, suitable hairstyles)
- Demonstration of quick, easy, and professional hairstyles
- Self-care tips for healthy hair

**Unit 5: Grooming for Men and Women**

- Gender-Specific Grooming: Grooming Essentials for Men vs. Women
- Men’s Grooming: Skincare, Haircare, and Facial Hair Grooming
- Women’s Grooming: Skincare, Makeup, and Haircare
- Nail Care: Manicure and Pedicure Basics
- Choosing Perfumes and Fragrances

### **Practical Activities:**

- Hands-on workshops: Manicure, pedicure, and facial grooming for both men and women
- Grooming demonstrations for different gender-specific needs
- Makeup basics for women: Everyday look vs. Professional look

## **Unit 6: Body Language, Posture, and Communication**

- The Role of Body Language in Grooming
- Posture: How to Stand, Walk, and Sit with Confidence
- Gestures, Eye Contact, and Facial Expressions
- Verbal and Non-Verbal Communication: Voice Modulation and Listening Skills
  - How to Improve First Impressions through Body Language and Communication

### **Practical Activities:**

- Body language exercises: Posture correction and confidence-building exercises
- Practice verbal communication and listening skills
- Role-playing: Professional and casual conversations, first impressions

## **Unit 7: Professional Etiquette and Social Manners**

- Introduction to Professional Etiquette
- Workplace Behavior: Punctuality, Respect, and Responsibility
- How to Greet People: Handshakes, Bowing, and Other Gestures
- Dining Etiquette: Business Lunches and Formal Events
- Meeting Etiquette: Greetings, Small Talk, and Networking
- Etiquette for Digital Communication (Emails, Video Calls, Social Media)
- Handling Criticism and Compliments Gracefully

## **Recommended Textbooks and Reading Material**

1. **“Research Ethics: A Philosophical Guide to the Responsible Conduct of Research”** by Gary Comstock
  - A comprehensive introduction to the ethical principles and practices in research.
2. **“The Ethics of Research with Human Subjects”** by Thomas A. Schwandt
  - Focuses on the ethical issues in human research, with practical examples.
3. **“Ethical Issues in Research”** by William P. L. M. Ritchie
  - Covers a wide range of ethical dilemmas across different research domains.
4. **The Belmont Report: Ethical Principles and Guidelines for the Protection of Human Subjects of**

**Research (1979)**

- A foundational document outlining ethical guidelines for human subject research.

5. **“Scientific Integrity”** by Frances M. H. Wang

- A guide to understanding research integrity, misconduct, and ethical decision-making.

6. **Examination Scheme:**

7.

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60

**SEMESTER I**

**Cell Biology Lab**

**Course Code: BMB-151**

**Credit Units: 02**

**Pre-requisite:** Basic information of Cell Biology

**Course Outcome:**

- Students will learn about the varieties of plants and their diversity.
- Students will gain a comprehensive knowledge on categories of plants and apply the same in identification of monocots and dicots
- Students will become familiar with plant cell anatomy.
- Students will be able to learn about the functioning of plant cell and understand their importance in plant life.
- Students will be able to implement different strategies to test the present of storage food material in plant parts.
- Students will be able to understand the methods of solute and solvent uptake in plant cells and their role in life processes.
- Students will be able to analyze the mechanism of transpiration by different plants.
- Students will be able to learn the mechanism underlying seed growth and development.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Study the effect of temperature and organic solvents on semi permeable membrane.	2
2	Demonstration of dialysis.	2
3	Study of plasmolysis and de-plasmolysis.	2
4	Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.	2
5	Study of structure of any Prokaryotic and Eukaryotic cell Microtomy: Fixation, block making, section cutting, double staining of animal tissues like liver, oesophagus, stomach, pancreas, intestine, kidney, ovary, testes	2
6	Cell division in onion root tip/ insect gonads.	2
7	Preparation of Nuclear, Mitochondrial & cytoplasmic fractions.	2

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60

## SEMESTER I

### Inorganic & Physical Chemistry Lab

**Course Code: BMB-152**

**Credit Units: 02**

**Pre-requisite:** Basic information of Chemistry

#### Course Outcome:

- Understand the volumetric analysis
- Analyze the water quality parameter.
- Determine viscosity, surface tension and their applications.
- Estimate the constituents in ores and bleaching powder sample.

#### Details of the Course:-

S. No.	Contents	Contact Hrs.
1	To determine the alkalinity of the given water sample containing carbonate ( $\text{CO}_3^{2-}$ ) ions and bicarbonate ( $\text{HCO}_3^-$ ) ions by titrating it against standard HCl solution [N/10] using phenolphthalein and methyl orange as indicators.	2
2	To determine the alkalinity of the given water sample containing carbonate ( $\text{CO}_3^{2-}$ ) ions and hydroxide ( $\text{OH}^-$ ) ions by titrating it against standard HCl solution [N/10] using phenolphthalein and methyl orange as indicators.	2
3	To determine the chloride ion ( $\text{Cl}^-$ ) content in the given water sample by Argentometric method (Mohr's method) using N/50 $\text{AgNO}_3$ as a standard solution and potassium chromate ( $\text{K}_2\text{CrO}_4$ ) as an internal indicator.	2
4	To determine the temporary and permanent hardness of given water sample by titrating it against standard solution of M/100 Ethylene Diamine Tetra acetic Acid (EDTA) using Eriochrome black-T (EBT) as an internal indicator.	2
5	To determine the coefficient of viscosity of the given sample solution by Ostwald's viscometer (Viscosity of water = 0.0101 Poise).	2
6	To determine the ferrous ion ( $\text{Fe}^{++}$ ) content in given sample solution of Mohr's salt ( $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ ) by titrating it against standard N/30 potassium dichromate ( $\text{K}_2\text{Cr}_2\text{O}_7$ ) solution by using potassium ferricyanide $\text{K}_3[\text{Fe}(\text{CN})_6]$ as an external indicator.	2
7	To determine the surface tension of the given sample solution by drop number method.	2

8	To determine the percentage of available chlorine in the given sample of 1 gram bleaching powder by titrating it against standard solution of N/25 sodium thiosulphate ( $\text{Na}_2\text{S}_2\text{O}_3$ ) using starch ( $\text{C}_6\text{H}_{10}\text{O}_5$ ) <sub>n</sub> as an internal indicator.	2
9	To determine the equivalent weight of iron by chemical displacement method using standard solution of N/25 sodium thiosulphate ( $\text{Na}_2\text{S}_2\text{O}_3$ ) and starch ( $\text{C}_6\text{H}_{10}\text{O}_5$ ) <sub>n</sub> as an internal indicator. (The equivalent weight of copper is 63.5).	2
10	To determine the Copper ( $\text{Cu}^{++}$ ) ion content in the given sample of copper ore (blue vitriol) by titrating it against standard N/30 sodium thiosulphate solution using KI and starch as indicator by Iodometric titration.	2

### Suggested Books:

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Sunita Rattan, "Practical Chemistry", S.K. Kataria & Sons Delhi, Indi, 2 <sup>nd</sup> Edition (2009)	2009
2.	Shashi Chawala, "Practical Chemistry", Dhanpat Rai and Company, India 3 <sup>rd</sup> Edition (2012)	2012

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
<b>Weightage (%)</b>	10	20	10	60



**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Reference Books</b>	
1.	Experiments in Plant Physiology: A Laboratory Manual. Bajracharya, D., Narosa publishers, New Delhi	1999
2.	Practicals in Plant Physiology and Biochemistry. Bala, M. Gupta, S. , Gupta N.K. and Sangha, M.K. , Scientific Publishers, India	2016

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER I

### Computer Fundamentals Lab

Course Code: BMB-153

Credit Units: 02

**Pre-requisite:** Basic knowledge of Computer application

**Course Outcome:**

- Students will learn to execute internal and external commands.
- Students will also be able to understand basic computer applications practically.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Execute "Internal & External Commands" in MS-DOS.	2
2	Create any 3 ".txt" files in MS-DOS and Copy the contents of two files in one single file.	2
3	Create the "directory structure" in MS-DOS.	2
4	In MS-DOS, Change the dos prompt: With your name, current date, current time, change the prompt to its original path.	2
5	Create one MS-word file having name "INTRODUCTION" and apply "center alignment", Make the heading bold, Italic and underlined and do apply font style of heading as —ALGERIAN   and size —24   by including fields like: Name, Permanent Address, Current Address, Educational Qualification, Hobbies, and Aim etc. Insert table for "educational Qualification".	2
6	Create one MS-Word File for drawing a flow chart to calculate "Simple Interest", using shapes.	2
7	Create a table in MS-Excel having name BCA having fields: S.No, Student Name, sub1_marks, sub2_marks, sub3_marks, sub4_marks. Calculate the "sum" and "percentage" of all the students. Also draw "pie chart" for showing the student percentage.	2
8	Create one MS-excel for a "Automobile Garage" by having fields like "year", "Sale", "Car Name". Draw a "column chart" for year and Sale.	2
9	Create "Attendance letter" for class MCA and send this letter at the address of all the MCA students using "Mail Merge" option.	2
10	Create a Power Point presentation with the main title "INTERNET ". Also add the following topics like: HISTORY OF THE INTERNET, INTERNET TERMS, and ADAVANTAGES OF THE INTERNET in Slides.	2

**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Norton, PEsEr, —Introduction to Computers, McGraw-Hill.	2011
2.	\Leon, Alexis & Leon, Mathews, —Introduction to Computers, Leon Tech World.	2012
3.	Yashwant Kanetker, —Let us Cl,BPB.	2010
4.	Rajaraman, V., —Fundamentals of Computers,PHI.	2011
5.	Rajaraman, V., —Computer Programming in Cl,PHI.	2012

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER I**

### **Ethics of Research**

**Course Code: SM-101a**

**Credit Units: 02**

#### **Course Outcomes (COs):**

By the end of the **Ethics of Research** course, students will be able to:

1. Understand the core ethical principles that govern research practices.
2. Identify and resolve ethical issues in research scenarios.
3. Apply ethical guidelines for informed consent and participant privacy in human research.
4. Make ethical decisions based on ethical frameworks and critical analysis.
5. Evaluate and ensure ethical treatment of animal subjects in research.
6. Recognize and prevent research misconduct, including plagiarism, falsification, and fabrication.
7. Promote ethical collaboration in international and cross-cultural research settings.
8. Conduct research with integrity and accountability, maintaining ethical standards.
9. Address emerging ethical issues in new areas of research, such as AI and genetic research.
10. Navigate ethical review processes, ensuring compliance with institutional and regulatory guidelines.

#### **Details of the course:**

##### **Unit 1: Introduction to Research Ethics**

- Definition of Research Ethics and its importance
- Key ethical principles in research: Honesty, Integrity, Transparency, and Accountability
- Historical background of research ethics (e.g., Nuremberg Code, Declaration of Helsinki, Belmont Report)
- Ethical challenges in contemporary research
- The role of ethical review boards (IRBs, Ethics Committees)
- Overview of the ethical guidelines and frameworks across disciplines

##### **Unit 2: Ethical Guidelines for Human Research**

- The concept of informed consent: purpose, process, and challenges
- Privacy, confidentiality, and data protection in human research
- Vulnerable populations in research: Children, elderly, prisoners, and those with mental disabilities
- Ethical issues in surveys, interviews, and experiments with human participants
- Risks and benefits in human research: Minimizing harm
- Ethical considerations in clinical trials and medical research

##### **Unit 3: Ethical Guidelines for Animal Research**

- Ethical considerations in animal research
- The 3Rs principle (Replacement, Reduction, Refinement) in animal research
- Animal welfare and humane treatment in experimental research

- Legal and institutional regulations regarding animal research
- Ethical alternatives to animal experimentation
- Case studies of ethical concerns in animal research

#### **Unit 4: Research Integrity and Misconduct**

- Definitions of research misconduct: Fabrication, Falsification, and Plagiarism (FFP)
- The consequences of research misconduct on society, science, and individuals
- Whistleblowing and the role of research institutions in preventing misconduct
- Procedures for investigating allegations of misconduct
- The impact of publication ethics: Peer review, authorship issues, and conflicts of interest
- Strategies for promoting research integrity and good practices in research
- Case studies of misconduct in research and lessons learned

#### **Unit 5: Ethical Decision-Making in Research**

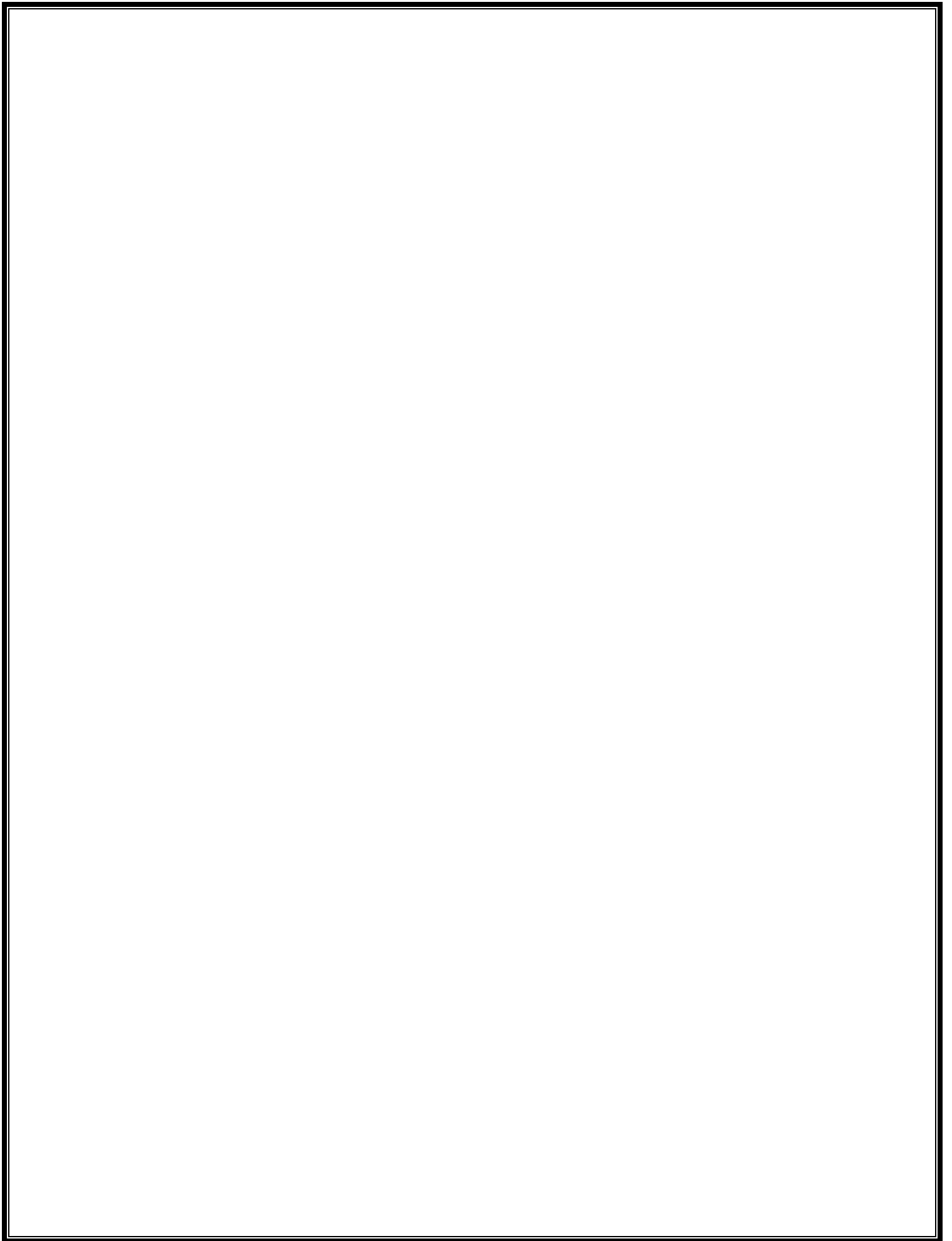
- Ethical decision-making models in research
- Balancing ethical principles in research practice
- Addressing dilemmas in qualitative vs. quantitative research
- Ethical challenges in interdisciplinary research
- Ethical challenges in emerging research fields (e.g., AI, genetic engineering, climate change)
- Conflict of interest in research: Definition, disclosure, and management

#### **Unit 6: Global Research Ethics and Cultural Sensitivity**

- Ethical challenges in cross-cultural research
- Ethics in international research collaborations
- Ethics of conducting research in developing countries
- Ethical concerns in research involving indigenous populations
- Global guidelines and conventions (e.g., CIOMS, UNESCO guidelines)
- Ethical issues in the publication of international research findings

#### **Examination Scheme**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



## General Proficiency-I

**Course Code: GP-101**

**Credit Units: 01**

**Pre-requisite:** Basic information of English Language

### **Course Outcome:**

- Effective communication: The ability to exchange ideas and information in a way that builds trust and respect
- Critical and analytical thinking: The ability to explore issues and ideas before forming a conclusion
- Integrative thinking: The ability to synthesize knowledge across different domains and perspectives
- Preparing students to be engaged citizens: Preparing students to participate in political culture and thrive in a rapidly evolving world

### **Details of the Course:-**

General language proficiency is the ability to read, write, listen, and speak in real-life situations. To test this, a test is usually developed for each skill with questions that are designed to imitate real life.

A syllabus is a guide to a course that includes course policies, rules, regulations, required texts, and a schedule of assignments and seminar.

### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER I

### Physical Education & Yoga

Course Code: GP-101a

Credit Units: 01

#### Course Outcomes (COs):

By the end of the **Physical Education & Yoga** course, students will be able to:

1. **Understand and apply** core concepts in physical education and fitness.
2. **Perform and teach** a wide range of **yoga asanas** and pranayama techniques for physical and mental well-being.
3. **Design and implement** fitness programs for individuals and groups.
4. **Assess physical fitness** and guide others in improving strength, flexibility, endurance, and cardiovascular health.
5. Use **yoga and physical activity** to promote **mental well-being**, stress relief, and emotional balance.
6. Demonstrate knowledge of **sports injury prevention** and provide **first aid**.
7. Use **yoga therapeutically** to address specific health conditions.
8. Teach and lead others in **yoga classes** and **fitness sessions**.
9. Foster a **holistic approach to health**, combining physical activity, nutrition, and mental wellness.
10. Commit to a **lifetime of learning** and professional development in the fields of **physical education, yoga**, and **health & wellness**.

#### 1. Unit I: Fundamentals of Physical Education

- Introduction to Physical Education
- History and Development of Physical Education
- Importance of Physical Fitness and Health
- Concepts of Physical Education, Sports, and Wellness
- Role of Physical Education in Personal Development

#### 2. Unit II: Basics of Yoga & Meditation

- **Module 1:** Introduction to Yoga and its History
- **Module 2:** Yoga Philosophy (Yoga Sutras of Patanjali)
- **Module 3:** The Eight Limbs of Yoga (Ashtanga Yoga)
- **Module 4:** Basic Asanas (Postures) and their Benefits
- **Module 5:** Introduction to Pranayama (Breathing Techniques)
- **Module 6:** The Role of Meditation in Yoga and Mental Health

#### 3. Elective/Optional Paper I: Sports and Recreation

- **Module 1:** Understanding the Importance of Sports in Physical Education
- **Module 2:** Organizing Sports Events and Competitions
- **Module 3:** Sports Psychology: Motivation and Performance
- **Module 4:** Nutrition and Hydration in Sports
- **Module 5:** Injury Prevention and First Aid in Sports

#### Practical Component:

- Practical Sessions on Organizing Sports Events



- Basic Training Techniques for Sports (e.g., Sprinting, Long Jump)

### Unit III: Advanced Physical Fitness

- **Module 1:** Advanced Training Methods (Strength, Endurance, Flexibility)
- **Module 2:** Designing a Fitness Program
- **Module 3:** The Science of Body Composition and Weight Management
- **Module 4:** Cardio and Aerobic Training Techniques
- **Module 5:** Monitoring and Assessing Fitness Progress

#### Practical Component:

- Practical Application of Fitness Assessment Tools
- Designing and Implementing a Fitness Routine (Based on Personal Goals)

### Unit IV: Advanced Yoga Practices

- **Module 1:** Deep Dive into Asanas: Advanced Postures
- **Module 2:** Therapeutic Applications of Yoga for Health
- **Module 3:** Pranayama and Breath Control Techniques (Advanced)

### Unit V: Sports Medicine and Injury Prevention

- **Module 1:** Common Sports Injuries and their Prevention
- **Module 2:** Anatomy and Physiology for Sports Medicine
- **Module 3:** Rehabilitation and Recovery in Sports
- **Module 4:** Basics of Massage Therapy for Sports Recovery
- **Module 5:** Using Technology and Equipment in Injury Prevention

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **Health & Nutrition**

**Course Code: GP-101b**

**Credit Units: 02**

#### **Course Objectives:**

- CO-1.** Understand the Fundamental Concepts of Nutrition
- CO-2.** Identify Nutrient Functions and Sources
- CO-3.** Examine Digestive Process and Nutrient Absorption
- CO-4.** Evaluate Impact on Chronic Diseases

#### **Unit 1: Introduction to Health and Nutrition**

Define health and nutrition.

Understand the importance of nutrition in maintaining overall health and preventing diseases.

Introduce basic nutritional principles and food groups.

What is health? Physical, mental, and social health.

The relationship between diet and health.

Nutrients: macronutrients vs. micronutrients

Nutrition guidelines and the role of public health organizations (e.g., WHO, USDA).

#### **Unit 2: Macronutrients: Carbohydrates, Proteins, and Fats**

Understand the role of each macronutrient in the body.

Identify food sources for carbohydrates, proteins, and fats.

Learn about the metabolism and energy production from macronutrients.

##### **Key Topics:**

Carbohydrates: Types (simple vs. complex), function, glycemic index, and food sources.

Proteins: Amino acids, essential vs. non-essential proteins, protein needs for various life stages.

Fats: Saturated, unsaturated, and trans fats; essential fatty acids, cholesterol, and healthy fat choices.

##### **Assessment:**

Create a food diary and identify the macronutrient composition of the foods you eat for a week.

Multiple-choice quiz on macronutrients.

#### **Unit 3: Micronutrients: Vitamins and Minerals**

Understand the function of vitamins and minerals in maintaining health.

Learn about the signs and symptoms of deficiencies and toxicities.

Identify major food sources of essential vitamins and minerals.

Vitamins: Fat-soluble (A, D, E, K) vs. water-soluble (B-complex, C), their functions, deficiencies, and toxicity. Minerals: Major minerals (calcium, iron, magnesium) vs. trace minerals (zinc, iodine, copper). Antioxidants and their role in disease prevention.

## Unit 4: The Digestive System and Nutrient Absorption

Understand how the digestive system processes food and absorbs nutrients.

Learn about enzymes, digestion, and the role of gut microbiota.

Discuss common digestive disorders and their nutritional implications.

Anatomy of the digestive system: Mouth, stomach, small intestine, large intestine.

Enzymes and hormones in digestion.

The role of the gut microbiota in health and disease.

Digestive disorders: IBS, celiac disease, food intolerances, etc.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER II**

### **Organic & Analytical Chemistry**

**Course Code: BMB-201**

**Credit Units: 04**

**Pre-requisite:** Basic information of Organic Chemistry

#### **Course Outcome:**

After completion of the course students will be able to:

- Understand the basic concepts of different purification techniques of organic compound.
- Explain the mechanism of organic reactions.
- Apply basic concepts of organic chemistry in determining the types of organic reactions.
- Categories various types of polymer and their uses.
- Importance of spectroscopy in organic chemistry, biotechnology and engineering applications.
- Predict the importance of organic reactions in daily life.

#### **Details of the Course:-**

##### **UNIT I: Purification of Organic Compounds:**

Crystallization, Sublimation, Distillation, Fractional Distillation, Distillation under reduced pressure, Steam distillation, Extraction with solvent, Principle and applications of chromatography in organic chemistry, High Performance Liquid Chromatography – Principle and applications.

##### **UNIT II: Bonding in Organic Compounds:**

Nature of covalent bond and its orbital representation, Hybridization, bond energy, polarity of bond & dipole moment of molecules, inductive effect, hydrogen bond, conjugation, resonance.

Homolytic & heterolytic fission of bonds, electrophiles & nucleophiles, Reaction intermediates: carbocation, carbanion and free radicals – stability, geometry, hybridization & generation.

##### **UNIT III: Mechanistic Organic Chemistry:**

Resonance and Aromaticity in aromatic compounds. Addition reactions, Substitution reactions, Elimination reactions & Rearrangement reactions in organic chemistry, Mesomerism and Orientation in aromatic substitution reactions.

**UNIT IV: Polymers:**

Polymerization, degree of polymerization, functionality of monomer, Classification of polymers on the basis of tacticity, mode of formation, structure of monomer unit, Mechanism of addition polymerization, Preparation, Properties and uses of Kevlar & PMMA, Plastics: definition, preparation, classification and applications, Fibers – Preparation, properties and uses of Nylon- 6,6 Nylon and Dacron, Conducting polymers: Polyacetylene, Polyaniline, Mechanism of Conduction, doping; Applications of Conducting polymers. Bio-degradable Polymers.

**UNIT V: Advanced Analytical Chemistry:**

General theory of spectroscopy. Principle of UV-VIS, IR, NMR, and Mass spectroscopy. Applications of spectroscopic techniques in structure elucidation of organic compounds.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
<b>Reference Books</b>		
1.	Physical Chemistry, P.W. Atkins	2009
2.	Organic Chemistry, I.L.Final (Vol-1, Vol-2)	2002
3.	Fundamentals of Molecular Spectroscopy, C.N. Banwell	1994

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER II**

### **Observational Chemistry**

**Course Code: BMB-201a**

**Credit Units: 04**

Pre-requisite: Basic information of Organic Chemistry

#### **Course Outcomes**

**CO-1** Develop Proficiency in Laboratory Techniques

**CO-2** Enhance Observational and Analytical Skills

**CO-3** Understand and Identify Chemical Reactions

**CO-4** Investigate the Physical Properties of Matter

**CO-5** Conduct Qualitative Analysis of Inorganic Compounds

#### **Unit 1: Introduction to Observational Chemistry and Laboratory Safety**

Introduction to basic principles of observational chemistry, the importance of laboratory safety, and the role of qualitative and quantitative analysis in understanding chemical processes.

#### **Unit 2: Physical Properties of Matter**

Exploration of the physical properties of matter that can be observed and measured without changing the chemical identity of substances.

- State of matter (solid, liquid, gas) and phase transitions
- Color, texture, density, melting and boiling points
- Solubility and miscibility tests
- Viscosity, surface tension, and refractive index

#### **Unit 3: Chemical Reactions and Observations**

Focus on understanding different types of chemical reactions and observing the changes that occur during these processes.

- Indicators of chemical reactions (color change, gas evolution, precipitate formation, heat change)
- Types of reactions: synthesis, decomposition, single replacement, double replacement, combustion, redox
- Acid-base reactions, precipitation reactions, oxidation-reduction reactions
- Energy changes during reactions (exothermic and endothermic reactions)

#### **Unit 4: Qualitative Analysis of Inorganic Compounds**

Observing the chemical properties of common inorganic compounds, especially metal salts, through qualitative analysis techniques.

- Flame tests for metal ions (e.g., sodium, potassium, calcium, copper)
- Identification of cations and anions in unknown samples
- Precipitation reactions and solubility rules
- Use of reagents to test for specific ions (e.g., silver nitrate for chloride ions)

### **Unit 5: Gas Laws and Observations**

Investigating the behavior of gases and performing experiments to observe how gases respond to changes in temperature, pressure, and volume.

- Boyle's Law, Charles's Law, Avogadro's Law, Ideal Gas Law
- Observing the behavior of gases under various conditions (e.g., pressure, temperature)
- Diffusion and effusion of gases
- Real vs. ideal gases

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER II**

### **Basic & Applied Chemistry**

**Course Code: BMB-201b**

**Credit Units: 04**

#### **Course Objectives:**

**CO-1** Develop a solid understanding of core chemical concepts such as atomic structure, chemical bonding, and thermodynamics.

**CO-2** Gain hands-on experience in applying chemical principles through laboratory techniques and experiments.

**CO-3** Analyze and interpret various chemical reactions and predict outcomes based on fundamental principles.

**CO-4** Solve quantitative problems using stoichiometry, including calculations involving moles, concentrations, and reaction yields.

**CO-5** Understand the behavior and properties of different states of matter and their transitions under varying conditions.

#### **Unit 1: Introduction to Chemistry and Matter**

Basic Concepts:

Definition of Chemistry, Branches of Chemistry (Physical, Organic, Inorganic, Analytical, Biochemistry).

Types of Matter: Elements, Compounds, Mixtures.

Classification of Matter: Homogeneous and Heterogeneous.

Chemical vs Physical Properties and Changes.

Measurements and Units (SI units, dimensional analysis).

Matter and Its Properties:

States of Matter: Solid, Liquid, Gas, and Plasma.

Properties of Solids, Liquids, and Gases.

Atomic and Molecular Theory of Matter.

#### **Unit 2: Atomic Structure and Periodicity**

Atomic Structure:

Structure of the Atom: Subatomic particles (protons, neutrons, electrons).

Atomic Number, Mass Number, Isotopes, Isobars.

Bohr's Model and Quantum Mechanical Model of the Atom.



Electron Configuration and Aufbau Principle.  
 Atomic Orbitals and Quantum Numbers.  
 Periodic Table and Periodicity:  
 Mendeleev's Periodic Table and Modern Periodic Law.  
 Trends in the Periodic Table: Atomic size, Ionization energy, Electron affinity, Electronegativity.  
 Periodic Properties and Their Applications.

### **Unit 3: Chemical Bonding and Molecular Structure**

Types of Chemical Bonds:  
 Ionic Bonding: Formation of ionic compounds, properties.  
 Covalent Bonding: Electron sharing, Lewis structures, polar vs nonpolar covalent bonds.  
 Metallic Bonding: Properties of metals.  
 Intermolecular Forces: Hydrogen bonding, van der Waals forces.  
 Molecular Geometry:  
 VSEPR Theory (Valence Shell Electron Pair Repulsion Theory).  
 Hybridization and Bonding Orbitals.  
 Molecular Polarity.

### **Unit 4: Stoichiometry and Chemical Reactions Stoichiometry:**

Mole Concept, Molar Mass, Avogadro's Number.  
 Balancing Chemical Equations.  
 Limiting Reactant, Excess Reactant, Theoretical and Percent Yield.  
 Types of Chemical Reactions:  
 Synthesis, Decomposition, Single and Double Displacement.  
 Combustion Reactions.  
 Redox Reactions: Oxidation, Reduction, and Balancing Redox Equations.  
 Acid-Base Reactions: Bronsted-Lowry Theory, Lewis Acid-Base Concept.

### **Unit 5: Thermodynamics and Kinetics**

Thermodynamics:  
 Laws of Thermodynamics.  
 Heat, Work, and Internal Energy.  
 Enthalpy, Entropy, and Free Energy.  
 Thermochemical Calculations and Hess's Law.  
 Chemical Kinetics:  
 Rate of Chemical Reactions.  
 Rate Laws, Reaction Order, and Rate Constants.  
 Activation Energy and Arrhenius Equation.  
 Factors Affecting Reaction Rates: Temperature, Concentration, Catalysts.

### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	

<b>Weightage (%)</b>	10	20	10	60
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## **SEMESTER II**

### **Elements of Biochemistry**

**Course Code: BMB-202**

**Credit Units: 04**

**Pre-requisite:** Basic understanding of biomolecules and concepts of general chemistry

#### **Course Outcome:**

- Students will be able to define biomolecules and buffers.
- Students will understand the structure and functions of biomolecules.
- Students will be able to classify and explain the role of various biomolecules in human body.
- Students will be able to analyze the causes of diseases on biochemical basis.
- Students will be able to understand various biochemical process and cell metabolism.

#### **Details of the**

##### **Course:- Unit I:**

A historical prospective, Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular proteins.

##### **Unit II:**

Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines,. Biologically important nucleotides,

Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA.

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.

### Unit III:

Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.

### Unit IV:

Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, enzyme specificity: types & theories, Biocatalysts from extreme thermophilic and hyperthermophilic archaea and bacteria. Role of:  $\text{NAD}^+$ ,  $\text{NADP}^+$ , FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, lipoic-acid, Biotin vitamin B12, Tetrahydrofolate and metallic ions

### Unit V:

Carbohydrates Metabolism: Reactions, energetics and regulation. Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle, Electron Transport Chain, Oxidative phosphorylation.  $\beta$ -oxidation of fatty acids.

### Suggested Books:

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1	Biochemistry, Lubert Stryer, 8th Edition, WH Freeman, 2015	2015
2	Harper's illustrated Biochemistry by Robert K. Murray, David A Bender, Kathleen M.Botham, PESEr J. Kennelly, Victor W. Rodwell, P. Anthony Weil. 30th Edition, McGrawHill, 2015.	2015
3	Biochemistry by Mary K.Campbell & Shawn O.Farrell, 9th Edition, Cenage Learning, 2018.	2018
4	Biochemistry, Donald Voet and Judith Voet, 4th Edition, Publisher: John Wiley andSons,	2010
<b>Reference Books</b>		
1	The Organic Chemistry of Enzyme-catalyzed Reactions Richard B. Silverman Academic Press	2002

2	Practical Enzymology Hans Bisswanger Wiley–VCH 2012.	2012
3	Fundamentals of Enzyme Kinetics Athel Cornish-Bowden Portland Press 4th edition, 2012.	2012
4	Fundamentals of Enzymology Nicholas Price and Lewis Steven Oxford University Press 3rd edition 2009.	2009

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER II

### Fundamentals of Biochemistry

Course Code: BMB-202a

Credit Units: 04

#### Course Objectives:

- Introduce students to the core chemical principles that govern biochemical processes.
- Study the structure and biological roles of proteins, lipids, nucleic acids, and carbohydrates.
- Understand key metabolic pathways (e.g., glycolysis, citric acid cycle) and their regulation and energy transfer.
- Explore enzyme mechanisms, kinetics, and regulation, including coenzyme and cofactor roles.
- Explain DNA replication, transcription, and translation as part of the central dogma of molecular biology.

#### Unit 1: Introduction to Biochemistry and Biomolecules

Overview of Biochemistry: Definition, scope, and importance of biochemistry in biology and medicine, Water and pH: Properties of water, pH, buffers, and their biological significance.

Biomolecules: Classification and structure of biomolecules (carbohydrates, proteins, lipids, nucleic acids), Basic Chemical Principles: Atomic structure, chemical bonds, and



























































































4.	<b>UNIT-4</b>	
	<ul style="list-style-type: none"> <li>• Food preservation methods.</li> <li>• Radappertization, radicidation, and radurization of foods.</li> <li>• Legal status of food irradiation, effect of irradiation on food constituents.</li> </ul>	12
5.	<b>UNIT-5</b>	
	<ul style="list-style-type: none"> <li>• Storage stability food preservation with low temperature, high temperature and drying.</li> <li>• Indicator and food-borne pathogens. Rheology of food production.</li> </ul>	6

**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	N.Jogdan Industrial Biotechnology, Himalaya Publishing House	2006
2.	Perlman D. Annual Reports of Fermentation Processes.	1997-1979
3.	Prescott SC & Dunn CG.. Industrial Microbiology. McGraw Hill.	1959
4.	Bains W. Biotechnology from A to Z. Oxford Univ. Press.	1993
<b>Reference Books</b>		
1.	Introduction to Food Biotechnology. Author; Perry Johnson.	2002

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER III**

### **Bacteriology & Virology**

**Course Code: BMB-302**

**Credit Units: 04**

**Pre-requisite:** Basic information of Bacteriology and Virology.

#### **Course Outcome:**

After completion of the course the students should be able to

- Describe the cell organization of bacteria i.e. morphology, ultrastructure and organelles present in bacterial cells.
- Apply the knowledge of bacteriological techniques.
- Describe the nutritional and physical requirements for bacterial growth.
- Describe the principles involved in killing bacteria, and make recommendations on use of physical and chemical methods used to control microbial growth.
- Describe the dynamics of the growth of a bacterial population and how this growth can be measured.
- Describe bacterial taxonomy and classification.
- Differentiate the nature of viruses.
- Understand classification of viruses.
- Learn the methods of laboratory diagnosis of viruses using different techniques.
- Learn about different plant and animal viruses.

#### **Details of the Course:-**

##### **Unit – I: Cell Organization:**

Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pili.

Cell-wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaeobacterial cell wall, Gram and acid fast staining mechanisms, lipopolysaccharide (LPS), sphaeroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall.

Cell Membrane: Structure, function and chemical composition of bacterial and archaeal cell membranes.

Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids

Endospore: Structure, formation, stages of sporulation.

##### **Unit – II: Bacterial growth and control:**

Culture media: Components of media, Synthetic or defined media, Complex media, enriched media, selective media, differential media, enrichment culture media Pure culture isolation: Streaking, serial dilution and plating methods, cultivation, maintenance and stocking of pure cultures, cultivation of anaerobic bacteria Growth: Binary fission, phases of growth.

### Unit – III: Bacterial Systematics and Taxonomy:

Taxonomy, nomenclature, systematics, types of classifications

Morphology, ecological significance and economic importance of the following groups:

Archaea: methanogens, thermophiles and halophiles

Eubacteria: Gram negative and Gram positive

Gram negative:

Non-proteobacteria– Deinococcus, Chlamydiae, Spirochetes

Alpha proteobacteria- Rickettsia, Rhizobium, Agrobacterium

Gamma proteobacteria –Escherichia, Shigella, Pseudomonas

Gram positive: Low G+C: Mycoplasma, Bacillus, Clostridium, Staphylococcus High G+C:

Streptomyces, Frankia

### Unit – IV: Nature, Properties and Classification of Viruses:

Properties of viruses; general nature and important features Subviral particles; viroids, prions and their importance Isolation and cultivation of viruses.

Morphological characters: Capsid symmetry and different shapes of viruses with examples Viral multiplication in the Cell: Lytic and lysogenic cycle Description of important viruses: salient features of the viruses infecting different hosts - Bacteriophages (T4 & Lambda); Plant (TMV & Cauliflower Mosaic Virus), Human (HIV & Hepatitis viruses).

### Unit – V: Role of Viruses in Disease and its prevention:

Viruses as pathogens: Role of viruses in causing diseases Prevention and control of viruses: Viral vaccines, interferons and antiviral compounds.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Pelczar Jr., M.J., Chan, E.C.S. and Krieg, Noel R., Microbiology, McGraw Hill (2003) 5th ed.	2003
2.	Dimmock, NJ, Easton, AL, Leppard, KN. Introduction to Modern Virology.6th edition, Blackwell Publishing Ltd.	2007
<b>References</b>		
1.	Microbiology 10 <sup>th</sup> Edition. Prescott, L.M.; Harley, J.P. and Klein, D.A. (2003) McGraw Hill, USA.	2016
2.	Foundations in Microbiology 10 <sup>th</sup> edition, Kathleen Park Talaro and Barry Chess.	2017
3.	Microbiology- An Introduction. Tortora, G.J., Funke, B.R., and Case, C.L., , Pearson Education (2015)12 <sup>th</sup> ed.	2015
4.	Principles of Virology, Vol I and Vol II, 4 <sup>th</sup> Edition, Jane Flint, Vincent Racaniello, Glenn Rall, Anna Marie Skalka, (2015), American Society of Microbiology	2015

5.	Srivastava S and Srivastava PS. Understanding Bacteria. Kluwer Academic Publishers,Dordrecht	2009
6.	Plant Viruses, Diseases and Their Management, Kajal Kumar Biswas, IK. International Publishing House Pvt Ltd, 2016.	2016
7.	Animal cell culture and Virology, S. Nandi, New India Publishing agency, 1 <sup>st</sup> ed. (2009)	2009
8.	Textbook of Medical Virology, Mishra B, CBS Publishing, 1 <sup>st</sup> edition, 2018	2018

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## **SEMESTER III**

### **Global Ecology**

**Course Code: BMB-302a**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of Environmental science

#### **Course Outcomes (CO):**

Upon successful completion of the **Global Ecology** course, students will be able to:

1. **CO1:** Understand and explain fundamental ecological principles, processes, and interactions in the context of global environmental systems.
2. **CO2:** Analyze the impact of human activities on the environment and global ecosystems.
3. **CO3:** Evaluate the causes and consequences of global environmental challenges, including climate change, biodiversity loss, and pollution.
4. **CO4:** Develop and propose sustainable solutions and conservation strategies to address global ecological issues.
5. **CO5:** Use scientific tools and methods, such as GIS, fieldwork, and ecological modeling, to study global ecological problems.

#### **Detail of the course:-**

##### **Unit 1: Introduction to Ecology and Global Environmental Systems**

- **Introduction to Ecology**
  - Definition and scope of ecology
  - Levels of ecological organization (individual, population, community, ecosystem, biome, biosphere)
- **Basic Ecological Processes**
  - Energy flow in ecosystems: producers, consumers, and decomposers
  - Biogeochemical cycles: carbon, nitrogen, phosphorus, and water cycles
  - Ecosystem functioning and biodiversity
- **Human-Ecosystem Interactions**
  - Human influence on natural systems
  - Ecological footprint and sustainability concepts

##### **Unit 2: Earth's Biomes and Global Ecosystems**

- **Biomes of the World**
  - Characteristics of major terrestrial biomes: tropical rainforests, deserts, temperate forests, tundra, and grasslands
  - Aquatic ecosystems: freshwater and marine ecosystems (lakes, rivers, coral reefs, oceans)
- **Ecosystem Services**

- Ecosystem functions and services: provisioning, regulating, cultural, and supporting
- The importance of biodiversity and healthy ecosystems in global environmental stability

### **Unit 3: Biodiversity, Conservation, and Global Sustainability**

- **Types of Biodiversity**
  - Genetic, species, and ecosystem diversity
  - Hotspots of biodiversity and endemism
- **Threats to Biodiversity**
  - Habitat destruction, fragmentation, and degradation
  - Invasive species, over-exploitation, climate change, and pollution
- **Conservation Strategies**
  - Protected areas and wildlife corridors
  - Restoration ecology and biodiversity hotspots
  - Sustainable development and the role of international agreements (CBD, CITES, etc.)

### **Unit 4: Climate Change and Global Environmental Challenges**

- **Climate Change Science**
  - The greenhouse effect and the role of greenhouse gases
  - Evidence and impacts of climate change (temperature rise, melting glaciers, sea-level rise)
  - Climate change models and future projections
- **Global Warming and Climate Change Effects**
  - Effects on weather patterns, ecosystems, and biodiversity
  - Impacts on human societies, agriculture, and water resources
- **Mitigation and Adaptation Strategies**
  - Carbon sequestration, renewable energy, and geoengineering
  - Adaptation strategies in vulnerable regions

### **Unit 5: Pollution and Environmental Degradation**

- **Types of Pollution**
  - Air, water, soil, noise, and plastic pollution
  - Point-source vs. non-point-source pollution
- **Pollution's Impact on Global Ecosystems**
  - Eutrophication, acid rain, and ocean acidification
  - Plastic pollution and microplastics in oceans
  - Toxic chemicals and their ecological and health impacts
- **Waste Management and Pollution Control**
  - Recycling, waste-to-energy technologies, and zero-waste initiatives
  - International policies on pollution control (e.g., Paris Agreement, Basel Convention)

### **Unit 6: Global Conservation and Environmental Policy**

- **International Environmental Agreements**
  - The role of the United Nations, Kyoto Protocol, Paris Agreement
  - Global environmental treaties and their effectiveness
- **Environmental Ethics and Justice**

- Ethical dilemmas in conservation and environmental protection
- Environmental justice: inequality and access to environmental resources
- **Policy Tools for Environmental Management**
  - Ecological restoration, sustainable resource management, and conservation laws
  - Role of NGOs and international organizations in global environmental governance

### **Unit 7: Sustainable Development and Global Ecology**

- **Sustainability Concepts**
  - Definitions and principles of sustainability (environmental, economic, social sustainability)
  - The role of ecological footprint and carbon footprint in sustainability assessments
- **Sustainable Agriculture and Forestry**
  - Agroecology, organic farming, sustainable land-use practices
  - Forest conservation and sustainable forestry management
- **Urban Sustainability**
  - Green cities, sustainable architecture, and urban ecology
  - Sustainable transportation and waste management systems

### **Unit 8: Emerging Global Ecological Issues and Future Directions**

- **Emerging Environmental Issues**
  - Ocean acidification, biodiversity loss, and the sixth mass extinction
  - Genetic engineering and synthetic biology in environmental conservation
- **Global Environmental Challenges in the 21st Century**
  - Population growth, resource depletion, and environmental equity
- **The Role of Technology in Global Ecology**
  - Role of biotechnology, renewable energy, and environmental monitoring technologies
  - Citizen science, big data, and artificial intelligence in ecological research

### **Suggested Books:**

1. "Essentials of Ecology" by G. Tyler Miller & Scott Spoolman
2. "Global Ecology: Understanding Global Environmental Change" by H. R. S. U.
3. "Introduction to Environmental Studies" by Andrew Friedland and Rick Relyea

### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER III**

### **Mycology & Phycology**

**Course Code: BMB-303**

**Credit Units: 04**

**Pre-requisite:** Basic information of Fungus and Algae

#### **Course Outcome:**

After the successful completion of this course

- Students should be able to know about various groups of fungi and algae.
- As most of the fungi are seen through naked eyes, students will be able to recognize them.
- Students will also have an idea about the pros and cons of fungi and algae.
- Students should be able to know about economic importance of fungi and algae.

#### **Details of the Course:-**

##### **Unit I:**

History of Mycology, Classification of fungi, Morphology, microscopy and structure of fungi

##### **Unit II: General Overview Phylums:-**

Chytridiomycota (The chytrids), Zygomycota (The conjugated fungi), Ascomycota (The sac fungi), Basidiomycota (The club fungi), Deutromycota (The imperfecti fungi).

##### **Unit III:**

Symbiotic association of fungi, Nutrition requirements

##### **Unit IV:**

Parasexual Cycles, Alcoholic fermentation, Fungus like organisms, Rusts and Smuts, Fungal disease of plants and humans

##### **Unit V:**

Classification and application of algae: General classification, Life cycle, thallus organisation and occurrence – (i) Chlorophyceae (ii) Charophyceae (iii) Diatoms (iv) Xanthophyceae (v) Phaeophyceae (vi) Rhodophyceae: (vii) Cyanobacteria

Lichens, Economic importance of algae with examples in agriculture, environment, industry and food.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books/Reference Books</b>		
1.	Introduction to Fungi 3 <sup>rd</sup> Edition. John Webster and Roland W.S. Weber (2007 ). Cambridge.	2007
2.	An Introduction to Mycology. R.S. Mehrotra and K.R. Aneja (2005). New age International Publishers.	2005
3.	Kumar HD. (1995). <i>The Text Book on Algae</i> . 4th edition. Affiliated East Western Press	1995

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER III**

### **Public Health and Pandemics**

**Course Code: BMB-303a**

**Credit Units: 04**

**Pre-requisite:** Basic understanding of diseases and their pathogenesis

#### **Course Outcome:**

Students will be able to learn and understand the concepts of how human system works in altered and diseased stage under the influence of various internal and external stimuli.

#### **Details of the**

#### **Course:-Unit I:**

##### **Introduction:**

History of pathology, basic definitions and familiarization with the common terms used in pathology, techniques used in pathology.

##### **Cellular Adaptations, Cell Injury and Cell Death:**

Causes and mechanisms of cell injury: reversible and irreversible injury, Cellular responses: Hyperplasia, Hypertrophy, Atrophy, Metaplasia, Necrosis, Apoptosis, subcellular and intracellular response, (with suitable examples of diseases), Cellular ageing.

##### **Unit II: Role of Inflammation in diseases (with suitable examples):**

General features of acute and chronic inflammation: Vascular changes, cellular events, termination of acute inflammatory response. Cells and molecular mediators of inflammation, morphological effects and outcome of acute inflammation. Systemic effects of chronic inflammation, granulomatous inflammation.

##### **Unit III: Tissue Renewal And Repair, Healing And Fibrosis:**

Mechanism of tissue regeneration, role of ECM, repair by healing, scar formation and fibrosis, cutaneous wound healing, tissue remodelling in liver (mechanism of fibrosis and cirrhosis).

##### **Unit IV: Hemodynamic Pathology:**

Edema, hyperaemia, congestion, haemorrhage, haemostasis and thrombosis, Embolism,

Infarction and shock and hypertension, **Nutritional diseases:** Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc Iron and Calcium) and their deficiency diseases.

**Unit V: Cell proliferation: Cancer:**

Definitions, nomenclature, characteristics of benign and malignant neoplasms, grading and staging of cancer, biology of tumor growth, mechanism of tumor invasion and metastasis, carcinogens and cancer, concept of oncogenes, tumor suppressor genes, DNA repair genes and cancer stem cells.

**Pathophysiology diseases:**

**A. Aetiology and Pathophysiology of:** Diabetes, Arteriosclerosis, Myocardial infarction, restrictive and obstructive respiratory diseases (COPD), Parkinson, Schizophrenia, Silicosis

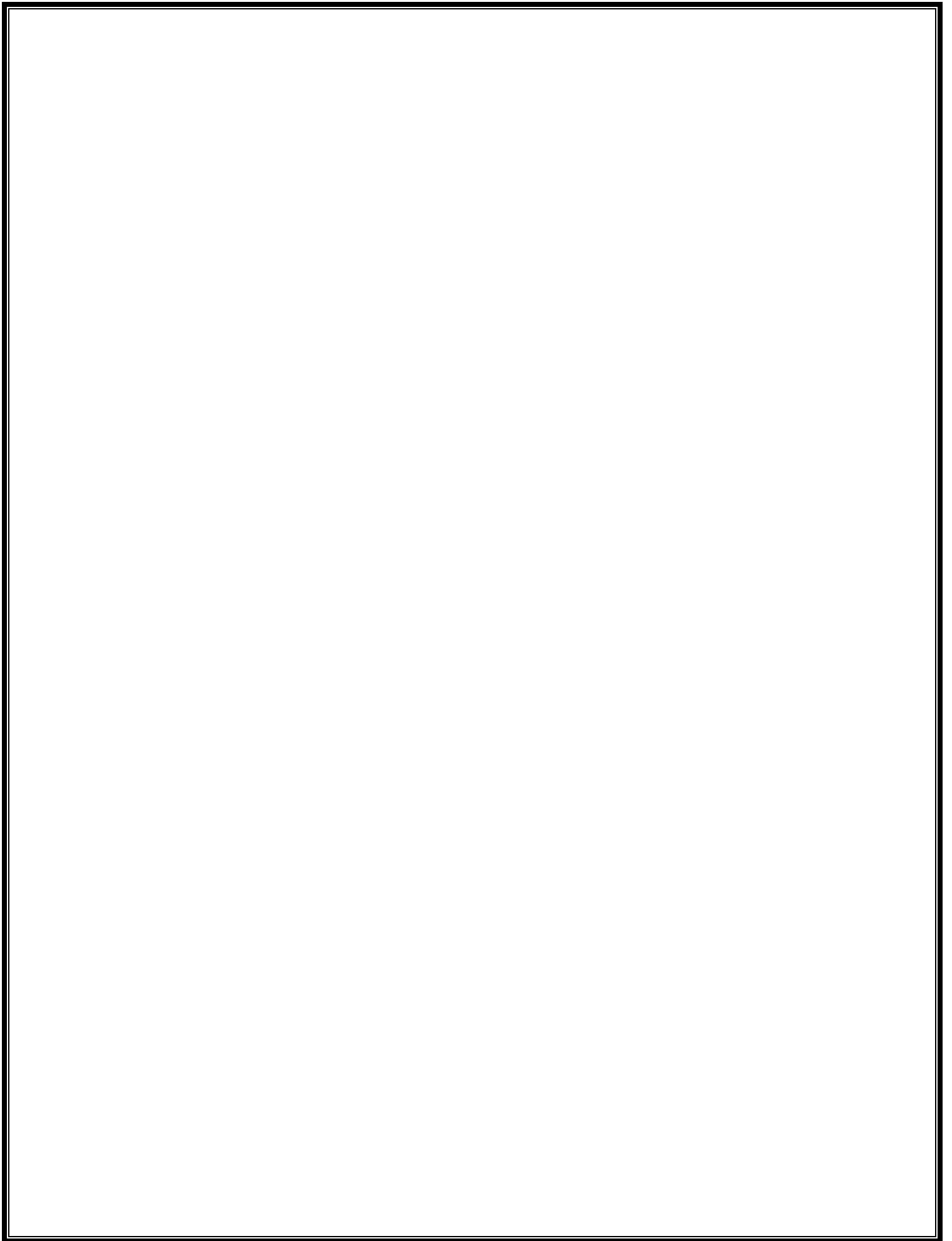
**B. Infectious Diseases:** Pathogenesis of diseases and overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Robbins and Cotran Pathologic Basis of Disease, 8th edition (2009), Vinay Kumar, Abul K. Abbas, Jon C. Aster, Nelson Fausto; Saunders Publishers, ISBN-13: 978-1416031215.	2009
2.	Medical Laboratory Technology Methods and Interpretations Volume 1 and 2, 6th edition (2009), Ramnik Sood; Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496.	2009
<b>Reference Books</b>		
1.	General and Systematic Pathology, 2nd edition (1996), J., Ed. Underwood and J. C. E. Underwood; Churchill Livingstone, ISBN-13: 978-0443052828.	1996
2.	Robbins Basic Pathology, 9th edition (2012), Kumar, Abbas, Fausto and Mitchell; Saunders Publication, ISBN-13: 978-1437717815.	2012

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60





## SEMESTER III

### Biofertilizers and Biopesticide

Course Code: BMB-304

Credit Units: 02

**Pre-requisite:** Basic information of Biofertilizers and Biopesticide

#### Course Outcome:

After completion of the course the students should be able to

- Learn the basic concept of microbial interactions.
- Understand the role of microbes as Biofertilizers.
- Learn basic understanding of role of microbes as bioinsecticides.

#### Details of the Course:-

##### UNIT-I: Biofertilizers:

General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers.

Symbiotic N<sub>2</sub> fixers: Rhizobium - Isolation, characteristics, types, inoculum production and field application, legume/pulses plants; Frankia- Isolation, characteristics, non-leguminous crop symbiosis. Cyanobacteria, Azolla- Isolation, characterization, mass multiplication, Role in rice cultivation, Crop response, field application.

##### UNIT-II: Non - Symbiotic Nitrogen Fixers:

Free living *Azospirillum*, *Azotobacter*- free isolation, characteristics, mass inoculums, production and field application.

##### UNIT-III: Phosphate Solubilizers:

Phosphate solubilizing microbes (bacteria and fungi) - Isolation, characterization, mass inoculum production, field application.

##### UNIT-IV: Mycorrhizal Biofertilizers:

Importance of mycorrhizal inoculum, types of mycorrhizae and associated plants, Mass inoculums production of Ectomycorrhizae and VAM, field applications of Ectomycorrhizae and VAM.

##### UNIT-V: Bioinsecticides:

General account of microbes used as bioinsecticides and their advantages over synthetic pesticides, *Bacillus thuringiensis*, production, Field applications, Viruses – cultivation and field applications (Baculovirus).

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Saleem F and Shakoori AR. Development of Bioinsecticide, Lap Lambert Academic Publishing GmbH KG	2012
2.	Aggarwal SK. Advanced Environmental Biotechnology, APH publication.	2005
<b>References</b>		
1.	Kannaiyan, S. Bioetchnology of Biofertilizers, CHIPS, Texas.	2003
2.	Mahendra K. Rai. Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.	2005
3.	Reddy, S.M. et. al. Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.	2002

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER III**

### **Biomathematics and Biostatistics**

**Course Code: BMB-305**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of Bio Mathematics and Bio Statistics

#### **Course Outcome:**

- Students will understand the use of mathematics and the significance of their application.
- Students will be able to understand the concept of Biostatistics.
- Understand the concept of Calculus.
- Explain the application of probability for Bio Students.
- Students will be able to understand sampling theory.
- Students will be able to learn Basic concept of Algebra.

#### **Details of the Course:-**

##### **UNIT-I: Introduction of Bio statistics:**

Introductory Statistics, Measure of central tendency: Mean Mode, Median. Measure of Dispersion: Standard Deviation, Variance, Moments, Skewness and Kurtosis.

##### **UNIT-II: Probability:**

Basic probability and laws. Random variable, variable (Discrete and Continuous), Probability density function and probability mass function. Distribution Binomial, Poisson and normal (without proof).

##### **UNIT-III: Statistical methods:**

Sampling parameters Difference between sample and Population parametric and nonparametric statistics, Chi-square test.

##### **UNIT-IV: Basic concepts of Algebra (Linear and quadratic):**

Progression: arithmetic progression, geometric progression and harmonic progression (with application in practicals).

##### **UNIT-V: Calculus:**

Basic concepts of differentiation and Integration, Coordinate 2D, straight line, properties of straight line, area of a triangle.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	C.B.Gupta, S.R.Singh and Mukesh Kumar “Engineering Mathematics for Semesters III and IV”, McGraw Hill Education	2016
2.	Riyaz Ahmad Khan “ Introduction to Remedial Mathematics” S.Chand Publication	2010
<b>Reference Books</b>		
1.	A. Edmondson and D, Druce: Advanced Biology Statistics, Oxford University Press	1996
2.	W. Danial Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons inc	2004

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER III

### Elementary Mathematics

Course Code: BMB-305a

Credit Units: 04

**Pre-requisite:** Basic information of Mathematics and Biostatistics

#### Course Outcome:

A student who successfully fulfills the course requirements will be able to

- define and appropriately use information technology terms;
- identify computer hardware components and describe their function;
- describe the essential elements of the computer's architecture and discuss how this architecture functions;
- describe the characteristics and representations of data, and interpret and compare data in different representations;
- identify and describe telecommunication components;
- describe the characteristics of operating systems and compare different operating systems;
- use a hypertext markup language to produce basic Web documents;
- discuss the general trends in technologies including examples of leading edge developments;
- Compare the roles of different sectors of the information technology.

#### Details of the course:

S. No.	Contents	Contact Hours
1	Introducing Computer System Evolution Of Computers, Generations of Computer, Characteristics Of Computers, Functions Of Computers, Advantages, Disadvantages Of Computers, Computer Applications ,The parts of a Computer system, Types Of Computers. Storing Data: Types of storage devices, Memory Hierarchy. Essential computer hardware, software. Computer Input Devices: Keyboard, Mouse, Webcam, Joystick and Output devices: Monitor, Printer, Plotters. Data representation	8
2	Using Operating System Operating system basics- The purpose of operating system, Type of operating system, providing a user interfaces. Networks and the Internet Networking basics – The uses of a network, Common types of networks. Network topologies. What is the Internet? Internet's major services, Understanding the world wide web.	8

3	<p style="text-align: center;">Algorithms and Flowcharts</p> Algorithms, Flowcharts, Divide and computer strategy, Writing algorithms and drawing flowcharts for simple exercises – Swapping contents of 2 variables, Largest of given three numbers, Solving a given quadratic equation, Factorial Of a given integer Constants, Variable and Data types Characters set, C tokens, Keywords and identifiers, Constants, Variables, Data types, Declaration of variables.	8
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	Operators and Expressions. Decision making and branching Decision making with <i>if</i> statement, simple if statement, the if « H O statement, nesting of L I « H O V Hader, the switch statement, the: operator, the go to statement. Decision making and looping The <i>while</i> statement, the <i>do</i> statement, The <i>for</i> statement, jumps in loops.	
4	Introduction of Bio statistics Introductory Statistics, Measure of central tendency: Mean, Mode, Median. Measure of Dispersion: Standard Deviation, Variance, Moments, Skewness and Kurtosis.	10
5	Statistical methods Sampling parameters Difference between sample and Population parametric and nonparametric statistics, Chi-square test.	8

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books/ Reference Books</b>		
1.	Norton, Peter, "Introduction to Computers", McGraw-Hill.	2005
2.	Rajaraman, V., "Fundamentals of Computers", PHI.	2005
3.	PK SINHA "Computer Fundamentals", BPB	Fourth edition
4.	Yashwant Kanetker, "Let us C", BPB.	2004
5.	A. Edmondson and D, Druce: Advanced Biology Statistics, Oxford University Press	1996
6.	W. Danial Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons inc	2004
7.	Rajaraman, V., "Computer Programming in C", PHI.	2005

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER III

### Microbial Genetics Lab

Course Code: BMB-351

Credit Units: 02

**Pre-requisite:** Basic information of Microbial Genetics Lab

**Course Outcome:**

After completion of the course the students will be able to

- Learn about principle and working of laboratory instruments.
- Acquire a comprehensive knowledge on techniques followed in study of genetic mutation.
- Become familiar with technical requirements, concepts and general procedures in molecular biology and implement the knowledge in research work.
- Learn and implement different strategies to isolate genomic and plasmid DNA from cells.
- Learn the methods of DNA transformation, transduction and conjugation for future recombinant techniques.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Preparation of Master and Replica Plates.	3
2	Study the effect of chemical (HNO <sub>2</sub> ) and physical (UV) mutagens on bacterial cells.	3
3	Study survival curve of bacteria after exposure to ultraviolet (UV) light.	3
4	Isolation of Plasmid DNA from <i>E.coli</i> .	3
5	Study different conformations of plasmid DNA through Agarose gel electrophoresis.	3
6	Demonstration of Bacterial Conjugation.	3
7	Demonstration of bacterial transformation and transduction.	3
8	Demonstration of AMES test.	3
9	Isolation of genomic DNA from bacteria.	3
10	To isolate naturally occurring mutants from soil.	3



**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text/Reference Books</b>	
1.	Principles and techniques of Practical Biochemistry: K. Wilson and J. Walker, Cambridge University Press, Cambridge.	2002
2.	Practical Genetics Paperback – August, by <a href="#">Jones</a> (Author), <a href="#">Rickards</a> (Author), Publisher: Open Univ Pr	1991

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60

## SEMESTER III

### Bacteriology & Virology Lab

**Course Code: BMB-352**

**Credit Units: 02**

**Pre-requisite:** Basic information of Bacteriology and Virology

#### **Course Outcome:**

After completion of the course the students will be able

- To learn good laboratory practices.
- To learn the principle and working of microbiology instruments and equipment in accordance with current laboratory safety protocol.
- To utilize the microbial flora for various applications.
- To learn microbiology laboratory techniques.

#### **Details of the Laboratory Course:-**

**Note:** A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by college according to facilities available.

<b>S. No.</b>	<b>Contents</b>	<b>Contact Hours</b>
1.	Preparation of different media: Complex media-Nutrient agar, McConkey agar, EMB agar.	2
2.	Simple staining, Negative staining, Gram's staining, Capsule staining, Endospore staining	5
3.	Isolation of pure cultures of bacteria by streaking method.	2
4.	Preservation of bacterial cultures by various techniques.	2
5.	Estimation of CFU count by spread plate method/pour plate method.	2
6.	Motility by hanging drop method.	2
7.	Isolation of coliphages from sewage water sample.	2
8.	One step growth curve for determination of virus titre.	2
9.	Immunological assays for virus detection.	2
10.	Cultivation and morphological identification of animal cell lines.	2

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Experiments in Microbiology, Plant Pathology and Biotechnology. 4th Edition. Aneja, K.R. (2003). New Age International Publishers, New Delhi. 5th ed.	2017
<b>References</b>		
1.	Microbiology: A Laboratory Manual. Benjamin Cummings. 10 <sup>th</sup> edition. Cappuccino J. and Sherman N. (2013)	2013
2.	Laboratory exercises in Microbiology by Harley Prescott. 7 <sup>th</sup> edition, McGraw-Hill Higher Education.	2008
3.	Benson's Microbiology Application, laboratory Manual Concise version (2016) McGraw Hill Publisher- 14 <sup>th</sup> ed	2016
4.	Applied Microbiology laboratory Manual (2016) Kendall Hunt Publisher- 5 <sup>th</sup> Edition, Frances Duncan	2016

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60

## SEMESTER III

### Mycology & Phycology Lab

Course Code: BMB-353

Credit Units: 02

**Pre-requisite:** Basic information of Fungus and Algae

**Course Outcome:**

After the successful completion of this course

- Students will be able to isolate fungi from soil.
- Students will be able to learn about the cultivation and preservation of fungi and algae.
- Students will be able to recognize the microscopic structure of fungi.
- Students will be able to recognize the microscopic structure of algae.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	To study cultivation and preservation of fungus under laboratory conditions.	2
2	Field trip to nearby forest area of Shobhit University and sample collection.	2
3	Isolation of fungi from fungal infected fruits or bread.	2
4	Isolation of fungi from soil.	2
5	To study morphology, microscopy of isolated fungi.	2
6	Various enzyme production by fungi (plate assay).	2
7	Effect of pH and temperature on fungus.	2
8	Study of the following genera through temporary and permanent slides: <i>Volvox</i> , and <i>Nostoc</i> .	2
9	Study of the following genera through temporary and permanent slides: <i>Coleochaete</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> , <i>Polysiphonia</i> .	2

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Reference Books</b>		
1.	Introduction to Fungi 3 <sup>rd</sup> Edition. John Webster and Roland W.S. Weber (2007). Cambridge.	2007
2.	Alexopoulos C.J, Mims C.W. and Blackwell M.I 1996. Introductory Mycology. John Wiley and Sons Inc.	1996
3.	Kumar HD. (1990). Introductory Phycology. 2nd edition. Affiliated East Western Press.	1990
4.	Microbiology 5 <sup>th</sup> Edition. Prescott, L. M.; Harley, J.P. and Klein, D.A. (2003) McGraw Hill, USA.	2003

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## General Proficiency-III

**Course Code: GP-301**

**Credit Units: 01**

**Pre-requisite:** Basic information of English Language

### **Course Outcome:**

- Effective communication: The ability to exchange ideas and information in a way that builds trust and respect
- Critical and analytical thinking: The ability to explore issues and ideas before forming a conclusion
- Integrative thinking: The ability to synthesize knowledge across different domains and perspectives
- Preparing students to be engaged citizens: Preparing students to participate in political culture and thrive in a rapidly evolving world

### **Details of the Course:-**

General language proficiency is the ability to read, write, listen, and speak in real-life situations. To test this, a test is usually developed for each skill with questions that are designed to imitate real life.

A syllabus is a guide to a course that includes course policies, rules, regulations, required texts, and a schedule of assignments and seminar.

### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## Psychology

**Course Code: GP-301 a**

**Credit Units: 01**

**Pre-requisite:** Basic information of Psychology

Course Outcome:

- Define and explain core concepts in psychology, including behavior, mental processes, sensation, perception, and learning.
- Apply theories from different areas of psychology (cognitive, behavioral, humanistic, etc.) to real-world problems.

### Details of the Course:-

Psychology is the scientific study of behavior and mental processes. The course syllabus typically covers various branches of psychology, including biological, cognitive, developmental, social, clinical, and abnormal psychology. It explores human behavior in different contexts, using both theoretical and empirical approaches.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## Sociology

Course Code: GP-301b

Credit Units: 01

**Pre-requisite: Basic information of Sociology**

Course Outcome:

- Understand Sociological Concepts
- Conduct Sociological Research
- Analyze Social Institutions

### Details of the Course:-

Sociology is the scientific study of society, human behavior, social relationships, and the structures that shape individuals' lives. The sociology course typically covers topics ranging from social institutions (family, education, religion) to issues like class, race, gender, and global inequalities. It involves understanding social processes, patterns of behavior, and the impact of social forces on individuals and groups.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## **SEMESTER IV**

### **Molecular Biology**

**Course Code: BMB-401**

**Credit Units: 04**

**Pre-requisite:** Basic information of Cell Biology

#### **Course Outcome:**

- Students will gain an understanding of molecular biology of nucleus and its effect of functioning of an organism.
- Students will understand the concepts of DNA, RNA and will develop an insight into the mechanism of DNA replication in the cell.
- Students will learn about the physiochemical reasons of damage of DNA and their effect on body functioning and will be able to analyze the in vivo mechanism of repair of DNA

damage and recombination processes.

- Students will develop an understanding of formation of RNA, different mechanisms in prokaryotes and eukaryotes and processing of final transcriptional products.
- Students will be able to understand the process of protein formation and its control.
- Students will be able to analyze the mechanisms of gene expression and its regulation.

#### **Details of the Course:-**

##### **UNIT-I: Structure of nucleotides and nucleic acids:**

Structures and types of DNA and RNA, packaging of genetic material in prokaryote and eukaryotes

##### **UNIT-II: DNA replication:**

Replication of DNA in prokaryotes and eukaryotes: Semiconservative nature of DNA replication, Bi-directional replication, Replication enzymes

##### **UNIT-III: DNA damage, repair and homologous recombination**

DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, Nonhomologous end joining. Homologous recombination: models and mechanism.

#### UNIT-IV: Transcription and RNA processing:

Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains

Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

#### UNIT-V: Regulation of gene expression and translation

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system), Genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation. Posttranslational modifications of proteins.

#### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	Genes IX, Lewin, Benjamin, Jones and Bartlett.	2008
	<b>Reference Books</b>	
1.	Molecular Biology of the Gene, James D Watson et. al., (5 <sup>th</sup> Edition,) Pearson	2009

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER IV

### Economic Biology

Course Code: BMB-401a

Credit Units: 04

**Pre-requisite:** Basic information of Economic Biology

#### Course Outcome:

- Students will gain an understanding of molecular biology of nucleus and its effect of functioning of an organism.
- Students will understand the concepts of DNA, RNA and will develop an insight into the mechanism of DNA replication in the cell.
- Students will learn about the physiochemical reasons of damage of DNA and their effect on body functioning and will be able to analyze the in vivo mechanism of repair of DNA damage and recombination processes.
- Students will develop an understanding of formation of RNA, different mechanisms in prokaryotes and eukaryotes and processing of final transcriptional products.
- Students will be able to understand the process of protein formation and its control.
- Students will be able to analyze the mechanisms of gene expression and its regulation.

**Pre-requisite:** In-depth knowledge of Molecular Biology

#### Details of the Course:-

##### Unit I: Introduction and scope of RDT:

Recombinant DNA, Milestones in genetic engineering, Biosafety and Bioethics, Overview of Scope and Applications of Recombinant DNA Technology. Isolation of nucleic acid (plasmid, DNA and RNA), quantification and its purity.

##### Unit II: Tools and strategies of molecular cloning:

Enzymes in Recombinant DNA Technology and its applications: Nucleases, Restriction endonucleases, DNA Polymerases, Terminal transferase, Reverse transcriptase, Kinase and Phosphatase, DNA ligases (T4 DNA ligase and *E.coli* DNA ligase).

Structure and strategies of cloning and screening of vectors based upon: Plasmids, Cosmids, Phages, Artificial Chromosomes (BAC and YAC), and hybrid vectors, shuttle vectors, plant vectors (*Agrobacterium* and virus based), expression vectors.

##### Unit III: Gene Cloning and Expression:

Cloning and screening strategies (including directional cloning): Cutting and joining

vector and insert DNA, transformation of recombinant DNA in host, methods for screening of Transformants. Introduction to gene expression (Prokaryotic and eukaryotic expression). Synthesis of cDNA, Construction of cDNA library and genomic DNA library.

#### **Unit IV: Methods in RDT:**

DNA, RNA and Protein analysis: Agarose gel electrophoresis, SDS-PAGE, Gel Shift Assay. Blotting techniques: Southern-, Northern- and Western blotting, probe labeling and hybridization; Polymerase Chain Reaction: Principle, methodology and application; variants of PCR. Molecular markers and their applications; DNA microarray analysis; Chromosome walking; Site directed mutagenesis.

#### **Unit V: Application of RDT:**

Transgenic Technology: Types approaches and application (Plant and Animals); Gene therapy: Principles, strategies and ethics of human gene therapy; DNA Fingerprinting and application of DNA technology in forensics and parental disputes; Products of recombinant DNA technology: human therapeutic- insulin, hGH, recombinant vaccines.

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Gene Cloning and DNA Analysis, An Introduction, T. A. Brown (7 <sup>th</sup> edition), Wiley-Blackwell	2015
2.	Recombinant DNA: Genes and Genomes - A Short Course, James D. Watson , Richard M. Meyers, Amy A. Caudy, Jan A. Witkowski, (3rd Edition), W.H. Freeman	2007
<b>Reference Books</b>		
1.	Molecular Cloning: A Laboratory Manual, Michael R. Green; Joseph Sambrook, (Fourth Edition), CSHL Press	2012
2.	Principles of Gene Manipulation and Genomics, Primrose, S.B. and Twyman, R.M., (7th ed.) Blackwell Publishing	2006

#### **Examination Scheme:**

	<b>Internal Assessment</b>	
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<b>Components</b>	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	<b>External Evaluation</b>
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER IV**

### **Gender Studies**

**Course Code: BMB-401b**

**Credit Units: 04**

**Pre-requisite:** Basic information of Gender equality

#### **Course Outcome**

**CO-1**To familiarize the students with the terminologies related to Gender studies.

**CO-2**To elaborate the concept of patriarchy and its impact on women

**CO-3**To introduce students to the discipline of Women's Studies and Gender Studies and its perspectives.

**CO-4**To trace the evolution of Gender Studies from Women's Studies. Learning outcomes

**CO-5**Familiarity with fundamental concepts related to field of women and gender studies.

#### **Unit I**

Introduction: Gender Studies - Origin and growth; need for Gender Studies – objectives, nature and scope of Gender Studies. Establishment of Centre for Women's Studies under UGC guidelines 14H

#### **Unit II**

Basic Concepts: Meaning and definition: gender, sex, difference between gender and sex, gender equality, gender empowerment, gender roles, gender gap. Patriarchy and Matriarchy: Meaning and definition. Gender discrimination- meaning, forms and areas, Need for Gender Sensitization. Bio-social perspective of gender, gender socialization, gender stereotyping, gender bias 16H Page 5 of 34

#### **Unit III**

Multidisciplinary Nature of Gender Studies Multi-disciplinarity of gender studies, relationship with mainstream social sciences (Economics, Sociology, History, Literature, Anthropology, Psychology and Political Science) 14 H

#### **Unit IV**

Women's Studies and Gender Studies A paradigm shift: from Women's Studies to Gender Studies. Relevance of women/gender studies in Indian context 6 H

#### **Unit V**

Future of Gender Studies Gender studies as a profession- employment opportunities, constraints, emerging needs Role of UGC in promoting the women's and gender studies, future of gender studies

#### **Recommended Readings**

1. Maithreyi Krishnaraj (2006), Is 'Gender' Easy to Study? Some Reflections, Economic and Political Weekly, October 21
2. 2. Menon, Nivedita (1999), Gender and Politics In India, OUP, New Delhi.
3. 3. Neera Desai and Maithreyi Krishnaraj (1986), Women's Studies in India – Some Perspectives, Popular Prakashan Private Ltd, Mumbai.
4. 4. Vina Mazumdar (1985), Emergence of Women's Question and Role of Women's Studies, Occasional Paper, Centre for Women's Development Studies, New Delhi
5. 5. Mary E. John (2008), Women's Studies in India – A Reader, Penguin Books, New Delhi
6. 6. Neera Desai and Maithreyi Krishnaraj (1987), Women and Society in India, Ajantha Publications, New Delhi
7. 7. Burton, A. (1994) Burdens of History: British Feminists, Indian Women and Imperial Culture. University of North Carolina Press

## SEMESTER IV

### International Business in Dairy Science

Course Code: BMB-401c

Credit Units: 04

**Pre-requisite:** Basic knowledge of food microbiology.

#### Course Outcome:

**CO-1:** Students will be able to know about the microorganisms important in food microbiology.

**CO-2:** Students would know about the factors influencing microbial growth in food.

**CO-3:** Students will understand various food borne diseases.

**CO-4:** Students will also have knowledge of microbiology of milk.

**CO-4:** Students will understand microorganisms as source of food.

#### Details of the Course:

Sl. No.	Contents	Contact Hours
1.	<b>UNIT-1</b> Microorganisms important in food microbiology: molds, yeast and bacteria – general characteristics, classification and importance. Principles of food preservation, preservation by use of high temperature, low temperature, drying and dessication. Chemical preservatives and additives. Preservation by radiation.	4
2.	<b>UNIT-2</b> Factors influencing microbial growth in food: Extrinsic and intrinsic factors. Microbial spoilage of food. Chemical changes caused by the microorganisms during spoilage. Spoilage of fish, meat, poultry, eggs, fruits and vegetables. Detection of spoilage and characterization.	10
3.	<b>UNIT-3</b> Classification of food borne diseases. Food borne infections: Brucella, Bacillus cereus, Clostridium perfringens, Yersinia enterocolitica and Escherichia, Salmonella spp. Food intoxication: Staphylococcal intoxication, Clostridial poisoning (Clostridium Botulinum). Food adulteration and prevailing food standards in India.	9
4.	<b>UNIT-4</b> Microbiology of Milk: Sources of microorganisms in milk and types of microorganisms in milk. Microbiological examination of milk (standard plate count, direct microscopic count, reductase, and phosphatase test). Dehydration and pasteurization of milk. Dairy products from microorganisms: Butter, yoghurt and cheese.	12



5.	<b>UNIT-5</b> Microorganisms as source of food: Single Cell Protein (SCP). Mushrooms and food value of mushrooms. Food conversions: Lactic acid conversions, soyabean conversions and Bakery. Microbiological estimation of food: Sample collection, preparation and analysis techniques.	6
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**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Food science By Norman N. Potler, Joseph H. Hotchkiss. Fourth edition, CBS Publishers and Distributors, New Delhi	2006
2.	Food Microbiology , by William C. Frazier and Dennis C. Westhoff, Fourth edition, Tata McGrawHill Publishing Company Limited, New Delhi	1997-1979
3.	Modern Food Microbiology by James M. Jay, Fourth Edition, CBS Publishers and Distributors, New Delhi.	1959
4.	Bains W. Biotechnology from A to Z. Oxford Univ. Press.	1993
<b>Reference Books</b>		
1.	Introduction to Food Biotechnology. Author; Perry Johnson.	2002

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER IV

### Immunology

**Course Code: BMB-402**

**Credit Units: 04**

**Pre-requisite:** Basic information of microbiology, infection, immunity.

**Course Outcome:**

- Students will be able to define and explain the fundamental principles of modern immunology.
- Students will be able to *classify* antibodies on the basis of their structures and functions.
- Students will be able to *understand* related immunological techniques and *apply* them in medical laboratory profession.
- Students will *acquire* knowledge about processing and presentation of antigens by different methods.
- Student will be able to understand cell mediated immune response.
- Students will be able to value role of immune system in different diseases.
- Students will be able to *apply* their knowledge to healthy and disease contexts.

**Details of the Course:-**

**UNIT – I: Introduction:**

History: Concept of Innate and Adaptive immunity; Structure, Functions and Properties of: Immune Cells; and (Primary and secondary Lymphoid organs). Active and Passive Immunity.

**UNIT – II: Antigens and Antibodies:**

Antigen, Immunogen, Factors contributing immunogenicity, Epitopes, Haptens; Adjuvants

Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic); Monoclonal and Chimeric antibodies, Hybridoma Technique. Principles of Precipitation, Agglutination, Immunodiffusion, Immunoelectrophoresis, ELISA, RIA, Immunofluorescence, Immunoelectron microscopy, Complement fixation test.

**UNIT – III: Major Histocompatibility Complex and Complement System:**

Organization of MHC locus (Mice & Human); Structure and Functions of MHC I & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways). Components of the Complement system; Activation pathways (Classical, Alternative and Lectin pathways).

#### **UNIT – IV: Generation of Immune Response:**

Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response, T-cell receptor, T-cell maturation, activation and differentiation.

#### **UNIT – V: Immunological Disorders, Tumor Immunity and vaccines:**

Autoimmunity and Autoimmune diseases, Hypersensitivity- Type I Hypersensitivity, Type II Hypersensitivity, Type III Hypersensitivity, Type IV Hypersensitivity; Types of tumors, tumor Antigens, causes and therapy for cancers, Vaccine.

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/ Reprint</b>
<b>Text Books</b>		
1.	Immunology, Goldsby RA, Kindt TJ, Osborne BA. Kuby's. 6th edition W.H. Freeman and Company, New York, 2007.	2007
2.	Essential Immunology, 10 <sup>th</sup> ed Roitt, Ivon; Delves, Peter (2001) Blackwell Scientific Publications Oxford.	2017
<b>References</b>		
1.	Basic and Clinical Immunology, Peakman M, and Vergani D. 2nd ed). Immunology on Churchill Livingstone Publishers, Edinberg, 2009	2009
2.	Richard C and Geiffrey S. 6th edition. Wiley Blackwell Publication. 2009.	2009
3.	Janeway's Immunobiology, Murphy K, Travers P, Walport M., 7 <sup>th</sup> edition Garland Science Publishers, New York. 2008.	2008

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER IV

### Anthropology

**Course Code: BMB-402a**

**Credit Units: 04**

**Pre-requisite:** Basic information of insects.

**Course Outcome:**

- After completion of the course the students will be able to
- Understand the microbial growth in different physiological conditions.
- Learn the phenomenon of nutrient utilization of microbes.
- Comprehend the concept of microbial respiration and their metabolism.

**UNIT-1 Social anthropology:**

history and subject matter; Relationship of social and cultural anthropology with sociology, psychology, history, economics and political science.

**UNIT-2 Concepts of Society;**

Pre-requisite of Human society Individual and Society; Group and its types; Community; Association and Institution Status and Role ;

**Unit -3 Social fact;**

Social Action; Social Structure , Function and Social Organisation ; Structural - Functionalism ; Social System ; Social Conflict

**Unit -4 Techniques and methods:**

Field work/ Ethnography and Survey Research Comparative and Historical Methods

**References:**

1. Metcalf Peter (2005) Anthropology: the basics. Abingdon (England), Routledge.
2. Ingold Tim (1994) Companion encyclopedia of anthropology. London, Routledge reference.
3. R.M MacIver & Charles H. Page (1950) Society : An Introductory Analysis. London, Macmillan
4. Ralph Linton (1936) The Study of Man. New York, Appelton Century Croft.
5. M. J. Herskovits (1974) Cultural Anthropology, New Delhi, Oxford and IBH Publications.
6. Roger Keesing (1984) An Introduction of Cultural Anthropology. NewYork, MacMillan.
7. Kingsley Davis (1948) Human Society, New York: MacMillan.
8. John Monaghan and Peter Just (2000) Social and Cultural Anthropology: A very Short Introduction. 9. Thomas Hylland Eriksen (2010) Small Places, Large Issues: An Introduction to Social and Cultural Anthropology.
10. Nigel Rapport and Joanna Overing (2006) Social and Cultural Anthropology: The Key Concepts .

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER IV**

### **Neurobiology**

**Course Code: BMB-402b**

**Credit Units: 04**

#### **Course Outcome**

- Gain a strong foundation in the fundamental principles of neurobiology, including the physiology of neurons, synaptic transmission, and cellular mechanisms.
- Understand the molecular basis of neural signaling, including ion channels, receptors, and neurotransmitter systems.
- Identify and describe the key structures of the central and peripheral nervous systems (e.g., brain regions, spinal cord, sensory and motor pathways).
- Understand how neural circuits and networks contribute to sensory processing, motor control, and higher cognitive functions.

#### **UNIT I Neural induction**

Overview of early embryology +details of hydra, C. elegans (indentation), Drosophila (delamination), frog, zebrafish, chick and humans (invagination), 'Organiser' of differentiation- Spemann and Mangold experiments, Keller sandwich, Molecular nature of neural inducer- Noggin, chordin, follistatin, activin, BMP4-WNT signalling- important for formation of neural plate, Neuroblast induction-acheate scute, lateral inhibition and details – notch delta signalling pathway- important for formation of neuroblasts.

#### **UNIT II Polarity and Segmentation**

Overview of polarity and brain architecture, rhombomeres  
AP-Axis in Drosophila-Bicoid and nanos, homeobox genes, ANT-C and BX-C in flies, effect of homeobox genes on hindbrain development in mammals, Upstream control of hox genes, transformers-RA, WNT-b-catenin, FGF  
Mesencephalon/metencephalon boundary organiser-WNT1, ENGRAILED1, FGF8, Forebrain development in mammals-pax genes, DV-axis polarity-sonic hedgehog(shh) induces the ventralisation (floorplate), Dorsal neural tube development- again WNT/BMP and shh signaling, Patterning the cerebral cortex-pax6, emx2, fgf8 and fgf18

#### **UNIT III Genesis and Migration**

Methods to visualise lineage and timing of a neurons birth-thymidine, BrdU, retroviral GFP, thymidine dating  
Molecular control of neuron number-intrinsic proteins and also mitogens like FGF, IGF, What separates neurons from glia, Cerebral and cerebellar cortex formation  
Molecular control of migration of neurons, adult neurogenesis

#### **UNIT IV Determination and differentiation**

Determination-various transcription factors involved (intracellular factors), Asymmetric cell division – eg NB, GMC, neuron – (numb and prospero) and drosophila eye, Local environmental factors- eg Drosophila eye imaginal disc (MF) and chick-quail transplant studies, Histogenesis-loss of competence Eg layers of the cortex by transplantation studies and retina by heterochronic experiments  
Neuronal differentiation form neural stem cell, embryonic stem cell and induced pluripotent cell-basic principle and methodology

#### **UNIT V Axon growth and guidance**

Overview of growth cone and axonal pathfinding. Initial study, Guidance cues for growth cone – Netrin, Semaphorin and Ephrins, Substrates for growth of developing axon – Role of cell adhesion molecule, in growth cone guidance, Mechanism of axon guidance- guidance cues and the control of cytoskeletal dynamic, localized translational of growth cone guidance, changing response to guidance cues, Axon regeneration

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
<b>Reference Books</b>		
1.	Physical Chemistry, P.W. Atkins	2009
2.	Organic Chemistry, I.L.Final (Vol-1, Vol-2)	2002
3.	Fundamentals of Molecular Spectroscopy, C.N. Banwell	1994

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER IV

### Nanotechnology

Course Code: BMB-402c

Credit Units: 04

#### Course outcomes

- Understand nanoscale materials: Learn about the unique properties of materials at the nanoscale
- Manipulate nanomaterials: Master techniques for synthesizing and manipulating nanomaterials
- Develop innovative applications: Create new devices and applications for various sectors

#### Unit I

**Background to Nanoscience:** Definition of Nano, Scientific revolution-Atomic Structure and atomic size, emergence and challenges of nanoscience and nanotechnology, carbon age-new form of carbon (CNT to Graphene), influence of nano over micro/macro, size effects and crystals, large surface to volume ratio, surface effects on the properties.

#### Unit II

**Types of nanostructure and properties of nanomaterials:** One dimensional, Two dimensional and Three dimensional nanostructured materials, Quantum Dots shell structures, metal oxides, semiconductors, composites, mechanical-physical-chemical properties.

#### Unit III

**Application of Nanomaterial:** Ferroelectric materials, coating, molecular electronics and nanoelectronics, biological and environmental, membrane based application, polymer based application.

#### Unit IV

**Surface Nanoscience:** Introduction to surface active agents. Theory and applications. Types of surfactants. Classification, synthesis of surfactant - Shape, size and structure of surfactants. Micelle, Emulsions, Microemulsions & Gels. Kraft temperature, surfactant geometry and packing.

#### Unit V

**Colloidal Nanoscience:** Introduction to colloidal material, surface properties, origin of colloidal particles, preparation & characterization of colloidal particles. Applications of super hydrophilic hydrophobic surfaces, self-cleaning surfaces. Surface viscosity.

#### References:

1. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et.al.
2. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.
3. Instrument E L Principe, P Gnauck and P Hoffrogge, Microscopy and Microanalysis (2005), 11: 830- 831, Cambridge University Press.
4. Processing & properties of structural nanomaterials - Leon L. Shaw, Nanochemistry: A Chemical Approach to Nanomaterials, Royal Society of Chemistry, Cambridge UK 2005.

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



























































## SEMESTER V

### Medicinal Microbiology

Course Code: BMB-501a

Credit Units: 04

**Pre-requisite:** Basic information of Medical Microbiology

**Course Outcome:**

Upon successful completion of this course the student will be able to:

**CO1:** Explain the morphology, physiology, and genetics of medically significant microorganisms (bacteria, viruses, fungi, and parasites).

**CO2:** Describe the mechanisms of microbial pathogenesis, including host-pathogen interactions and immune responses to infections.

**CO3:** Demonstrate knowledge of infectious diseases caused by various pathogens, their clinical manifestations, and methods of prevention.

**Course Details:- Unit 1: Introduction to Microbiology**

- History and scope of microbiology.
- Classification and taxonomy of microorganisms.
- Morphology and structure of bacteria, viruses, fungi, and parasites.
- Sterilization, disinfection, and biosafety practices in microbiology labs.

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**Unit 2: Bacterial Pathogenesis**

- Bacterial growth, metabolism, and genetics.
- Mechanisms of pathogenicity: adhesion, invasion, toxins.
- Host-microbe interactions: immune evasion and immune responses.
- Important bacterial pathogens (e.g., *Escherichia coli*, *Staphylococcus aureus*, *Mycobacterium tuberculosis*).

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**Unit 3: Virology**

- Structure and classification of viruses.
- Viral replication and pathogenesis.
- Laboratory diagnosis of viral infections.
- Key viruses (e.g., influenza, HIV, hepatitis viruses, coronaviruses).
- Vaccines and antiviral drugs.

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**Unit 4: Medical Mycology**

- Fungal classification and structure.
- Pathogenic fungi and fungal diseases (e.g., *Candida*, *Aspergillus*, *Cryptococcus*).
- Laboratory diagnosis of fungal infections.
- Antifungal agents and resistance mechanisms.

## Unit 5: Parasitology

- Classification and life cycles of medically important parasites.
- Protozoan infections (e.g., malaria, amoebiasis).
- Helminthic infections (e.g., schistosomiasis, tapeworms).
- Laboratory diagnosis and control of parasitic diseases.

### Suggested Books:

- **"Medical Microbiology" by Patrick R. Murray, Ken S. Rosenthal, and Michael A. Pfaller**
  - A comprehensive book covering the microbiology of pathogens, host defenses, and infectious diseases.
  - Focus: Clinical and diagnostic aspects with detailed illustrations.
- **"Sherris Medical Microbiology" by Kenneth J. Ryan and C. George Ray**
  - Offers a clinical approach to microbiology, highlighting mechanisms of disease.
  - Focus: Core concepts, concise explanations, and integrated case studies.
- **"Fields Virology" by David M. Knipe and Peter M. Howley**
  - The definitive text on virology, covering structure, replication, and clinical aspects of viruses.
  - Focus: Research-oriented, ideal for advanced studies.
- **"Medical Mycology" by D. R. Arora**
  - Covers fungal pathogens and associated diseases in detail.
  - Focus: Clinical and diagnostic perspectives on mycology.
- **"Parasitology: A Conceptual Approach" by Eric S. Loker and Bruce V. Hofkin**
  - Modern insights into parasitic organisms, their biology, and diseases.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER V**

### **Recombinant DNA Technology**

**Course Code: BMB-502**

**Credit Units: 04**

**Pre-requisite:** In-depth knowledge of Molecular Biology

#### **Course Outcome:**

- The student will be familiar with the historical background and important milestones, biosafety and bioethics in genetic engineering.
- The student will be acquainted with tools of RDT like enzymes, vectors and hosts.
- The student will be acquainted with technical knowhow of gene cloning and expression and factors for optimizing the heterologous gene expression.
- The student will be acquainted with the techniques required for gainful applications of genetic engineering.
- The student will be able to apply RDT in different domains of life science, medical, agriculture, forensic and allied fields for the welfare of living beings.

#### **Details of the Course:-**

##### **Unit I: Introduction and scope of RDT:**

Recombinant DNA, Milestones in genetic engineering, Biosafety and Bioethics, Overview of Scope and Applications of Recombinant DNA Technology. Isolation of nucleic acid (plasmid, DNA and RNA), quantification and its purity.

##### **Unit II: Tools and strategies of molecular cloning:**

Enzymes in Recombinant DNA Technology and its applications: Nucleases, Restriction endonucleases, DNA Polymerases, Terminal transferase, Reverse transcriptase, Kinase and Phosphatase, DNA ligases (T4 DNA ligase and *E.coli* DNA ligase).

Structure and strategies of cloning and screening of vectors based upon: Plasmids, Cosmids, Phages, Artificial Chromosomes (BAC and YAC), and hybrid vectors, shuttle vectors, plant vectors (*Agrobacterium* and virus based), expression vectors.

##### **Unit III: Gene Cloning and Expression:**

Cloning and screening strategies (including directional cloning): Cutting and joining vector and insert DNA, transformation of recombinant DNA in host, methods for screening of Transformants. Introduction to gene expression (Prokaryotic and eukaryotic

expression).Synthesis of cDNA, Construction of cDNA library and genomic DNA library.

**Unit IV: Methods in RDT:**

DNA, RNA and Protein analysis: Agarose gel electrophoresis, SDS-PAGE, Gel Shift Assay. Blotting techniques: Southern-, Northern- and Western blotting, probe labeling and hybridization; Polymerase Chain Reaction: Principle, methodology and application; variants of PCR. Molecular markers and their applications; DNA microarray analysis; Chromosome walking; Site directed mutagenesis.

**Unit V: Application of RDT:**

Transgenic Technology: Types approaches and application (Plant and Animals); Gene therapy: Principles, strategies and ethics of human gene therapy; DNA Fingerprinting and application of DNA technology in forensics and parental disputes; Products of recombinant DNA technology: human therapeutic- insulin, hGH, recombinant vaccines.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Gene Cloning and DNA Analysis, An Introduction, T. A. Brown (7 <sup>th</sup> edition), Wiley-Blackwell	2015
2.	Recombinant DNA: Genes and Genomes - A Short Course, James D. Watson , Richard M. Meyers, Amy A. Caudy, Jan A. Witkowski, (3rd Edition), W.H. Freeman	2007
<b>Reference Books</b>		
1.	Molecular Cloning: A Laboratory Manual, Michael R. Green; Joseph Sambrook, (Fourth Edition), CSHL Press	2012
2.	Principles of Gene Manipulation and Genomics, Primrose, S.B. and Twyman, R.M., (7th ed.) Blackwell Publishing	2006

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER V

### Microbial Technology

Course Code: BMB-502a

Credit Units: 04

**Pre-requisite:** In-depth knowledge of Molecular Biology

#### Course Outcome:

The student will be familiar with the historical background and important milestones,

**CO1:** Explain the role of microorganisms in industrial, environmental, agricultural, and healthcare applications.

**CO2:** Describe the principles and techniques of microbial biotechnology, including fermentation, genetic engineering, and bioinformatics.

**CO3:** Analyze the applications of microbial enzymes, biofuels, biopolymers, and other bioproducts in various industries

.Details of the Course:-

#### Unit 1: Introduction to Microbial Technology

- Historical milestones in microbial biotechnology.
- Role of microorganisms in industry, healthcare, and environment.
- Types of microbes used in technology: bacteria, fungi, viruses, and algae.
- Basic tools and techniques in microbial technology (e.g., sterilization, culture methods).

#### Unit 2: Industrial Microbiology

- Fermentation technology: principles, types (submerged and solid-state), and scale-up.
- Industrially important microbes: *Saccharomyces cerevisiae*, *Aspergillus*, *Lactobacillus*.
- Production of primary metabolites (e.g., ethanol, organic acids) and secondary metabolites (e.g., antibiotics, vitamins).
- Bioreactors: design, operation, and process optimization.
- Downstream processing and product recovery.

#### Unit 3: Microbial Enzymes and Applications

- Types of microbial enzymes: amylases, proteases, lipases, cellulases.
- Enzyme production and immobilization techniques.
- Applications in food, pharmaceutical, and biofuel industries.
- Advancements in enzyme technology: directed evolution and recombinant enzymes.

#### Unit 4: Microbial Genetics and Genomics

- Genetic engineering in microbes: tools (plasmids, CRISPR, cloning vectors).
- Recombinant DNA technology and its applications.
- Microbial genomics: sequencing, annotation, and functional studies.

- Synthetic biology and metabolic engineering of microbes for desired products.

### **Unit 5: Environmental Microbial Technology**

- Role of microbes in waste management: biodegradation and bioremediation.
- Microbial treatment of wastewater and solid waste.
- Microbial biofertilizers and biopesticides in sustainable agriculture.
- Role of algae in biofuel production and carbon sequestration.

### **Suggested Books:**

- "Microbial Biotechnology: Fundamentals of Applied Microbiology" by Alexander N. Glazer and Hiroshi Nikaido
- "Industrial Microbiology and Biotechnology" by Michael J. Waites, Neil L. Morgan, and John S. Rockley
- "Manual of Industrial Microbiology and Biotechnology" by Richard H. Baltz, Julian E. Davies, and Arnold L. Demain
- "Principles of Gene Manipulation and Genomics" by Sandy B. Primrose and Richard Twyman
- "Molecular Biotechnology: Principles and Applications of Recombinant DNA" by Bernard R. Glick, Jack J. Pasternak, and Cheryl L. Patten

### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER V**

### **Bio-Analytical Tools**

**Course Code: BMB-503**

**Credit Units: 04**

**Pre-requisite:** Basic understanding of molecular biology, Physics and chemistry

#### **Course Outcome:**

- Students will learn about the different bio-analytical techniques.
- Students will be able to use critical thinking skills to trouble shoot problems as they occur and determine possible causes.
- Students will be able to apply the knowledge of bio analytical techniques to the most commonly performed laboratory practices.

#### **Course Details:-**

##### **Unit I:**

Simple microscopy, phase contrast microscopy, dark field microscopy, florescence and electron microscopy (TEM and SEM).

##### **Unit II:**

Principle and law of absorption, fluorimetry, colorimetry, spectrophotometry (UV/visible).

##### **Unit III:**

Basic principle of Centrifugation, Speed based types of centrifugation, cell fractionation techniques, isolation of sub- cellular organelles and particles.

##### **Unit IV:**

Introduction to the principle of chromatography. Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion exchange chromatography, gas chromatography, HPLC.

##### **Unit V:**

Introduction to electrophoresis. Starch-gel, polyacrylamide gel (native and SDS-PAGE), Agarose-gel electrophoresis, pulse field gel electrophoresis, immuno- electrophoresis, isoelectric focusing, Western blotting. Introduction to Biosensors and Nanotechnology and their applications.



**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Shu-Kun, L. Physical Biochemistry: Principles and Applications. By David Sheehan , 2 <sup>nd</sup> Edition. John Wiley & Sons Ltd.	2000
2	Karp, G. Cell and Molecular Biology: Concepts and Experiments. 8th Edition. John Wiley& Sons. Inc.	2010
3.	Cooper, G.M. and Hausman, R.E.The Cell: A Molecular Approach. 7th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.	2016
<b>Reference Books</b>		
1.	Swargiary, A. Biological Tools & Techniques (A textbook for UG/PG students of Life Sciences).	2017

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER V

### Bio-Analytical Tools

Course Code: BMB-503a

Credit Units: 04

**Pre-requisite:** Basic understanding of molecular biology, Physics and chemistry

**Course Outcome:**

**CO1:** Explain the principles and working mechanisms of instruments used in microbiological research and diagnostics.

**CO2:** Describe the role of advanced technologies such as microscopy, spectroscopy, chromatography, and electrophoresis in microbial studies.

**CO3:** Understand the applications of molecular and biophysical tools in the analysis and characterization of microorganisms.

**CO4:** Develop proficiency in the operation, calibration, and maintenance of microbiological instruments.

**CO5:** Perform experiments involving techniques such as PCR, chromatography, flow cytometry, and mass spectrometry for microbial analysis.

**Course Details:- Unit 1: Introduction to Instrumentation in Microbiology**

- Overview of the role of instrumentation in microbiology.
- Basics of measurement and calibration.
- Good laboratory practices (GLP) and biosafety in handling instruments.
- Maintenance and troubleshooting of laboratory equipment.

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**Unit 2: Microscopy Techniques**

- **Optical Microscopy:** Bright-field, dark-field, phase-contrast, and fluorescence microscopy.
- **Electron Microscopy:** Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM).
- **Confocal Laser Scanning Microscopy:** Principles and applications in microbial imaging.
- Sample preparation techniques for microscopy.

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**Unit 3: Spectroscopy and Colorimetry**

- **UV-Visible Spectroscopy:** Principles, instrumentation, and applications in microbial growth analysis and enzyme kinetics.
- **Fluorescence Spectroscopy:** Applications in detecting microbial metabolites.
- **Infrared (IR) Spectroscopy:** Identification of microbial cell components.
- **Colorimetry:** Principles and use in biochemical assays.

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**Unit 4: Chromatography Techniques**

- Principles and types of chromatography.

- **Thin-Layer Chromatography (TLC):** Separation of microbial metabolites.
- **Gas Chromatography (GC):** Analysis of volatile compounds.
- **High-Performance Liquid Chromatography (HPLC):** Quantitative analysis of antibiotics and other metabolites.
- Applications of chromatography in microbial product purification.

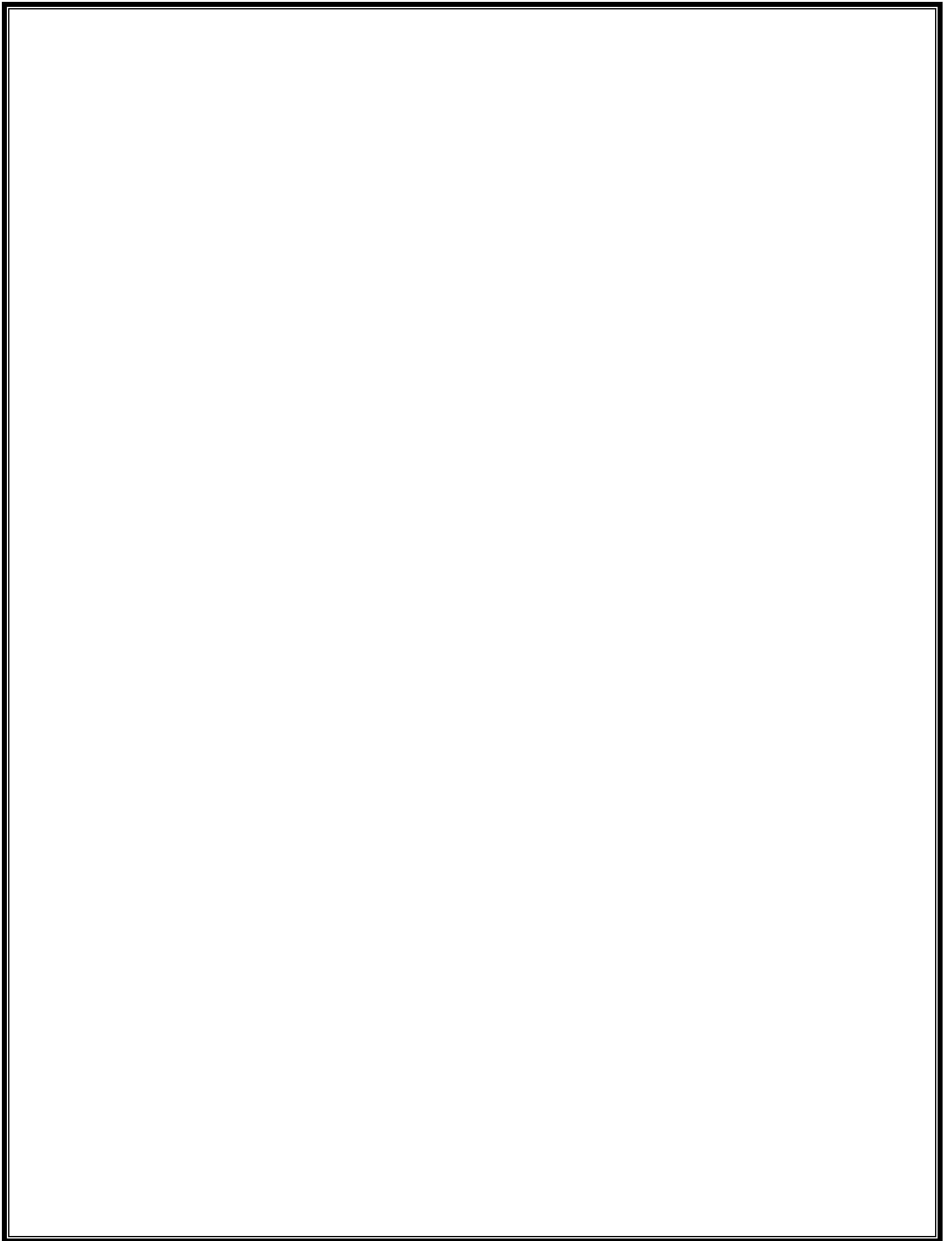
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### **Unit 5: Electrophoresis Techniques**

- Principles of electrophoresis and gel matrix preparation.
- **Agarose Gel Electrophoresis:** DNA/RNA analysis.
- **Polyacrylamide Gel Electrophoresis (PAGE):** Protein profiling and molecular weight determination.
- **Isoelectric Focusing:** Applications in protein separation.
- **Pulse Field Gel Electrophoresis (PFGE):** Microbial genome analysis.

### **Suggested Books:**

1. "Principles of Instrumental Analysis" by Douglas A. Skoog, F. James Holler, and Stanley R. Crouch
2. "Instrumental Methods of Analysis" by Willard, Merritt, Dean, and Settle
3. "Biophysical Chemistry: Principles and Techniques" by Avinash Upadhyay, Kakoli Upadhyay, and Nirmal Nath
4. "Fundamentals of Light Microscopy and Electronic Imaging" by Douglas B. Murphy and Michael W. Davidson
5. "Electron Microscopy: Methods and Protocols" edited by John Kuo



## **SEMESTER V**

### **Food and Dairy Microbiology**

**Course Code: BMB-504**

**Credit Units: 04**

**Pre-requisite:** Basic understanding of Food and Dairy Microbiology

**Course Outcome:** After completion of the course the students will be able to

- Learn and understand the microbial spoilage of food.
- Understand the principles and methods of food preservation.
- Understand the fermented foods and food borne diseases.

#### **Details of the Course:-**

##### **Unit I: Foods as a substrate for microorganisms:**

Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general.

##### **Unit II: Microbial spoilage of various foods:**

Principles, Spoilage of vegetables, fruits, meat, eggs, milk and butter, bread, canned Foods.

##### **Unit III: Principles and methods of food preservation:**

Principles, physical methods of food preservation: temperature (low, high, canning, drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO<sub>2</sub>, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins.

##### **Unit IV: Fermented foods:**

Dairy starter cultures fermented dairy products: yogurt, acidophilus milk, koumiss, kefir, dahi and cheese, other fermented foods: dosa, sauerkraut, soy sauce and tempeh, Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market.

##### **Unit V: Food borne diseases:**

Food intoxications: Staphylococcus aureus, Clostridium botulinum and mycotoxins; Food infections: Bacillus cereus, Vibrio parahaemolyticus, Escherichia coli, Salmonellosis, Shigellosis, Yersinia enterocolitica, Listeria monocytogenes and Campylobacter jejuni.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Adams MR and Moss MO. (1995). Food Microbiology. 4 <sup>th</sup> edition, New Age International (P) Limited Publishers, New Delhi, India.	1995
2.	Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.	1987
<b>Reference Books</b>		
1.	Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.	1993
2.	Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.	1996

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER V

### Paleontology

Course Code: BMB-504

Credit Units: 04

Pre-requisite: **Basic understanding of Paleontology**

**Course Outcome:** After completion of the course the students will be able to

**CO1:** Demonstrate an understanding of the fundamental principles and concepts of paleontology, including fossil formation, fossilization processes, and the history of life on Earth.

**CO2:** Describe the major events in the history of life, including the evolution and extinction of organisms, using evidence from the fossil record.

**CO3:** Understand and explain the role of paleontology in reconstructing past climates, ecosystems, and evolutionary processes.

#### Details of the Course:-

#### Unit 1: Introduction to Paleontology

- **Overview of Paleontology:** Definition, scope, and significance in understanding Earth's history.
- **History of Paleontology:** Key milestones in the development of paleontological science.
- **Branches of Paleontology:** Invertebrate paleontology, vertebrate paleontology, paleobotany, micropaleontology, and ichnology.
- **Fossils:** Types of fossils (body fossils, trace fossils, chemical fossils), fossilization process, and taphonomy.
- **Dating of Fossils:** Relative dating vs. absolute dating, principles of stratigraphy, and radiometric dating methods.

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#### Unit 2: Principles of Stratigraphy

- **Stratigraphy and Paleontology:** Introduction to stratigraphy and its significance in paleontology.
- **Principles of Stratigraphy:** Law of superposition, law of original horizontality, law of lateral continuity, and biostratigraphy.
- **Sequence Stratigraphy:** Concepts and methods used to interpret fossil sequences.
- **Stratigraphic Correlation:** Techniques for correlating rock layers across regions using fossils.
- **Lithostratigraphy vs. Biostratigraphy:** Differences and uses of lithology and fossil content for stratigraphic correlation.

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#### Unit 3: Fossilization and Fossil Preservation

- **Modes of Fossilization:** Permineralization, casting, molding, carbonization, and amber preservation.
  - **Taphonomy:** Study of how organisms decay, become fossilized, and are preserved.
  - **Biases in the Fossil Record:** Preservation potential, environmental factors, and geological processes affecting fossilization.
  - **Microfossils:** Types and significance of microfossils in paleoenvironmental reconstruction.
  - **Exceptional Fossils:** Lagerstätten and the preservation of soft tissues.
-

## Unit 4: Paleobotany

- **Early Plants and Evolution:** Origin and early evolution of plants.
- **Plant Fossils:** Types of plant fossils (wood, leaves, spores, and pollen).
- **Plant Fossilization:** Processes involved in the fossilization of plants and examples of famous plant fossils.
- **Paleoclimate Reconstruction:** Using plant fossils to reconstruct past climates.
- **Mesozoic and Cenozoic Plant Evolution:** Key developments in plant evolution during the Mesozoic and Cenozoic eras.

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## Unit 5: Invertebrate Paleontology

- **Introduction to Invertebrates:** Classification and major groups (sponges, cnidarians, mollusks, arthropods, echinoderms, etc.).
- **Fossilization of Invertebrates:** Preservation of shells, exoskeletons, and soft-bodied organisms.
- **Key Invertebrate Fossils:** Trilobites, brachiopods, ammonites, gastropods, and bivalves.
- **Biostratigraphy and Invertebrates:** Using invertebrate fossils for stratigraphic dating and correlation.
- **Ecology of Invertebrate Fossils:** Paleoecology of ancient invertebrates and their environments.

### Suggested Books:

- "Principles of Paleontology" by David M. Raup and Steven M. Stanley
- "Paleontology: A Brief History of Life" by Kent C. Condie
- "In the Blink of an Eye: How Vision Sparked the Big Bang of Evolution" by Andrew Parker
- "Stratigraphy and Sedimentation" by Donald R. Prothero
  
- "Principles of Stratigraphy" by W. S. MacLeod
- "Geologic Time: Scale and Correlation" edited by D. H. Tarling



## SEMESTER V

### Medical Microbiology Lab

**Course Code: BMB-551**

**Credit Units: 02**

**Pre-requisite:** Basic information of Medical Microbiology Lab

#### **Course Outcome:**

Upon successful completion of this course the student will be able to:

- This course provides learning opportunities in the basic principles of medical microbiology and infectious disease.
- It covers mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- It also provides opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.
- Helps to understand the use of lab animals in medical field.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganisms control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

#### **Details of the Course:-**

Sl. No.	Contents	Contact Hours
1	Study of composition and use of important differential media for identification of bacteria: EMBAgar, McConkey agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS	3
2	Study of bacterial flora of skin by swab method	3
3	Perform antibacterial sensitivity by Kirby-Bauer method	3
4	Identification of human blood groups.	3
5	To perform Total Leukocyte Count of the given blood sample.	3
6	To perform Differential Leukocyte Count of the given blood sample.	3
7	To separate serum from the blood sample (demonstration).	3
8	To perform immunodiffusion by Ouchterlony method.	3

**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Ananthanarayan R. and Paniker C.K.J. Textbook of Microbiology. 8th edition, University Press Publication	2009
2.	Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication	2013
3.	Goering R., Dockrell H., Zuckerman M. and Wakelin D. Mims' Medical Microbiology. 4 <sup>th</sup> edition. Elsevier	2007
4.	Wiley JM, Sherwood LM, and Woolverton CJ. Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education	2013

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60

## SEMESTER V

### Recombinant DNA Technology Lab

Course Code: BMB-552

Credit Units: 02

**Pre-requisite:** Basic experience of molecular biology techniques

#### Course Outcome:

- Students will be able to isolate and analyze DNA/plasmid DNA and protein.
- Students will be able to digest and ligate the DNA molecules.
- Students will be able to design primers and amplification of DNA by PCR.
- Students will be able to learn the techniques of cloning gene in plasmid vectors.
- Students will be able to screen the positive transformants with the gene cloned through reporter based assays.

#### Details of the Course:-

S. No.	Contents	Contact Hours
1	Isolation of Vector/plasmid DNA	3
2	Quantification of Nucleic acid and determination of its purity	3
3	Isolation of protein	3
4	Restriction digestion of DNA and its analysis by AGE	6
5	Ligation of DNA molecules	3
6	Primer designing	3
7	Polymerase chain reaction	6
8	Preparation of competent cells	3
9	Transformation in bacteria and reporter gene assay	3

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Methods in yeast genetics: a Cold Spring Harbor Laboratory course manual. David C. Amberg, Daniel Burke, Jeffrey Strathern Cold Spring Harbor Laboratory Press, c2005 2005 ed.	2005
2.	Departmental Laboratory Manual	2018
<b>Reference Books</b>		
1.	Molecular Cloning- A Laboratory Manual: 3 <sup>rd</sup> Edition, 2001, Vol. 1 -3 . Sambrook J and Russell D.W.(2001 ). Cold spring Harbor Laboratory Press, New York.	2001
2.	DNA cloning: A Practical Approach. Glover and Hames ( 2001) Oxford Univ. Press.	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER V

### Bio-Analytical Tools Lab

**Course Code: BMB-553**

**Credit Units: 02**

**Pre-requisite:** Basic knowledge of immunology and molecular biology

#### Course Outcome:

- Students will gain new insights about different bioanalytical procedures.
- Students will be able to use critical thinking to develop skill to trouble shoot the problems as they occur and to determine the possible causes.
- Students will be able to apply the knowledge of basic practical to the most commonly performed applications in the bioanalysis.

#### Details of the Course:-

S. No.	Contents	Contact Hours
1	Native gel electrophoresis of proteins	3
2	SDS-polyacrylamide slab gel electrophoresis of proteins under reducing conditions	3
3	Preparation of the sub-cellular fractions of rat liver cells	3
4	Preparation of protoplasts from leaves	6
5	Separation of amino acids by paper chromatography	3
6	To identify lipids in a given sample by TLC	3
7	To verify the validity of Beer's law and determine the molar extinction coefficient of NADH	6

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Shu-Kun, L. Physical Biochemistry: Principles and Applications. By David Sheehan , 2 <sup>nd</sup> Edition. John Wiley & Sons Ltd.	2000
2	Karp, G. Cell and Molecular Biology: Concepts and Experiments. 8th Edition. John Wiley& Sons. Inc.	2010
3.	Cooper, G.M. and Hausman, R.E.The Cell: A Molecular Approach. 7th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.	2016
	<b>Reference Books</b>	
1.	Swargiary, A. Biological Tools & Techniques (A textbook for UG/PG students of Life Sciences).	2017

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER V

### Food and Dairy Microbiology Lab

**Course Code: BMB-554**

**Credit Units: 02**

**Pre-requisite:** Basic understanding of Food and Dairy Microbiology

**Course Outcome:** After completion of the course the students will be able to

- Gain knowledge about fermentation techniques used in food and dairy industry.
- Understand the role of microorganisms in fermentation.
- Gain skills to control fermentation process.
- Learn the microbiology of different types of fermented food products.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Bacterial counts of food samples.	2
2	Quantitative analysis of milk by standard plate count method.	2
3	Isolation and counting of fecal bacteria in water.	2
4	Test of quality of milk by methylene blue dye reduction test.	2
5	Detection of mastitis through milk test.	2
6	Isolation of bacteria and fungi from spoiled food.	2
7	Microbial populations in fruit juices, soft drinks and ice-cream.	2
8	Isolation of microorganisms from curd.	2
9	Isolation of lipolytic organisms from butter.	2
10	Visit to microbiology based food industry and observe the unit operation procedures.	2

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Adams MR and Moss MO. (1995). Food Microbiology. 4 <sup>th</sup> edition, New Age International (P) Limited Publishers, New Delhi, India.	1995
2.	Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.	1987
<b>Reference Books</b>		
1.	Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.	1993
2.	Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.	1996

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60



## General Proficiency-V

**Course Code: GP-501**

**Credit Units: 01**

**Pre-requisite:** Basic information of English Language

### **Course Outcome:**

- Effective communication: The ability to exchange ideas and information in a way that builds trust and respect
- Critical and analytical thinking: The ability to explore issues and ideas before forming a conclusion
- Integrative thinking: The ability to synthesize knowledge across different domains and perspectives
- Preparing students to be engaged citizens: Preparing students to participate in political culture and thrive in a rapidly evolving world

### **Details of the Course:-**

General language proficiency is the ability to read, write, listen, and speak in real-life situations. To test this, a test is usually developed for each skill with questions that are designed to imitate real life.

A syllabus is a guide to a course that includes course policies, rules, regulations, required texts, and a schedule of assignments and seminar.

### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER VI**

### **Microbiological Analysis of Air and Water**

**Course Code: BMB-601**

**Credit Units: 04**

**Pre-requisite:** Basic information of air and water microbiology.

**Course Outcome:**

- Students will become familiar with aeromicrobiology.
- Students will be able to learn the collection of air sample and its analysis.
- Students will be familiarized with the water microbiology and control measures.
- Students will be able to explain the microbiological analysis of water.

**Details of the Course:-**

**Unit I: Aeromicrobiology:**

Bioaerosols, Air borne microorganisms (bacteria, Viruses, fungi, each from every category) and their impact on human health, and environment, significance in food and pharma industries and operation theatres, allergens.

**Unit II: Air Sample Collection and Analysis:**

Bioaerosol sampling, air samplers, methods of analysis, CFU, culture media for bacteria and fungi, Identification characteristics.

**Unit III: Control Measures:**

Fate of bioaerosols, inactivation mechanisms – UV light, HEPA filters, desiccation, Incineration.

**Unit IV: Water Microbiology:**

Water borne pathogens, water borne diseases.

**Unit V: Microbiological Analysis of Water:**

Sample Collection, Methods to detect portability of water samples: (a) standard qualitative procedure: presumptive/MPN tests, confirmed and completed tests for fecal coliforms (b) Membrane filter technique. Control measures by precipitation, chemical disinfection, filtration.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	da Silva N, Taniwaki MH, Junqueira VC, Silveira N, Nascimento MS, Gomes RAR (2012) Microbiological Examination Methods of Food and Water A Laboratory Manual, CRC Press.	2012
2.	Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA.	2000
<b>Reference Books</b>		
1.	Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.	2009
2.	Hurst CJ, Crawford RL, Garland JL, Lipson DA (2007) Manual of Environmental Microbiology, 3rd edition, ASM press.	2007

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER VI

### Hospital Management

Course Code: BMB-601a

Credit Units: 04

**Pre-requisite:** Basic information of Hospital management

#### Course Outcome:

**CO1:** Demonstrate a comprehensive understanding of the healthcare system, hospital operations, and the role of hospital management in the delivery of quality healthcare services.

**CO2:** Understand key concepts in healthcare management such as hospital organization, patient care management, healthcare policies, and legal and ethical aspects of hospital administration.

**CO3:** Explain the various functional areas of hospital management, including finance, human resources, marketing, information systems, and logistics, and how they contribute to the overall effectiveness of the institution.

**CO4:** Apply analytical tools and management techniques to solve operational, financial, and strategic issues in hospital management.

**CO5:** Use healthcare data to analyze hospital performance, improve decision-making, and develop strategies to optimize hospital operations and patient care services.

#### Details of the Course:-

##### Unit 1: Introduction to Healthcare and Hospital Management

- **Healthcare System Overview:** Structure, components, and functions of healthcare systems.
- **Introduction to Hospital Management:** Importance and challenges in managing hospitals.
- **Types of Healthcare Organizations:** Public vs private hospitals, general vs specialized hospitals.
- **Hospital Organization Structure:** Key departments, staff roles, and inter-departmental collaboration.
- **Healthcare Delivery Models:** Models of healthcare delivery (e.g., primary, secondary, and tertiary care).

##### Unit 2: Hospital Administration and Organizational Structure

- **Management Functions:** Planning, organizing, staffing, leading, and controlling in hospital settings.
- **Hospital Organizational Structure:** Hierarchy, governance, and administration of healthcare facilities.
- **Leadership in Healthcare:** Leadership theories, leadership styles, and their application in healthcare.
- **Human Resource Management in Hospitals:** Recruitment, training, performance management, and workforce planning in healthcare organizations.
- **Role of Hospital Administrator:** Responsibilities, skills, and competencies of a hospital manager.

##### Unit 3: Financial Management in Hospitals

- **Healthcare Financial Management:** Principles of hospital finance, budgeting, and financial reporting.
- **Revenue Management:** Billing, coding, and insurance reimbursements in hospitals.
- **Cost Management and Control:** Cost structures, cost-benefit analysis, and cost control in hospital settings.
- **Financial Planning and Forecasting:** Budgeting, cash flow management, and financial decision-making.

- **Healthcare Insurance Systems:** Overview of public and private insurance models, claims processing, and reimbursement.

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#### **Unit 4: Hospital Operations Management**

- **Hospital Operations and Logistics:** Managing hospital resources, procurement, and supply chain management.
- **Patient Flow and Bed Management:** Techniques to manage patient intake, bed occupancy, and discharge planning.
- **Quality Assurance and Improvement:** Implementing and maintaining quality standards in patient care.
- **Hospital Information Systems (HIS):** Role of information systems in managing hospital data, Electronic Health Records (EHR), and telemedicine.
- **Facility Management:** Maintenance of hospital infrastructure, safety protocols, and disaster preparedness.

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#### **Unit 5: Patient Care and Service Delivery**

- **Patient-Centered Care:** Concepts and practices of patient care, focusing on patient satisfaction and experience.
- **Medical and Nursing Services Management:** Coordination of medical, nursing, and allied health services in hospitals.
- **Clinical Pathways and Protocols:** Standardization of treatment processes and clinical guidelines.
- **Patient Safety and Risk Management:** Identifying and mitigating risks, ensuring patient safety.
- **Healthcare Marketing and Public Relations:** Strategies for patient retention, hospital branding, and reputation management.

#### **Suggested Books:**

- **"Hospital Administration and Management" by S. L. Goel & Rajeev Kumar**
- **"Hospital and Health Services Administration: Principles and Practices" by S. A. Begum**
- **"Principles of Hospital Administration and Planning" by B.M. Sakharkar**
  
- **"Healthcare Systems: A Global Perspective" by C. R. K. Rao**
- **"Introduction to Health Care Management" by Sharon B. Buchbinder & Nancy H. Shanks**
- **"Health Care USA: Understanding Its Organization and Delivery" by Harry A. Sultz & Kristina M. Young**

## SEMESTER VI

### Soil and Water Microbiology

**Course Code: BMB-601b**

**Credit Units: 04**

**Pre-requisite:** Basic information of Hospital management

#### Course Outcome:

**CO1:** Demonstrate a comprehensive understanding of the types of microorganisms (bacteria, fungi, protozoa, algae, viruses) present in soil and water ecosystems.

**CO2:** Identify the different microbial communities in diverse soil and water environments and their role in ecosystem functioning.

**CO3:** Explain the fundamental microbial processes involved in nutrient cycling in soil and water (e.g., nitrogen fixation, carbon cycling, phosphorus solubilization).

**CO4:** Analyze the role of microorganisms in the biogeochemical cycles (nitrogen, carbon, sulfur, phosphorus) in soil and water ecosystems.

#### Details of the Course:-

##### Unit 1: Introduction to Soil and Water Microbiology

- **Overview of Microbiology:** Basics of microbiology, types of microorganisms (bacteria, fungi, viruses, protozoa, algae).
- **Soil and Water Ecosystems:** Basic concepts of soil and water ecosystems, significance of microorganisms in these environments.
- **Environmental Microbiology:** Role of microorganisms in the environment, biogeochemical cycles, and environmental sustainability.
- **Soil and Water Interactions:** Interaction between soil microorganisms and water bodies, influence on soil structure, water retention, and quality.

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##### Unit 2: Soil Microbiology

- **Soil Composition:** Understanding soil as an ecosystem—minerals, organic matter, and soil texture.
- **Soil Microbial Communities:** Types of microorganisms in soil (bacteria, fungi, actinomycetes), and their distribution in different soil environments.
- **Microbial Activities in Soil:** Microbial processes involved in nutrient cycling—nitrogen fixation, carbon cycling, phosphorus solubilization, sulfur oxidation.
- **Soil Enzyme Activity:** Role of enzymes in soil, degradation of organic matter, and nutrient transformation.
- **Microbial Ecology of Soil:** Soil microbial diversity, environmental factors affecting microbial communities (temperature, moisture, pH, oxygen levels).

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##### Unit 3: Water Microbiology

- **Water Microorganisms:** Microbial communities in freshwater and marine ecosystems—bacteria, protozoa, and algae.
- **Microbial Ecology of Aquatic Environments:** Distribution and role of microorganisms in rivers, lakes, ponds, and oceans.
- **Water Quality and Contamination:** Microbial indicators of water quality (e.g., coliforms), waterborne diseases, and sources of contamination (e.g., sewage, industrial waste).

- **Microbial Pathogens in Water:** Pathogenic microorganisms in water—bacteria (e.g., E. coli), viruses, protozoa, and their impact on human health.
- **Water Treatment and Purification:** Biological treatment methods, microbial bioremediation of polluted water, role of microorganisms in wastewater treatment.

#### Unit 4: Microbial Biogeochemical Cycles

- **Nitrogen Cycle:** Role of microorganisms in nitrogen fixation, nitrification, denitrification, and ammonia oxidation.
- **Carbon Cycle:** Microbial degradation of organic matter, respiration, methane production, and carbon dioxide release.
- **Sulfur Cycle:** Role of sulfur-reducing and sulfur-oxidizing bacteria in sulfur cycling.
- **Phosphorus Cycle:** Microbial role in phosphorus solubilization and mobilization in soil and water.
- **Iron, Manganese, and Other Nutrient Cycles:** Microbial interactions with other elements in the environment.

#### Unit 5: Soil and Water Pollution and Bioremediation

- **Pollutants in Soil and Water:** Types of pollutants (organic, inorganic, heavy metals) and their impact on soil and water ecosystems.
- **Microbial Degradation of Pollutants:** Role of microorganisms in breaking down pollutants, bioremediation techniques, and enhancing microbial activity for cleanup.
- **Bioremediation in Soil:** In situ and ex situ bioremediation methods, applications in agriculture and environmental management.
- **Bioremediation in Water:** Microbial treatment of wastewater, oil spills, and other water pollutants.
- **Heavy Metal Contamination:** Impact of heavy metals (e.g., lead, arsenic) on microbial communities and strategies for removal using microbial processes.

##### Suggested Books:

- Gerard J. Tortora, Berdell R. Funke, Christine L. Case
- Joanne Willey, Linda Sherwood, Christopher J. Woolverton
- Marjorie Kelly Cowan, Kathleen Park Talaro

##### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER VI**

### **Marine Microbiology**

**Course Code: BMB-602**

**Credit Units: 04**

**Pre-requisite:** In-depth knowledge of marine microbiology.

#### **Course Outcome:**

- The student will be able to understand marine environment.
- The student will be able to know the methods of marine microbiology.
- The student will be able to know role of microbes in ocean processes.
- The students will be able to know recent trends in marine microbiology.

#### **Details of the Course:-**

##### **UNIT I: Marine Environment:**

World's oceans & Seas, Physio – Chemical properties of marine water, marine microbial habitat: water column, sediments, coastal ecosystems, mangroves salt marshes. Bio-films & Microbial mats. Microbial life at surface of living & nonliving systems and microbial interactions. Quorum sensing in marine microbes and significance. Metabolic diversity and importance of microbial communities, Photo trophy & primary productivity.

##### **UNIT II: Methods in Marine Microbiology:**

Sampling methods of different habitat of oceans and screening by CLSM & FCM. Importance of Culturable & non-Cultural microorganisms. Molecular tools to study marine diversity. Limitations of analysis of nucleic acid directly from marine environment.

##### **UNIT III: Role of Microbes in ocean processes:**

Bioenergetics, Carbon & Nitrogen cycling in ocean, Photosynthesis and Primary productivity. Eutrophication of coastal areas. Microbial loop in ocean food web. Microbial processes and climate change. Bio – fouling & bio – deterioration, indicator organisms and pollution control. Symbiosis of microalgae with animals: Chemoautotrophic prokaryotes with animals. Symbionts of sponges, mixotrophy in protists. Metabolic consortia and mutualism between prokaryotes.

##### **UNIT IV: Marine Microbes:**

Bacterial and viral disease of fresh water, seawater, aqua culture: fish, bivalve mollusks, Crustaceans, corals. Diagnosis methods. Control of diseases. Biodegradation and Bioremediation of marine pollutants (oil, Organic comp. etc.).



## UNIT V: Recent trends in Marine Microbiology:

Recently identified microorganisms of marine ecosystem, their applications in present and future industries.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Munn, C. 2011. Marine Microbiology: Ecology and Applications. GS Publications. PP- 648.	2011
2	Sekwon Kim. 2013. Marine Microbiology: Bioactive compounds and Biotechnological applications. Wiley VCH.	2013
<b>Reference Books</b>		
1.	Paul, J. 2001. Marine Microbiology. Academic Press. PP-666.	2001

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER VI

### Vetinary Sciences

Course Code: BMB-602a

Credit Units: 04

**Pre-requisite:** In-depth knowledge of Vetinary science

The student will be able to understand marine environment.

- Understand the anatomy, physiology, and pathology of animals and the role of the veterinarian in maintaining animal health
- Develop skills in diagnosing and treating common and complex diseases in animals, using appropriate diagnostic and therapeutic methods.
- Gain proficiency in performing routine and emergency surgeries, managing post-operative care, and applying advanced surgical techniques..

#### Details of the Course:-

- **Unit 1: Introduction to Veterinary Science**
  - Overview of veterinary science and animal health care
  - Veterinary profession and its importance
  - Veterinary ethics and laws
- **Unit 2: Anatomy and Physiology**
  - Animal cell structure and functions
  - Organ systems: Digestive, respiratory, circulatory, and reproductive systems
  - Comparative anatomy in domestic animals
- **Unit 3: Animal Husbandry and Management**
  - Livestock farming: Cattle, sheep, goats, and poultry
  - Animal breeding and genetics
  - Animal nutrition and feeding systems
- **Unit 4: Microbiology and Immunology**
  - Microbial flora in animals
  - Animal pathogens (bacteria, fungi, viruses)
  - Immune system response and vaccination

#### Suggested Books:

- Textbook of Veterinary Internal Medicine"
- Veterinary Surgery: Small Animal"
- Veterinary Microbiology and Microbial Disease"

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER VI**

### **Biodiversity**

**Course Code: BMB-602b**

**Credit Units: 04**

**Pre-requisite:** In-depth knowledge of biodiversity

The student will be able to understand biodiversity

- Demonstrate an understanding of the different levels and types of biodiversity (species, genetic, and ecosystem diversity).
- Analyze biodiversity using various methods and indices, including species richness, evenness, and diversity indices.
- Critically assess the impact of human activities on biodiversity, including habitat destruction, climate change, and overexploitation.

**Details of the Course:-**

#### **Unit 1: Concept and Importance of Biodiversity**

- Definition of biodiversity: species, genetic, and ecosystem diversity
- Importance of biodiversity for ecosystem stability and human well-being
- Biodiversity at global, regional, and local levels

#### **Unit 2: Levels of Biodiversity**

- Species diversity, genetic diversity, and ecosystem diversity
- Measuring biodiversity (species richness, evenness, and diversity indices)
- Methods of biodiversity assessment and monitoring

#### **Unit 3: Evolution and Origin of Biodiversity**

- Theories of evolution (Darwinism, Neo-Darwinism)
- Speciation and the process of adaptive radiation
- Origin of biodiversity in different ecological zones

#### **•Unit 4: Biogeography and Distribution of Biodiversity**

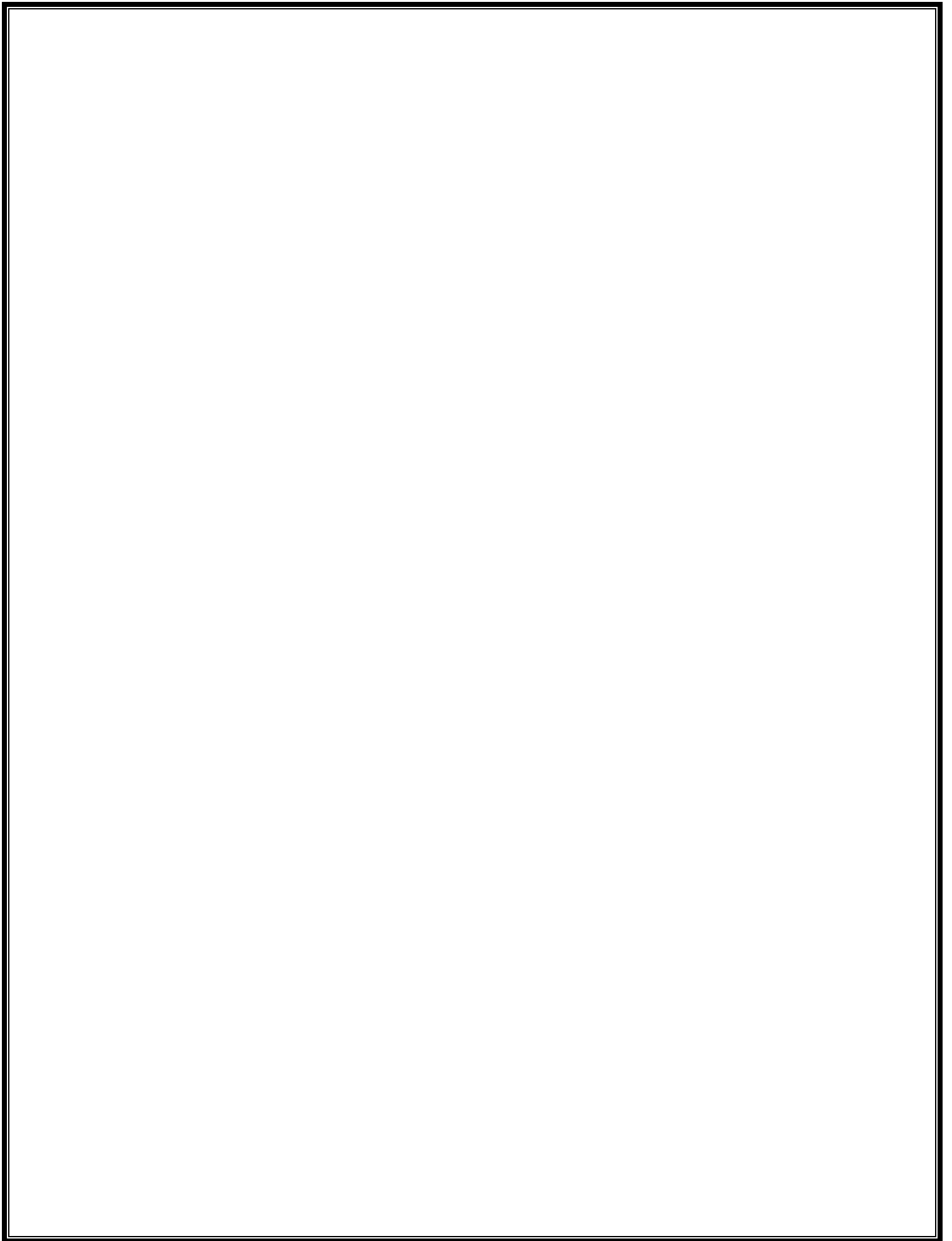
- Global patterns of biodiversity (latitudinal gradients, endemism)
- Major biomes of the world (tropical forests, deserts, grasslands, etc.)
- Human impact on the distribution of biodiversity

**Suggested Books:**

- "Biodiversity"
- **"Conservation Biology: Evolution in Action"**
- **"Biodiversity and Conservation"**

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



## **SEMESTER VI**

### **Bioinformatics**

**Course Code: BMB-603**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of computer application

#### **Course Outcome:**

- Students will be able to understand basics of internet and computers along with information on various databases.
- Students will be able to understand application of bioinformatics in biotechnology.
- Students will be able to understand sequence alignment and various algorithms for it.
- Students will be able to understand and interpret sequence annotation and its retrieval.
- The information about various biologically important databases will be made available to students.

#### **Details of the Course:-**

##### **UNIT – I:**

History of Bioinformatics, Basics of Internet and Computers, Various databases, Bioinformatics and its role in central dogma of molecular biology.

##### **UNIT – II:**

The notion of Homology, Sequence Information Sources, EMBL, GenBank, Entrez, Unigene, Understanding the structure of each source and using it on the web.

##### **UNIT – III:**

Various Sequences tools, Pairwise Alignments, Introducing to BLAST, using it on the web, Interpreting results, Multiple Sequence Alignment, Phylogenetic Analysis.

##### **UNIT – IV:**

Searching Databases, SRS, Entrez, Sequence Similarity Searches-BLAST, FASTA, Data Submission, Genome Annotation, Pattern and repeat finding, Gene identification tools.

##### **UNIT – V:**

Protein Information Sources, PDB, SWISSPROT, TREMBL, Understanding the structure of each source and using it on the web. Introduction of Data Generating Techniques and Bioinformatics problem posed by them-Restriction Digestion, Chromatograms, Blots, PCR, Microarrays, Mass Spectrometry.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text/Reference Books</b>		
1.	Bioinformatics: Principles and Applications. Ghosh Z. and Bibekanand M., Oxford University Press, 2008.	2015
2.	Genome analysis and bioinformatics: a practical approach. T.R. Sharma, I.K. International Publishing House Pvt. Ltd., 2009.	2009
3.	Bioinformatics and Functional Genomics, Pevsner J. II Edition, Wiley-Blackwell, (2009).	2015
4.	Discovering Genomics, Proteomics and Bioinformatics, Campbell A. M., Heyer L. J., II Edition. Benjamin Cummings, 2006.	2006
5.	Bioinformatics: A practical guide to analysis of genes and proteins, Andreas D. Baxevanis, Wiley Student edition,	2006
6.	Bioinformatics, Sequence and genome analysis by David W. Mount, Second Edition, CSHL Press, 2004	2004

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER VI**

### **Developmental biology and embryology**

**Course Code: BMB-603a**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of Developmental biology and embryology

Course Outcome:

- Describe the key events in the development of organisms, from fertilization to adulthood, including cellular division, differentiation, and morphogenesis..
- Understand the molecular and genetic basis of development, including gene expression regulation, transcription factors, signaling pathways, and the role of master regulators in cell differentiation.
- Explain the processes of fertilization, cleavage, gastrulation, and neurulation, and their importance in shaping the embryonic body plan.

#### **Details of the Course:-**

##### **Unit 1: Introduction to Developmental Biology**

- Basic concepts of developmental biology
- Historical background and importance of model organisms (e.g., Drosophila, Xenopus, mouse, chick)
- Overview of developmental stages (zygote to adult)

##### **Unit 2: Fertilization**

- Process of fertilization in animals and plants
- Molecular events during fertilization
- Mechanisms of sperm-egg interaction and activation

##### **Unit 3: Early Embryonic Development**

- Cleavage and formation of the blastula
- Development of the germ layers (ectoderm, mesoderm, endoderm)
- Patterning of the embryo and axis formation (e.g., anterior-posterior, dorsal-ventral)

##### **Unit 4: The Role of Genes in Development**

- Gene expression regulation in early development
- Transcription factors and signaling pathways
- Master regulators in development (e.g., Hox genes, morphogens)



**Suggested Books:**

- Developmental Biology"
- "Molecular Biology of the Cell"
- Embryology: A Color Atlas"

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER VI**

### **Population biology**

**Course Code: BMB-603b**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of Population biology

Course Outcome:

- Describe and analyze different population growth models (exponential and logistic) and their applicability in real-world scenarios.
- Apply Hardy-Weinberg equilibrium and understand the role of genetic drift, migration, mutation, and natural selection in shaping population genetics.
- Examine the interactions between species (competition, predation, mutualism) and understand their impact on population size and distribution.

### **Details of the Course:-**

#### **Unit 1: Introduction to Population Biology**

- Definition and scope of population biology
- Basic concepts: population, population density, dispersion, and growth
- Historical development of population biology

#### **Unit 2: Population Growth and Regulation**

- Exponential and logistic growth models
- Carrying capacity and density-dependent vs. density-independent factors
- Factors influencing population regulation (food, predation, disease, competition)

#### **Unit 3: Life History Strategies**

- Life history theory: r-strategists vs. K-strategists
- Reproductive strategies and their impact on population dynamics
- Age structure, generation time, and reproductive investment

#### **Unit 4: Population Genetics**

- Hardy-Weinberg equilibrium
- Gene flow, genetic drift, mutation, and selection
- Evolutionary forces shaping population genetic structure

#### **Suggested Books:**

- "Population Ecology: A Unified Study of Animals and Plants"
- "Introduction to Population Ecology"
- "Principles of Population Genetics"

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER VI

### Microbiological Analysis of Air and Water Lab

**Course Code: BMB-651**

**Credit Units: 02**

**Pre-requisite:** Basic information of air and water microbiology.

**Course Outcome:**

- Students will become familiar with aeromicrobiology.
- Students will be able to learn the collection of air sample and its analysis.
- Students will be familiarized with the water microbiology and control measures.
- Students will be able to explain the microbiological analysis of water.

**Details of the Course:-**

Note: A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by college according to facilities available.

S. NO.	CONTENTS	CONTACT HOURS
1	Introduction to the Basic Microbiology Laboratory Practices and Equipments.	2
2	Analysis of air and water - pH, moisture content, water holding capacity, percolation, capillary action.	2
3	Isolation of microbes (bacteria & fungi) from contaminated water.	2
4	Isolation and enumeration of bacteria from air.	2
5	Assessment of microbiological quality of water.	2
6	Determination of BOD of waste water sample.	2
7	Assessment of microbiological quality of air.	2
8	Determination of COD of waste water sample.	2

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	da Silva N, Taniwaki MH, Junqueira VC, Silveira N, Nascimento MS, Gomes RAR (2012) Microbiological Examination Methods of Food and Water A Laboratory Manual, CRC Press.	2012
2.	Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA.	2000
<b>Reference Books</b>		
1.	Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.	2009
2.	Hurst CJ, Crawford RL, Garland JL, Lipson DA (2007) Manual of Environmental Microbiology, 3rd edition, ASM press.	2007

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER VI

### Marine Microbiology Lab

Course Code: BMB-652

Credit Units: 02

**Pre-requisite:** Basic information of Marine Microbiology

**Course Outcome:**

- The student will acquire practical skills of marine environment.
- The student will be able to know the methods of marine microbiology.
- The student will be able to know role of microbes in ocean processes.
- The students will be able to know recent trends in marine microbiology.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Isolation and identification of microbes from mangroves, coastal waters and sediments with special emphasis on sample collection methodology, collection trips in boats/ trawlers.	2
2	Assessment of salt requirement of marine isolates from different ecosystem.	2
3	Analysis of physico-chemical parameters.	2
4	Study of biofilm microorganisms.	2
5	Hydrolytic enzyme profiling of the marine bacterial isolates.	2
6	Nitrification and denitrification by the marine bacterial isolates.	2

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Hunter-Cevera, J., Karl, D. and Buckley, M., Marine Microbial Diversity: the key to Earth's habitability, American Academy of Microbiology.	2005
2.	Munn, C. Marine Microbiology: ecology and applications, Garland Science, Taylor and Francis group, N.Y.	2018
<b>Reference Books</b>		
1.	Oliver, J. D. (1982) Taxonomic scheme for the identification of marine bacteria by Deep Sea Research Part A. Oceanographic Research Papers, 29 (6): 795 -798.	1982

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER VI

### Bioinformatics Lab

**Course Code: BMB-653**

**Credit Units: 02**

**Pre-requisite:** Basic knowledge of computer application

**Course Outcome:**

- Students will be able to understand basics of internet and computers along with information on various databases.
- Students will be able to understand application of bioinformatics in biotechnology.
- Students will be able to understand sequence alignment and various algorithms for it.
- Students will be able to understand and interpret sequence annotation and its retrieval.
- The information about various biologically important databases will be made available to students.

**Details of the Course:-**

**Note:** A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by college according to facilities available.

S. NO.	CONTENTS	CONTACT HOURS
1	Introduction to various databases of proteins, nucleic acids. Primary, secondary and composite databases.	3
2	BLAST, FASTA, DOT PLOT	3
3	MSA using various free tools.	3
4	Phylognetic predictions.	3
5	Prediction of structure of proteins and nucleic acids	3
6	ORF prediction and its validation	3
7	Primer designing	3
8	Restriction mapping	3
9	Epitope prediction using various online tools	3
10	Data mining tool and its practical applications in a case study	3



**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text/Reference Books</b>	
1.	Bioinformatics: Principles and Applications. Ghosh Z. and Bibekanand M., Oxford University Press, 2008.	2015
2.	Genome analysis and bioinformatics: a practical approach. T.R. Sharma, I.K. International Publishing House Pvt. Ltd., 2009.	2009
3.	Bioinformatics and Functional Genomics, Pevsner J. II Edition, Wiley-Blackwell, (2009).	2015
4.	Discovering Genomics, Proteomics and Bioinformatics, Campbell A. M., Heyer L. J., II Edition. Benjamin Cummings, 2006.	2006
5.	Bioinformatics: A practical guide to analysis of genes and proteins, Andreas D. Baxevanis, Wiley Student edition,	2006
6.	Bioinformatics, Sequence and genome analysis by David W. Mount, Second Edition, CSHL Press, 2004	2004

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER VI**

### **Project/Dissertation**

**Course Code: BMB-604**

**Credit Units: 6**

#### **Course Contents:**

- Forty five days of Sixth Semester of the B.Sc. Curriculum is devoted to major project/field work.
- Students, with the help of their mentor and faculty colleagues will identify a lab in India & abroad for the research work.
- The student should stay for a minimum prescribed Semester period at the place of work.
- Students not staying for the prescribed period will be marked absent as per the University Rules.
- At the end of their project the students shall submit the dissertation as per the Guidelines prescribed below.

#### **The Aims of the Project**

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award a B.Sc. Degree.

#### **Objectives**

- To provide the students an opportunity to demonstrate the ability to devise, select and use a range of methodologies appropriate to the chosen topic of research.
- To allow students to show the application of skills of data collection, critical analysis and concept synthesis necessary for formation of defensible conclusions and/or recommendations.
- To allow students the opportunity to demonstrate ability to draw appropriate conclusions argued from the evidence presented. [Should the research produce negative or inconclusive results, the conclusions should be critically examined to ascertain the reasons].
- To provide a forum to demonstrate the skills of structuring and present a balanced informed complete, clear and concise written argument.

## **Dissertation Guidelines**

### **The Dissertation Topic**

It is important to distinguish here between „dissertation topic“ and „dissertation title“. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally the topic is expected to be:

- Relevant to Microbiology;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to the knowledge of students;
- Value and interest to the students and their personal and professional development.

### **Dissertation format**

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, name of the student, name of degree and the date of submission.
- Second page should contain the certificate received from the organization/University from where the student has completed his/her project work.
- The next page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of graphs, figures and tables giving legends and page numbers.
- Next to follow should be following in the sequence given below:
  - Abbreviations used (if any)
  - Introduction
  - State-of-Art
  - Material & Methods
  - Results
  - Discussion
  - Summary (approximately 500 words)
  - Conclusion

- Future Prospects

- References: After this concluding chapter, students should give a list of all the references they have used. These should be cross - references with the text. For articles from journals, the following details are required e.g.

Schloter M, Assmus B and Hartmann A (1995) the use of immunological methods to detect and identify bacteria in the environment. *Biotech Adv* 13: 75-90

For books, the following details are required

Bahera BK and Varma A (2003) *Green Energy from Waste Biomass*, Capital Book Company, New Delhi, India

For book chapter

Mukherji KG, Mandeep and Varma A (1998) Mycorrhizosphere microorganisms: screening and evaluation. (Ed) Varma A. In: *Mycorrhiza Manual*. Springer-Verlag, Germany, pp 85-97

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

- List of Publications (if any) by the students should be attached in the end.

### **Guidelines for the assessment of the dissertation**

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the materials & methods employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?

### **Examination Scheme:**

<b>Components</b>	<b>Theme of Project</b>	<b>Quality of Project</b>
<b>Weightage (%)</b>	<b>30</b>	<b>70</b>

## General Proficiency-VI

**Course Code: GP-601**

**Credit Units: 01**

**Pre-requisite:** Basic information of English Language

### **Course Outcome:**

- Effective communication: The ability to exchange ideas and information in a way that builds trust and respect
- Critical and analytical thinking: The ability to explore issues and ideas before forming a conclusion
- Integrative thinking: The ability to synthesize knowledge across different domains and perspectives
- Preparing students to be engaged citizens: Preparing students to participate in political culture and thrive in a rapidly evolving world

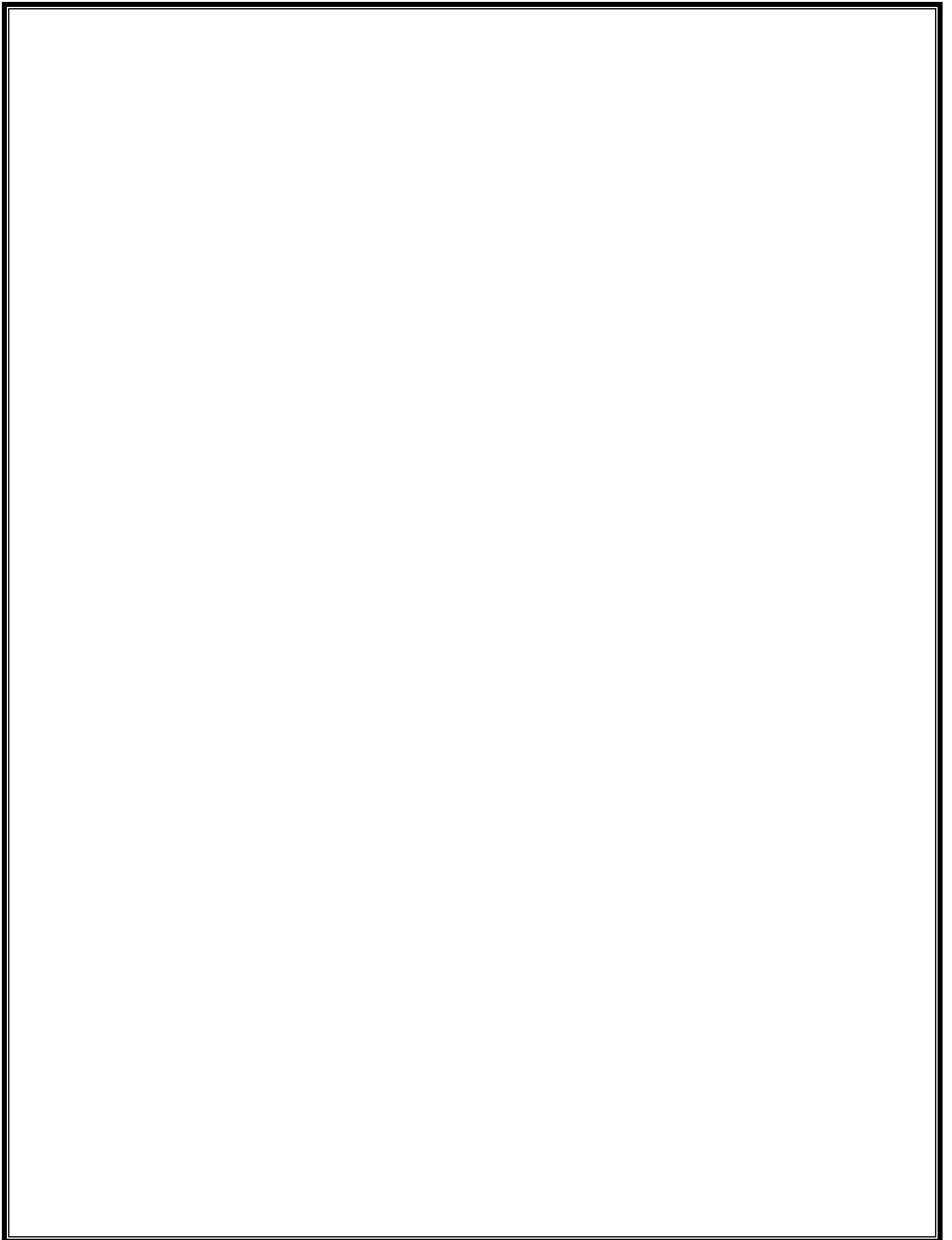
### **Details of the Course:-**

General language proficiency is the ability to read, write, listen, and speak in real-life situations. To test this, a test is usually developed for each skill with questions that are designed to imitate real life.

A syllabus is a guide to a course that includes course policies, rules, regulations, required texts, and a schedule of assignments and seminar.

### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60





## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Biological Engineering & Sciences**

#### **Ordinances, Regulations & Syllabus**

**For**

**Master of Science in Microbiology (M.Sc.) Two Year Programme  
Semester Pattern  
(w.e.f. session 2017-18)**

**(Scheme & syllabus from 2017-2019)**

## **PEOs: Program Educational Objectives POs: Program Outcomes PSOs: Program Specific**

**OutcomesName of the Department:** Department of Microbiology

**Name of the Program:** M.Sc. Microbiology

**Duration of the degree:** 2 Years

M. Sc. (Microbiology) course combines the concepts of biology and chemistry to understand living things and their relationship with the ecosystem. The course covers the study of microorganisms and their effect on human life. M.Sc. in Microbiology is an advanced course that helps students understand the microbes such as virus, bacteria, fungi, algae etc. at a deeper level. Students also learn the role of these microorganism in waste management and the production of fermented foods. Throughout M.Sc. Microbiology course, students study the detailed microbiology topics and interdisciplinary subjects.

M.Sc. Microbiology has a significant role in pharmaceuticals, agriculture, brewery and manufacturing of commercial products. The practical, research-based project and laboratory work throughout the M.Sc. Microbiology helps candidates excel at the workplace with required skills and knowledge.

### **Program Educational Objectives (PEOs)**

**PEO 1:** The objective of the Master's Program in Microbiology is to equip the students to gain bimolecular knowledge and analytical skills at an advanced level.

**PEO 2:** The program emphasizes to apply knowledge acquired about prokaryotic and eukaryotic cellular processes, interaction of microorganisms among themselves, with physical and chemical agents and higher order organisms in environment and biological systems to various conditions.

**PEO 3:** The laboratory training in addition to theory is included so that the students will acquire the skills to qualify for a broad range of positions in research, industry, consultancy, education and public administration, or for further education in a doctoral program.

**PEO 4:** Students will be able to address broad range of fields including biopolymer chemistry, marine biochemistry, environmental biotechnology, food science, microbiology, microbial genetics, molecular biology and systems biology.

### **Program Outcomes (POs)**

**The Masters in Microbiology Program will address the increasing need for skilled scientific manpower with an understanding of research ethics involving microorganisms to contribute to application, advancement and impartment of knowledge in the field of microbiology and molecular biology globally. The laboratory training will empower them to prepare for careers in broad range fields. The M.Sc. Microbiology student will have:**



### **Program Specific Outcomes (PSOs)**

**PSO 1:** Acquires and demonstrates competency in laboratory safety. Develops routine and specialized microbiological laboratory skills applicable to research, hospitals and industries.

**PSO 2:** Applies statistical and bioinformatics tools for interpretation of biological data and gains expertise in Computational Biology.

**PSO 3:** Acquires knowledge of structural and enzymatic properties of microbes and fermentation engineering, to develop human / environment friendly products or processes.

**PSO 4:** Gets familiarized with principles and techniques of various basic and analytical instruments used in laboratories.

**PSO 5:** Recognizes the importance of IPR and Patenting. Gain Entrepreneurial skills to initiate Startup.

**PSO 6:** Gets trained in bimolecular mechanisms involved in life processes, health and diseases.

**PSO 7:** Gains proficiency in related disciplines such as Molecular Biology, Pharmaceutical Sciences, Nanobiotechnology and Immunology.

**PSO 8:** Explores the life forms at cellular, molecular and nano levels. Understands amazing properties of microbial world and appreciates the beauty of microbial life forms.

**PSO 9:** Assesses the role of microbes in improving soil quality and agricultural output through sustainable microbiological applications.

**PSO 10:** Work as Health care professionals in the fields of laboratory management, hospital and community services, in development & preparation of Study material for visually challenged.

### **Programme Outcome Objectives (POO's)**

**POO 1** Demonstrate a comprehensive understanding of core business concepts, theories, and practices across various disciplines, including finance, marketing, management, and operations.

**POO 2** Apply critical thinking and analytical skills to solve complex business problems and make informed decisions based on quantitative and qualitative data.

**POO 3** Exhibit effective verbal and written communication skills, enabling clear presentation of ideas and persuasive arguments in diverse business contexts.

**POO 4** Work effectively in teams, demonstrating leadership, interpersonal skills, and the ability to manage group dynamics to achieve common goals.

**POO 5** Understand and apply ethical principles and social responsibility in business decision-making, recognizing the impact of business actions on society and the environment.

**POO 6** Analyze and appreciate the impact of globalization on business practices and strategies, and demonstrate cultural awareness in diverse business environments.

**POO 7** Utilize modern technology and information systems to enhance business operations, including data analysis tools and management software.

**POO 8** Foster an entrepreneurial mindset by identifying opportunities, assessing risks, and developing innovative solutions to create value in the marketplace.

**POO 9** Commit to ongoing personal and professional development, recognizing the importance of staying current with industry trends and advancements.

**POO 10** Develop and implement effective business strategies that align with organizational goals and respond to market dynamics.

# Course Components of Academic Programme

## M.Sc. (Microbiology)

Minimum Duration: 4 Semesters (2 Years)

Maximum Duration: 6 Semesters (3 Years)

Total Number of Credits: 93 Credits

Course Components		Credits
<b>1</b>	<b><u>Compulsory Course</u></b>	
.		
I.	Foundation Course (FC)	00
II.	Core Course (CC)	61
<b>2</b>	<b><u>Elective Course</u></b>	
.		
I.	Departmental Electives (DE)	06
II.	Interdepartmental Electives (IE)	00
<b>3</b>	<b><u>Discipline-Centric Ability Enhancement Course</u></b>	
.		
I.	Seminar (SM)	03
II.	Project (PJ)/ Dissertation (DS)	16
I	Skill (SK) and Ability Enhancement Course (AEC)	04
I		
I		
.		
I	Comprehensive (CM)	00
V		
.		
<b>4</b>	<b><u>General Course</u></b>	
.		
I.	Human Values, Health Care and Professional Ethics (HP)	00
II.	Healthy Living and Fitness (HF)	00
I	Disaster Management (DM)	00
I		
I		
.		
I	General Proficiency (GP)	03
V		
.		
<b>5</b>	<b><u>Audit Course</u></b>	
.		

**Requirement of Awards of Degree: - Total Credits: - 93; CGPA $\geq$ 4.5 and any other conditions as per regulation and ordinances.**

**Summary Sheet M.Sc. (Microbiology)**

<b>Semester</b>	<b>Credit</b>				<b>Total</b>
	<b>CC</b>	<b>DCAEC (AEC/SK/SM/PJ)</b>	<b>DE</b>	<b>GC</b>	
I	25	3	0	1	29
II	21	3	0	1	25
III	15	1	6	1	23
IV	00	16	0	0	17
<b>Total</b>	<b>61</b>	<b>23</b>	<b>6</b>	<b>3</b>	<b>93</b>

**Core Courses: CC**

**Discipline-Centric Ability Enhancement Course: DCAEC**

**Ability Enhancement Course: AEC**

**Skill Course: SEC**

**Departmental Electives: DE General Course: GC**

## M.Sc. (Microbiology) PROGRAMME STRUCTURE

### FIRST SEMESTER

Course Code	Course Title	Category	(L)	(T)	(P)	Credits
<b>Core Courses</b>						
CMBE-501/ <b>CMBE-501a</b>	Biochemistry/Cell & Developmental Biology	CC	3	0	0	3
CMBE-503 <b>CMBE-503a</b> <b>CMBE-503b</b>	Bacteriology/Pandemics/Soil Microbiology	CC	3	0	0	3
CMBE-505 <b>CMBE-505a</b>	Virology/Plant Virology	CC	3	0	0	3
CMBE-507 <b>CMBE-507a</b>	Mycology & Phycology/Medicinal Chemistry	CC	3	0	0	3
CMBE-551	Biochemistry Lab	CC	3	0	0	3
CMBE-553	Bacteriology, Virology & Mycology & Phycology Lab					
CMBE-581 <b>CMBE-581a</b>	Seminar-I/Personality Development					
	<b>TOTAL</b>					<b>24</b>

### SECOND SEMESTER

Course Code	Course Title	Category	(L)	(T)	(P)	Credits
<b>Core Courses</b>						
CMBE-502 <b>CMBE-502a</b> <b>CMBE-502b</b>	Molecular Biology/Inheritance Biology/Cytology	CC	4	0	0	4
CMBE-504 <b>CMBE-504a</b> <b>CMBE-504b</b> <b>CMBE-504c</b>	Immunotechnology/ Fundamentals of Infections and Immunity/Human Pathology/ Human Physiology & Anatomy	CC	4	0	0	4
CMBE-506/ <b>CMBE-506a</b> / <b>CMBE-506b</b> / <b>CMBE-506c</b>	Microbial Genetics/ Medical Oncology/Radiation Biophysics/Forensic Science	CC	4	0	0	4
CMBE-508 <b>CMBE-508a</b> <b>CMBE-508b</b>	Microbial Physiology and Development/Animal Tissue Culture/Animal Biotechnology	CC	4	0	0	4
CMBE-510 <b>CMBE-510a</b>	Research Methodology/ Research Ethics	CC	3	0	0	3
CMBE-552	Molecular Biology Lab	CC	-	-	2	2
CMBE-554	Microbial Genetics & Microbial Physiology Lab	CC	-	-	2	2
CMBE-582	Seminar II	CC	-	-	-	1
	<b>TOTAL</b>					<b>24</b>

**THIRD SEMESTER**

Course Code	Course Title	Category	(L)	(T)	(P)	Credits
<b>Core Courses</b>						
CMBE-601 <b>CMBE-601a</b> <b>CMBE-601b</b> <b>CMBE-601c</b> <b>CMBE-601d</b> <b>CMBE-601e</b>	Recombinant DNA Technology/Nanobiotechnology/ Genetic Engineering/Genomics & Proteomics/ Gene Therapy/ <b>Grey</b> <b>Biotechnology</b>	CC	4	0	0	4
<b>CMBE-603</b> <b>CMBE-603a</b>	Cellular Microbiology/Molecular Diagnostics	CC	4	0	0	4
<b>CMBE-605</b> <b>CMBE-605a</b>	Medical Microbiology/Medical lab Diagnostic	CC	4	0	0	4
CMBE-607	Microbial Technology	CC	4	0	0	4
CMBE-651	Recombinant DNA Technology Lab	CC	-	-	3	3
CMBE-653	Medical Microbiology Lab	CC	-	-	3	3
CMBE-655	Minor Project/Field work	CC	-	-	-	2
	<b>TOTAL</b>					<b>24</b>

**FOURTH SEMESTER**

Course Code	Course Title	Category	(L)	(T)	(P)	Credits
<b>Discipline-Centric Ability Enhancement Course</b>						
CMBE-692	Dissertation	CC	-	-	-	12
	<b>TOTAL</b>					<b>12</b>

**Dissertation**

**Note:** Students must submit their dissertation report immediately on return from summer vacation in June /July and the same would be evaluated for 16 credit units, which would be included in the Fourth Semester marks.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/ Quiz	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER I

# BIOCHEMISTRY

**Course Code: CMBE-501**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of Biochemistry

### **Course Outcome:**

- Understanding chemical properties
- Learning how the chemical properties of molecules determine how they interact and react with each other
- Understanding chemical reactions
- Learning about different types of chemical reactions and how living organisms use them
- Understanding metabolism
- Learning about human biotransformations (metabolism) and how they influence disease and toxic states
- Laboratory skills
- Learning how to use basic laboratory skills and apparatus to obtain reproducible data from biochemical experiments

### **Details of the Course:-**

#### **UNIT I: Thermodynamic principles:**

First law of thermodynamics, isothermal process, entropy, second law of thermodynamics, reversible and irreversible process, free energy, chemical potential, Gibbs free energy, redox potential. Interaction in biological system: Role of water and weak interaction– hydrogen bonds, electrostatic bonds, hydrophobic interactions, Van-der Waals forces, buffers and pH scale.

**UNIT II: Carbohydrates:** Basic structure and function, properties of monosaccharides, disaccharides and polysaccharides, isomerism, mutarotation and functions.

**Lipids:** Fatty acids, glycerol, phospholipids, sphingolipids, sterols, lipoproteins, prostaglandins.

**Amino acids, peptides and proteins:** Common structural features, classification by R group, non-protein amino acids, essential amino acids, Zwitter ion structures, isoelectric point, acid-base properties, pKa, primary, secondary, tertiary and quaternary structures of proteins, Ramachandran plot. **Nucleic acids:** Nitrogenous bases, nucleosides, nucleotides, structural polymorphism of DNA (A, B and Z-DNA) and RNA, biological functions of nucleotides.

#### **UNIT III: Metabolism-I**

**Carbohydrate metabolism:** Glycolysis, TCA cycle, Glyoxylate cycle, pentose phosphate pathway, gluconeogenesis, glycogenolysis and glycogenesis, feedback regulation of metabolic pathways.

**Mitochondrial ETS and oxidative phosphorylation:** Inhibitors and uncouplers of phosphorylation, anaerobic pathway and substrate level phosphorylation,

**Chloroplastic ETS and photophosphorylation:** Pigment centres, light harvesting complexes.

#### UNIT IV: Metabolism-II

**Lipids:** Fatty acid biosynthesis, acetyl CoA carboxylase, fatty acid synthase, desaturase and elongase, fatty acid oxidation. Biosynthesis and degradation of amino acids. Biosynthesis and degradation of purines and pyrimidines, nucleosides and nucleotides, salvage pathway.

#### UNIT V: Enzymes:

General characteristics, classification and catalytic power of enzymes, activation energy, steady state enzyme kinetics, Michaelis-Menton equation, vitamins, coenzymes and metal cofactors, enzyme inhibition, activation of enzymes, multienzyme complexes.

#### Suggested Books:

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Willey, J.M., Sherwood, L.M. and Woolverton, C.J. 2008. Prescott, Harley and Klein's Microbiology (7 <sup>th</sup> eds.). Mc Graw Hill, USA	2008
2.	Subbarao, M.S. 2007. Soil Microbiology (4 <sup>th</sup> eds.). Oxford and IBH, New Delhi.	2007
3.	Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. 2008. Microbiology (5 <sup>th</sup> eds.). Tata Mc Graw Hill, New Delhi	2008
4.	Dubey, R.C. and Maheswari, D.K. 2008. A text book of Microbiology (2 <sup>nd</sup> eds.). S. Chand Publications	2008
5.	Sullia, S.B. and Shantaram, S. 2005. General Microbiology (2 <sup>nd</sup> eds.). Oxford and IBH Publications.	2005

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## **SEMESTER I**

# **CELL & DEVELOPMENTAL BIOLOGY**

**Course Code: CMBE-501a**

**Credit Units: 03**

**Pre-requisite:** Basic information of Cell & Developmental Biology

### **Course Outcome:**

- Students will acquire knowledge about basics of cell biology.
- Students will learn about how various functions of organelles and their working.
- Students will gain an insight into microscopic structures and chemical components of various regions of cells.
- Students will attain a comprehensive knowledge of functioning of cell and synchronization of activities of various organelles.
- Students will be able to learn about various signaling mechanism involved in a cell which ultimately leads to a visible physiological response.
- Students will be able to understand the architectural components involved in making cells rigid and how cells are connected to each other.
- Students will learn about molecular events involved in cell cycle.
- Students will apply the information gained in understanding the issues and conditions encountered if things go wrong with cell cycle and how our understanding of cell signaling generate drug targets.

### **Details of the Course:-**

#### **UNIT I: Introduction to prokaryotes, eukaryotes & cell theory**

Introduction to microscopy Plasma Membrane: structure – organization, lipid bilayer, proteins & glycol conjugates, liposomes, functions – ionic transport, types of transport (symport, antiport, active & passive), and channel proteins. Intracellular compartmentalization: structure, organization and functions of nucleus, mitochondria, lysosome, Golgi body chloroplast, peroxisome, endoplasmic reticulum (rough and smooth)

#### **UNIT II: Vesicular traffic in the secretory and endocytic pathway:**

Transport from endoplasmic reticulum through the golgi network to lysosome, endocytosis, exocytosis, molecular mechanisms of vesicular transport and the maintenance of compartments diversity.

#### **UNIT III: Cell signaling: general mechanistic principles:**

Types of signaling, GPCR, RTK with examples, Calcium Signaling, Mechanism of Chemotaxis, signal transduction and vision Significance of vesicular trafficking and cell signaling Cell motility and shape: structure and functions, microfilaments microtubules and intermediate filament.

#### **UNIT IV: Integrating cell into tissue:**

Cell-cell adhesion and communication, cell matrix adhesion, extra cellular matrix: collagen & non-collagen

components. Cell cycle, molecular events and regulation.

Cell division: general strategy and regulation, molecular mechanism of mitosis and meiosis. Regulation of cell cycle Role of cyclins / cdks in the initiation of replication.

#### **UNIT V: Cancer-Biology:**

Types of cancer, onset of cancer, proto-oncogenes and tumor suppresser genes, oncogenic mutations affecting cell proliferation, cell cycle and genome stability. Programmed cell death & unprogrammed cell death. Expression patterns of proteins & enzymes during cell proliferation Molecular signaling of cancer Aetiology of Cancer.

#### **UNIT VI: Introduction to Developmental Biology**

History and Basic Concepts, Basics of model systems: Vertebrate Model Systems, Invertebrate and Plant Model Systems, basic patterning and development plan of model Plan, initial division pattern, and evolution and development biology

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Reference Books</b>		
1.	Molecular Biology of cell, 4 <sup>th</sup> ed. Alberts, Bruce ( <i>et.al</i> ) (2002) Garland Science Publishing, New York.	2002
2.	Cell Biology- Smith and Wood by Chapman and Hall. Cell Biology: Organelle structure and function, Sadava, D E.(2004) Panima pub., New Delhi. Cell and Molecular Biology, 8 <sup>th</sup> ed. Robertis, Edp De and RobertisEmf De (2002) Lippincott Williams and Wilkins Pvt. Ltd., (International Student Edition) Philadelphia.	2004, 2002

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER I**

### **BACTERIOLOGY**

**Course Code: CMBE-503**

**Credit Units: 03**

**Pre-requisite:** Basic information of Bacteriology

#### **Course Outcome:**

- Identifying and differentiating structures
- Learning to recognize, identify, and differentiate the internal and external structures of microbial cells
- Understanding functions
- Learning to explain the function of structures in bacterial and fungal cells that are important for causing disease
- Understanding bacteriology's role

#### **Unit I : Basics in Biochemistry:**

Brief history and scope of microbiology, Classification of micro-organisms, culture techniques, methods of isolation and identification of microbes. Staining of microbes: simple, special and differential staining.

#### **Unit II : Microorganisms– Bacteria:**

Morphology and structure of bacteria. Structural organization of bacterial cell wall, gram positive and gram negative bacteria, archaebacteria, actinobacteria. Nutritional requirement and growth curve, autotrophic and heterotrophic bacteria, batch and continuous cultures of microbes, pure cultures, growth inhibitory substances, physical and chemical methods of microbial control. Microbial genetics, transformation, conjugation, transduction in bacteria.

#### **Unit III : Microorganisms- Fungi:**

Characteristic feature, morphology, structure, nutrition, metabolism and reproduction of economically important fungi. Mycotoxins

#### **Unit IV Microorganisms- Viruses:**

Ultrastructure, multiplication of viruses, Isolation, cultivation of viruses, Bacterial viruses, animal viruses, plant viruses, Viroids, prions.

#### **Unit V Medical Microbiology:**

Diseases caused by bacteria, mycoplasma, fungi, virus and their symptoms. Biotechnological methods to deal with diseases caused by microorganisms.

## Unit VI: Biotechnological applications of microorganisms:

Classification of microbial products Equipments and accessories for industrial processes- fermenters, scaling-up of processes, downstream processing of products. Microbiological processes for production of organic acid, solvents, antibiotics, enzymes, exo- and endo-polysaccharides. Beverage fermentation- beer, wine, liquor fermentation. Microbiology of milk, dairy and food, preservation of food, food additives and supplements. Genetic engineering of microbes for industrial uses. Microorganisms for bioremediation, sewage treatment, biofertilizers, biopesticides, biofuels, biogas, bioenergy, microbial leaching of ores.

### SUGGESTED BOOKS:

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Goldsby, R.A., Kindt, T.J. and Osborne, B.A. Kuby's Immunology (4 <sup>th</sup> eds.). W H Freeman and Company.	2008
2.	Playfair, J. and Bancroft, G. 2007. Infection and Immunity (3 <sup>rd</sup> eds.). Oxford University Press.	2007
3.	Willey, J.M., Sherwood, L.M. and Woolverton, C.J. 2008. Prescott, Harley and Klein's Microbiology (7 <sup>th</sup> eds.). Mc Graw Hill, USA.	2008
4.	Chakravarty, A.K. 2008. Immunology and Immunotechnology (3 <sup>rd</sup> eds.). Oxford University Press.	2008

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER I

### PANDEMICS

**Course Code: CMBE-503a**

**Credit Units: 03**

**Pre-requisite:** Basic information of Animal kingdom system

#### **Course Outcome:**

- Students will be able to *define* and explain the fundamental principles of digestion.
- Students will be able to *understand* comparative circulation system, nervous system, endocrine system and excretory system.
- Students will *acquire* knowledge about the function of different types of organs in different animal kingdom.

#### **Details of the Course:-**

##### **UNIT – I: Digestion and Respiration:**

Comparative aspects of Digestion in invertebrate and vertebrate (general account), human: Mechanism of digestion and absorption of carbohydrates, Proteins, Lipids and Nucleic acids. Composition of bile, saliva, pancreatic, gastric and intestinal juice.

Comparative aspects of Respiration in invertebrate and vertebrate (general account), human: Exchange of gases, Transport of O<sub>2</sub> and CO<sub>2</sub>, Oxygen dissociation curve, Chloride shift.

##### **UNIT – II: Circulation:**

Comparative aspects of Circulation in invertebrate and vertebrate (general account), Human: Composition of blood, Plasma proteins & their role, blood cells, Haematopoiesis, Mechanism of coagulation of blood.

Mechanism of working of heart: Cardiac output, cardiac cycle, Origin & conduction of heartbeat.

##### **UNIT – III: Muscle physiology and osmoregulation:**

Structure of cardiac, smooth & skeletal muscle, threshold stimulus, All or None rule, single muscle twitch, muscle tone, isotonic and isometric contraction, Physical, chemical & electrical events of mechanism of muscle contraction. Excretion: modes of excretion, Ornithine cycle, Mechanism of urine formation.

##### **UNIT – IV: Nervous System:**

Mechanism of generation & propagation of nerve impulse, structure of synapse, synaptic conduction, salutatory conduction, Neurotransmitters.

##### **UNIT – V: Endocrine System:**

Mechanism of action of hormones (insulin and steroids). Different endocrine glands – Hypothalamus, pituitary, pineal, thymus, thyroid, parathyroid and adrenals, hypo & hyper-secretions.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company.	2006
	<b>Reference Books</b>	
1.	Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition. John wiley & sons,Inc.	2006

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER I**

### **SOIL MICROBIOLOGY**

**Course Code: CMBE-503b**

**Credit Units: 03**

**Pre-requisite:** Basic information of Animal kingdom system

#### **Course Outcome:**

- Students will be able to *define* and explain the fundamental principles of digestion.
- Students will be able to *understand* comparative circulation system, nervous system, endocrine system and excretory system.
- Students will *acquire* knowledge about the function of different types of organs in different animal kingdom.

#### **UNIT 1: Growth and reproduction in bacteria:**

Asexual reproduction methods, bacterial population logarithmic representation, growth phases, generation time calculation, and specific growth rate

#### **UNIT II: Microbes in human health and environment:**

Important human diseases and their causative agents, immunity, primary and secondary immune response, antigens, antibodies, and vaccines

#### **UNIT III: Environmental microbiology**

Microbial interactions such as mutualism, commensalism, and parasitism

#### **UNIT IV: Application of microorganisms**

Bio-pesticides, bio-fertilizers, biodegradation, bio-deterioration, and bioremediation

#### **UNIT V: Soil as a habitat for microorganisms**

Microorganisms in soil and their significance: bacteria, fungi, algae, protozoa, rhizosphere and rhizoplane. Biogeochemical cycles: C, N and role of microorganisms.

### Suggested Books:

<b>S . N o .</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Repr int</b>
1 .	Madigan MT, Martinko JM, Dunlap PV and Clark DP. Brock Biology of Microorganisms. Pearson International Edition	2006
2 .	Cappucino J and Sherman N. Microbiology: A Laboratory Manual. Pearson Education Limited	2008
3 .	Wiley JM, Sherwood LM and Woolverton CJ. Prescott's Microbiology. McGrawHill International.	2007
4 .	Pelczar MJ, Chan ECS and Krieg NR. Microbiology. McGraw Hill Book Company	2010
5 .	Atlas RM. Principles of Microbiology. W.M.T. Brown Publishers	2006

### Examination Scheme:

<b>Compon ents</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendanc e</b>	<b>Cla ss Te st</b>	<b>Assignment/ Project/Seminar/Q uiz</b>	
<b>Weight age (%)</b>	10	2 0	10	60



## SEMESTER I

## VIROLOGY

**Course Code: CMBE-505**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of Viruses

**Course Outcome:**

Students will be able to differentiate the nature of viruses, laboratory diagnosis of viruses using different techniques and classification of viruses.

**Unit I: Basics in Microbiology:**

Brief history and scope of microbiology Classification of micro-organisms, culture techniques, methods of isolation and identification of microbes. Staining of microbes: simple, special and differential staining.

**Unit II: Microorganisms– Bacteria:**

Morphology and structure of bacteria. Structural organization of bacterial cell wall, gram positive and gram negative bacteria, archaebacteria, actinobacteria. Nutritional requirement and growth curve, autotrophic and heterotrophic bacteria, batch and continuous cultures of microbes, pure cultures, growth inhibitory substances, physical and chemical methods of microbial control. Microbial genetics, transformation, conjugation, transduction in bacteria.

**Unit III: Microorganisms- Fungi:**

Characteristic feature, morphology, structure, nutrition, metabolism and reproduction of economically important fungi. Mycotoxicoses

**Unit IV: Microorganisms- Viruses:**

Ultrastructure, multiplication of viruses Isolation, cultivation of viruses Bacterial viruses, animal viruses, plant viruses. Viroids, prions.

**Unit V: Medical Microbiology:**

Diseases caused by bacteria, mycoplasma, fungi, virus and their symptoms. Biotechnological methods to deal with diseases caused by microorganisms.

**Unit VI: Biotechnological applications of microorganisms:**

Classification of microbial products Equipments and accessories for industrial processes- fermenters, scaling-up of processes, downstream processing of products. Microbiological processes for production of organic acid, solvents, antibiotics, enzymes, exo- and endo-polysaccharides. Beverage fermentation- beer, wine, liquor fermentation. Microbiology of milk, dairy and food, preservation of food, food additives and supplements. Genetic engineering of microbes for industrial uses. Microorganisms for bioremediation, sewage treatment, biofertilizers, biopesticides, biofuels, biogas, bioenergy, microbial leaching of ores.

### Suggested Books:

<b>S . N o .</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Rep rint</b>
1 .	Nelson, D.L. and Cox, M.M. 2007. Lehninger Principle of Biochemistry (4 <sup>th</sup> eds.). W. H. Freeman and Co	2007
2 .	Berg, J.M., Tymoczko, J.L. and Stryer, L. 2007. Biochemistry (6 <sup>th</sup> eds.). W.H. Freeman and Co.	2007
3 .	Voet, D.J., Voet, J.G. and Pratt, C.W. 2008. Fundamentals of Biochemistry (3 <sup>rd</sup> eds.). John Wiley Sons Inc	2008
4 .	Satyanarayana, U. and Chakrapani, U. 2007. Essentials of Biochemistry (2 <sup>nd</sup> eds.). Books and allied Pvt. Ltd	2007
5 .	Murray, R.K., Granner, D.K. and Rodwell, V.W. Harper's illustrated biochemistry (27 <sup>th</sup> eds.) Mc Graw Hill, USA.	2006

### Examination Scheme:

<b>Compon ents</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendanc e</b>	<b>Cla ss Te st</b>	<b>Assignment/ Project/Seminar/Q uiz</b>	
<b>Weight age (%)</b>	10	2 0	10	60

## **SEMESTER I**

### **PLANT VIROLOGY**

**Course Code: CMBE-505a**

**Credit Units: 03**

**Pre-requisite:** Basic information of Plant Virology.

#### **Course Outcome:**

After completion of the course the students should be able to

- Describe the cell organization of bacteria i.e. morphology, ultrastructure and organelles present in bacterial cells.
- Apply the knowledge of bacteriological techniques.
- Describe the nutritional and physical requirements for bacterial growth.
- Describe the principals involved in killing bacteria, and make recommendations on use of physical and chemical methods used to control microbial growth.
- Describe the dynamics of the growth of a bacterial population and how this growth can be measured.
- Describe bacterial taxonomy and classification.
- Differentiate the nature of viruses.
- Understand classification of viruses.
- Learn the methods of laboratory diagnosis of viruses using different techniques.
- Learn about different plant and animal viruses.

#### **Details of the Course:-**

##### **Unit – I: Cell Organization:**

Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pili. Cell-wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaeobacterial cell wall, Gram and acid fast staining mechanisms, lipopolysaccharide (LPS), sphaeroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall.

Cell Membrane: Structure, function and chemical composition of bacterial and archaeal cell membranes. Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids Endospore: Structure, formation, stages of sporulation.

##### **Unit – II: Bacterial growth and control:**

Culture media: Components of media, Synthetic or defined media, Complex media, enriched media, selective media, differential media, enrichment culture media Pure culture isolation: Streaking, serial dilution and plating methods, cultivation, maintenance and stocking of pure cultures, cultivation of anaerobic bacteria Growth: Binary fission, phases of growth.

##### **Unit – III: Bacterial Systematics and Taxonomy:**

Taxonomy, nomenclature, systematics, types of classifications

Morphology, ecological significance and economic importance of the following groups: Archaea:

methanogens, thermophiles and halophiles

Eubacteria: Gram negative and Gram positive Gram negative:

Non-proteobacteria– Deinococcus, Chlamydiae, Spirochetes Alpha proteobacteria- Rickettsia, Rhizobium, Agrobacterium Gamma proteobacteria –Escherichia, Shigella, Pseudomonas

Gram positive: Low G+C: Mycoplasma, Bacillus, Clostridium, Staphylococcus High G+C:

Streptomyces, Frankia

#### **Unit – IV: Nature, Properties and Classification of Viruses:**

Properties of viruses; general nature and important features Subviral particles; viroids, prions and their importance Isolation and cultivation of viruses.

Morphological characters: Capsid symmetry and different shapes of viruses with examples Viral multiplication in the Cell: Lytic and lysogenic cycle Description of important viruses: salient features of the viruses infecting different hosts - Bacteriophages (T4 & Lambda); Plant (TMV & Cauliflower Mosaic Virus), Human (HIV & Hepatitis viruses).

#### **Unit – V: Role of Viruses in Disease and its prevention:**

Viruses as pathogens: Role of viruses in causing diseases Prevention and control of viruses: Viral vaccines, interferons and antiviral compounds.

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
1.	Microbiology 10 <sup>th</sup> Edition. Prescott, L.M.; Harley, J.P. and Klein, D.A. (2003) McGraw Hill, USA.	2016
2.	Foundations in Microbiology 10 <sup>th</sup> edition, Kathleen Park Talaro and Barry Chess.	2017
3.	Microbiology- An Introduction. Tortora, G.J., Funke, B.R., and Case, C.L., , Pearson Education (2015)12 <sup>th</sup> ed.	2015
4.	Principles of Virology, Vol I and Vol II, 4 <sup>th</sup> Edition, Jane Flint, Vincent Racaniello, Glenn Rall, Anna Marie Skalka, (2015), American Society of Microbiology	2015

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	

<b>Weight age (%)</b>	10	2 0	10	60
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## **SEMESTER I**

### **MYCOLOGY & PHYCOLOGY**

**Course Code: CMBE-507**

**Credit Units: 03**

**Pre-requisite:** Basic information of Fungus and Algae

#### **Course Outcome:**

After the successful completion of this course

- Students should be able to know about various groups of fungi and algae.
- As most of the fungi are seen through naked eyes, students will be able to recognize them.
- Students will also have an idea about the pros and cons of fungi and algae.
- Students should be able to know about economic importance of fungi and algae.

#### **Details of the Course:- Unit I:**

History of Mycology, Classification of fungi, Morphology, microscopy and structure of fungi

#### **Unit II: General Overview Phylums:-**

Chytridiomycota (The chytrids), Zygomycota (The conjugated fungi), Ascomycota (The sac fungi), Basidiomycota (The club fungi), Deutromycota (The imperfecti fungi).

#### **Unit III:**

Symbiotic association of fungi, Nutrition requirements

#### **Unit IV:**

Parasexual Cycles, Alcoholic fermentation, Fungus like organisms, Rusts and Smuts, Fungal disease of plants and humans

#### **Unit V:**

Classification and application of algae: General classification, Life cycle, thallus organisation and occurrence – (i) Chlorophyceae (ii) Charophyceae (iii) Diatoms (iv) Xanthophyceae (v) Phaeophyceae (vi) Rhodophyceae: (vii) Cyanobacteria

Lichens, Economic importance of algae with examples in agriculture, environment, industry and food.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books/Reference Books</b>	
1.	Introduction to Fungi 3 <sup>rd</sup> Edition. John Webster and Roland W.S. Weber (2007 ). Cambridge.	2007
2.	An Introduction to Mycology. R.S. Mehrotra and K.R. Aneja (2005). New age International Publishers.	2005
3.	Kumar HD. (1995). <i>The Text Book on Algae</i> . 4th edition. Affiliated East Western Press	1995

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER I

### MEDICINAL CHEMISTRY

**Course Code: CMBE-507a**

**Credit Units: 03**

**Pre-requisite:** Basic information of chemistry and drug development

#### Course Outcome:

After the successful completion of this course

- Students will be able to explain the relationship between structure and biological activity of various drug molecules.
- Students will be able to understand the most of various classes of drug molecules.

#### Details of the Course:-

##### Unit I: General Introduction and Drug target classification

Definition and scope of drug design.

Proteins as drug targets: Receptors – receptor role, ion channels, membrane bound enzyme activation, agonist and antagonists, concept of inverseagonist, desensitization and sensitization of receptors, affinity, efficacy and potency. Enzymes – Enzyme inhibitors (competitive, non-competitive, suicide inhibitors), medicinal use of enzyme inhibitors. Nucleic acids as drug targets: Classes of drugs that interact with DNA: DNA intercalators and DNA alkylators.

##### Unit II: Physicochemical principles of drug action

Partition coefficient, drug dissolution, acid base properties, surface activity, bioavailability, stereochemical aspects of drug action.

##### Unit III: Drug receptor interactions

Kinetic analysis of ligand receptor interactions using scatchard plot, double reciprocal plot, Hill plot, forces involved, relationship between dose and effect (graded and quantal response).

##### Unit IV: Principles of drug design

Introduction to SAR, strategies in the search for new lead compounds, analogue synthesis versus rational drug design, concept of prodrugs.



## Unit V: Drug discovery and pharmainformatics

Drug discovery pipeline, drug target identification and validation for microbial pathogen, selection of gene unique to the pathogen, screening for its presence in other microbes and human host, Drug Databases, PubChem, Calculating drug-like properties, introduction to rational drug design methods, optimization of lead compounds, protein 3D structure and bindings it analysis, similarity based virtual screening using online tools.

### Suggested Books:

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Repr int
	<b>Text Books/Reference Books</b>	
1 .	Introduction to Medicinal Chemistry, 4th edition (2009), Graham I. Patrick, Oxford University Press. ISBN-13: 978-0199234479.	2009
2 .	The Organic Chemistry of Drug Design and Drug Action, 2nd edition (2004), Richard B. Silvermann, Elsevier, Academic Press. ISBN-13: 978-0126437324.	2004

### Examination Scheme:

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Clas s Te st	Assignment/ Project/Seminar/Q uiz	
Weight age (%)	10	2 0	10	60

## **SEMESTER I**

### **BIOCHEMISTRY LAB**

**Course Code: CMBE-551**

**Credit Units: 02**

#### **Course Outcomes:**

- This course regarded as an introduction to basic biochemistry
- And will be useful for students who want to study clinical chemistry.
- The course uses simple protocols and available materials and instruments to understand Biochemical substances.
- Some experiments were put to teach students how to work independently in the any Lab. -
- Modern lab researchers should know the principles of the biochemical methods of analysis and to learn the main theoretical statements.
- For it, medical Lab Science students have to get the minimum of manual skills during a research of biochemistry, eg. Measuring out solutions and biological liquids, centrifugation, colorimetry of colored solutions, determination of pH, peculiarities of the technique of enzyme investigations etc.
- The given manual contains the Descriptions of the biochemical methods of analysis which all the skills are required in.

#### **Detail of the Course:**

- **Introduction:** to the Biochemistry, Safety Rule, Lab report.
- **Lab 1:** Carbohydrate Qualitative tests.
- **Lab2:** Carbohydrate quantitative tests.
- **Lab 3:** Amino acids and protein qualitative tests.
- **Lab 4:** Quantitative determination of proteins by biuret reagent.
- **Lab 5:** Lipids Qualitative tests.
- **Lab 6:** Vitamins, Qualitative and Quantitative tests.
- **Lab 7:** Amino acids titration curves.
- **Lab 8:** RNA preparation and Qualitative tests.
- **Lab 9:** Horizontal and Vertical Electrophoresis.

#### **Suggested Books:**

<b>S. No .</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Reference Books</b>	
1.	Culture of Animal Cells – a manual of basic techniques 4 <sup>th</sup> Edition. Freshney, R. I. (2000) John Wiley & Sons, New York.	2000
2.	Animal Cell Biotechnology. Spier, R. E. and Griffiths, J. B. (1988) Academic Press.	1988

**Examination Scheme:**

<b>Compon ents</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendant e</b>	<b>Viva- Voce</b>	<b>Practical Record</b>	
<b>Weight age (%)</b>	10	20	10	60

## SEMESTER I

### BACTERIOLOGY, VIROLOGY & MYCOLOGY & PHYCOLOGY LAB

Course Code: CMBE-553

Credit Units: 02

#### Course Outcome:

After completion of the course the students should be able to

- Differentiate the nature of bacteria, algae, fungi & viruses.
- Understand classification of microorganism.
- Learn the methods of laboratory diagnosis of viruses using different techniques.
- Learn about different plant and animal viruses.

#### Course Details

1. Isolation of coliphages from sewage water sample.
2. One step growth curve for determination of virus titre.
3. Immunological assays for virus detection.
4. Screening of embryonated viable eggs and demonstration of virus cultivation.
5. Cultivation and morphological identification of animal cell lines.
6. Induction of lambda lysogen by UV radiations.
7. Studies on Specialized transduction .
8. Isolation of lambda DNA and their characterization.
9. Amplification of lambda DNA by PCR.
10. Phage typing of E.coli bacteriophages.

#### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Virology 3 rd Edition by Conrat H.F., Kimball P.C. and Levy J.A. 1994. Prentice Hall, Englewood Cliff, New Jersey.	1994
2.	Introduction to Modern Virology 4th Edition by Dimmock N J, Primrose S. B. 1994. Blackwell Scientific Publications. Oxford.	1994

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage	10	20	10	60

(%)				
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## SEMESTER I

### SEMINAR I

**Course Code: CMBE-581**

**Credit Units: 02**

#### Course Outcomes:

- Describe the measurable skills, abilities, knowledge or values.
- Students should be able to demonstrate as a result of a completing a course.
- They are student-centered rather than teacher-centered.
- They describe what the students will do, not what the instructor will teach.

#### Detail of the course

**Research methods:** Lectures, seminars, and practical exercises that cover themes like what constitutes scientific knowledge

**Research problems:** How to identify and work through research problems

**Primary and secondary sources:** How to become familiar with sources and critique them, and how to research secondary sources

**Research databases:** How to use research database tools

**Research proposals:** How to prepare preliminary interdisciplinary research proposals

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER I

### PERSONALITY DEVELOPMENT

Course Code: CMBE-581a

Credit Units: 02

#### Course Outcomes:

- Discovering strengths
- Promoting well-being
- Improving academic performance
- Demonstrating adaptability, persistence, dependability, and resilience
- Seeking and considering feedback from others
- Employing self-reflection to gain insight

#### Course Detail:

**Improved attitude:** People can develop a more positive outlook on life.

**Better employment prospects:** Self-confidence can help people appear more trustworthy and productive, which can lead to better employment opportunities.

**Improved relationships:** People can develop better relationships with coworkers and become role models for others.

**Better communication:** People can develop effective communication skills, such as active listening and using clear language.

**Better emotional intelligence:** People can learn to understand their feelings, turn intentions into action, and build stronger relationships.

**Better time management:** People can learn to organize their time more efficiently.

**Holistic development:** People can contribute to their holistic development.

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER II**

### **MOLECULAR BIOLOGY**

**Course Code: CMBE-502**

**Credit Units: 04**

**Pre-requisite:** Basic information of Cell Biology

#### **Course Outcome:**

- Students will gain an understanding of molecular biology of nucleus and its effect of functioning of an organism.
- Students will understand the concepts of DNA, RNA and will develop an insight into the mechanism of DNA replication in the cell.
- Students will learn about the physiochemical reasons of damage of DNA and their effect on body functioning and will be able to analyze the in vivo mechanism of repair of DNA damage and recombination processes.
- Students will develop an understanding of formation of RNA, different mechanisms in prokaryotes and eukaryotes and processing of final transcriptional products.
- Students will be able to understand the process of protein formation and its control.
- Students will be able to analyze the mechanisms of gene expression and its regulation.

#### **Details of the Course:-**

##### **UNIT-I: Structure of nucleotides and nucleic acids:**

Structures and types of DNA and RNA, packaging of genetic material in prokaryote and eukaryotes.

##### **UNIT-II: DNA replication:**

Replication of DNA in prokaryotes and eukaryotes: Semiconservative nature of DNA replication, Bi-directional replication, Replication enzymes.

##### **UNIT-III: DNA damage, repair and homologous recombination**

DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, Nonhomologous end joining. Homologous recombination: models and mechanism.

## UNIT-IV: Transcription and RNA processing:

Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains.

Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

## UNIT-V: Regulation of gene expression and translation

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system), Genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation. Posttranslational modifications of proteins.

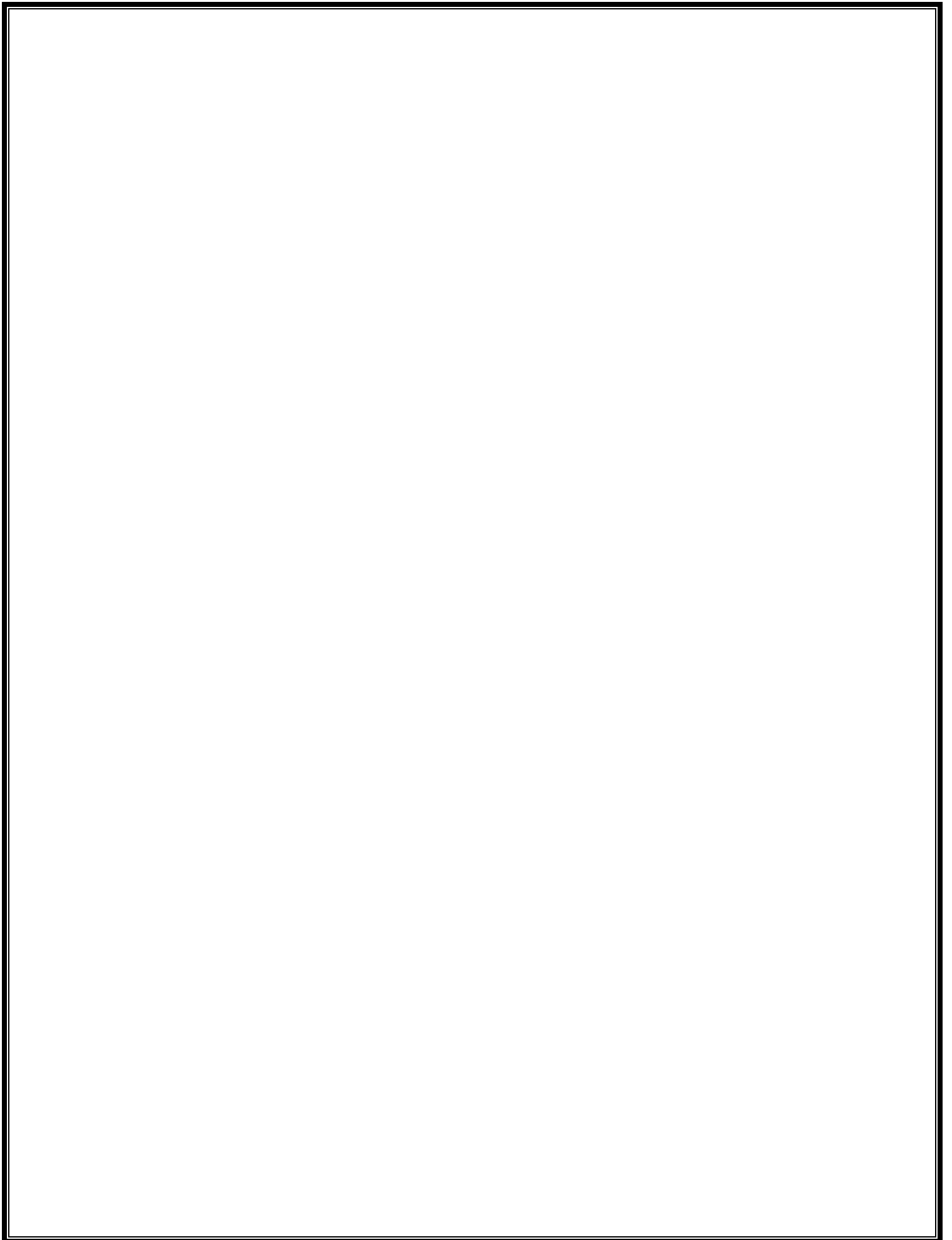
### Suggested Books:

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Repr int
	<b>Text Books</b>	
1 .	Genes IX, Lewin, Benjamin, Jones and Bartlett.	2008
	<b>Reference Books</b>	
1 .	Molecular Biology of the Gene, James D Watson et. al., (5 <sup>th</sup> Edition,) Pearson	2009

### Examination Scheme:

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Cla ss Te st	Assignment/ Project/Seminar/Q uiz	
Weight age (%)	10	2 0	10	60





## **SEMESTER II**

### **INHERITANCE BIOLOGY**

**Course Code: CMBE-502a**

**Credit Units: 04**

#### **Course Outcomes:**

- Students will be able to develop an understanding of mechanism and importance of genetic material in prokaryotes and eukaryotes, RNA processing, formation of DNA from RNA and its applications.
- Students will be able to understand the concept of expression of inheritance through genetic code, methods of protein formation and underlying mechanisms in prokaryotes and eukaryotes.
- Students will be able to evaluate the regulation processes in genes of higher and lower organisms.

#### **Details of the course:-**

##### **Unit – 1 DNA Structure and Mutagenesis**

Historical developments in genetics, discovery of DNA and experimental evidence, Structure of Circular DNA molecule, Primary, Secondary, Tertiary and Quaternary structure of DNA, Watson and Crick model of double stranded DNA the law of DNA constancy and C value paradox and topological manipulations. DNA replication: DNA replication mechanism, enzymes involved in DNA replication and models of DNA replication. Molecular basis of spontaneous and induced mutations [physical and chemical mutagenic agents], Types of mutation: point, frameshift, lethal, conditional lethal, inversion and deletion, null mutation, reversion of mutations, intra and intergenic suppression mutations. Environmental mutagenesis, toxicity testing and population genetics. Systems that safeguard DNA. DNA methylation and DNA repair mechanisms - excision, mismatch, SOS, photoreactivation, recombination repair and glycosylase system.

##### **Unit – 2 Prokaryotic Transcription and Translation**

Organization of transcriptional units and regulation of gene expression Mechanism of transcription of prokaryotes-Structure and function of RNA polymerase, [DNA foot printing], termination and antitermination – N proteins and nut sites in DNA binding proteins, enhancer sequences and control of transcription, RNA processing (Capping, polyadenylation, splicing, introns and exons) Ribonucleoprotein, structure of mRNA, rRNA, tRNA. Direction of protein synthesis, RNA template, direction with experimental proof, tRNA as adaptor, ribosomes and their organization in prokaryotes, polycistronic mRNA in bacteria, initiation of translation in bacteria, small sub-units, its accessory factors, SD sequence in bacteria, initiator tRNA, elongation of translation, translocation and termination mechanisms. Post-translational modification. Salient features of genetic code.

##### **Unit – 3 Regulation of gene expression in prokaryotes**

Operon concept, co-ordinated control of structural genes, stringent response, catabolite repression, instability of bacterial RNA, positive regulation in E.coli [Arabinose operon] and negative regulation in E.coli [lac operon], inducers and repressors, regulation by attenuation by trp operon.

**Unit – 4 Genetic recombination**

Genetic recombination processes: Role of rec proteins in homologous recombination. Conjugation: Discovery, F+, F- and Hfr cells, types of Hfr; F+ and F- and Hfr and F- genetic crosses. Mechanism of conjugation. Sexduction, conjugational transfer of colicinogenic and resistance transfer factors. Genetic mapping. Plasmid Replication and Incompatibility, Control of copy number.

Transposons – Insertion sequences and composite transposons, phages as transposons replicative, non-replicative and conservative transposition. Mutations i.e. deletions, inversions and frameshift due to transposition. Mechanism of transposition, controlling elements of maize – autonomous and non-autonomous elements. Types of transposons and their properties.

### Unit – 5 Phage Genetics

T4 virulent phage: structure, life cycle, genetic map and DNA replication. Lambda temperate phage: Structure, genetic map, lytic and lysogenic cycle, lysogenic repression and phage immunity. [Lambda regulon] applications of phages in microbial genetics.

### Suggested Books:

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Repr int
1 .	Microbial Genetics by Maloy ET. Al. 1994. Jones and Bartlett Publishers.	1994
2 .	Molecular Genetics of Bacteria by J. W. Dale. 1994. John Wiley and Sons	1994
3 .	Modern Microbial Genetics. 1991 by Streips and Yasbin. Niley Ltd.	1991
4 .	Moleculat Biology of the Gene 4th Edition by J.D. Watson, N.H. Hoppkins, J.W. Roberts, J.A. Steitz and A.M. Weiner. 1987, The Benjamin / Cummings Publications Co. Inc. California.	1987

### Examination Scheme:

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Clas s Te st	Assignment/ Project/Seminar/Q uiz	
Weight age (%)	10	2 0	10	60

## **SEMESTER II**

## **CYTOLOGY**

**Course Code: CMBE-502b**

**Credit Units: 04**

**Pre-requisite:** Basic information of Cell Biology

### **Course Outcome:**

- Basic chemical composition of living matter.
- Structural characteristics of prokaryotic and eukaryotic cells.
- Taxonomy and characteristics of the major kingdoms.
- Mechanics of membrane transport.
- Basic concepts of bioenergetics, photosynthesis, and cellular respiration.
- Mechanics of cellular reproduction.
- Mendelian genetics and genetic change.
- Nucleic acids and basic concepts of protein synthesis and gene regulation.

### **Details of the Course:-**

#### **UNIT I: Cell:**

Introduction and classification of organisms by cell structure, cytosol, Compartmentalization of eukaryotic cells, cell fractionation Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model

#### **UNIT II: Cell Membrane and Permeability:**

Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport. Sex-limited and sex-influenced inheritance, Transposons. Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments

#### **UNIT III: Endoplasmic reticulum:**

Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion. Lysosomes: Vacuoles and micro bodies: Structure and functions Ribosomes: Structures and function including role in protein Synthesis.

#### **UNIT IV: Mitochondria:**

Structure and function, Genomes, biogenesis, Chloroplast: Structure and function, genomes,

biogenesis. Nucleus: Structure and function, chromosomes and their structure. Extracellular Matrix: Composition, molecules that mediate cell adhesion

### UNIT V: Membrane receptors:

For extra cellular matrix, macromolecules, regulation of receptor expression and function. Signal transduction. Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer.

#### Suggested Books:

S · N o ·	Name of Authors/Books/Publishers	Year of Publication/Repr int
	<b>Reference Books</b>	
1	Molecular Biology of cell, 4 <sup>th</sup> ed. Alberts, Bruce (et.al)(2002) Garland Science Publishing, New York.	2002
2	Cell Biology- Smith and Wood by Chapman and Hall. Cell Biology: Organelle structure and function, Sadava, D E. (2004) Panima pub., New Delhi. Cell and Molecular Biology, 8 <sup>th</sup> ed. Robertis, Edp De and RobertisEmf De (2002) Lippincott Williams and Wilkins Pvt. Ltd., (International Student Edition) Philadelphia.	2004, 2002

#### Examination Scheme:

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Clas s Te st	Assignment/ Project/Seminar/Q uiz	
Weight age (%)	10	20	10	60

## SEMESTER II

### Immunotechnology

**Course Code: CMBE-504**

**Credit Units: 04**

**Pre-requisite:** Basic information of Immunotechnology

#### **Course Outcome:**

- Students will acquire knowledge about processing and presentation of immune system.
- Student will be able to understand cell mediated immune response.
- Students will be able to value role of immune system in different diseases.
- Students will be able to apply their knowledge to technologies related to immunology.

#### **Details of the course:**

##### **UNIT I:**

**Introduction to Immunology:** History and terminology, innate and acquired immunity, active and passive immunity, immune responses, cells (T-cells, B-cells) and organs of immune system, cell mediated and humoral immunity, cytokines, toll-like receptors.

##### **UNIT II:**

**Antibody:** Classification, isotypes, fine structure, biosynthesis of immunoglobulin, rearrangement of genes and class switching, complement system.

**Antigen:** Nature of antigens, haptens, adjuvants, vaccines.

##### **UNIT III:**

**MHC complex:** Function, structure and MHC restriction.

##### **UNIT IV:**

**Principles of virulence and pathogenicity:** Host-parasite interactions.

**Transplantation and tumor immunology:** Tumor cell immunity, transplantation of tissues and organs, relationship between donor and recipient, role of MHC molecules in allograft rejection, bone marrow and haematopoietic stem cell transplantation, tumor antigen, tumor immunoprophylaxis.

**Autoimmune diseases:** Autoimmune hemolytic anemia, systemic lupus erythematosus, multiple sclerosis, rheumatoid arthritis, AIDS, diabetes mellitus.

**Inflammation and hypersensitivity:** Hypersensitivity reactions, inflammasome.

**UNIT V:**

**Applied immunotechnology:** Antigen-antibody interaction, affinity and avidity, agglutination and precipitation reactions, immunofluorescence, fluorescence activated cell sorting analysis.

**Antibody engineering:** Hybridoma and monoclonal antibody (Mab), recombinant antibody molecules, human and humanized antibodies, uses of Mab.

**Antigen engineering:** ELISA, RIA, immunodiffusion, immunoelectrophoresis, immunoblotting, antibody for diagnosis, antibody for therapy, cytokine therapy

**Suggested Books:**

S · N o ·	Name of Authors/Books/Publishers	Year of Publication/Repr int
<b>Reference Books</b>		
1 ·	1. Willey, J.M., Sherwood, L.M. and Woolverton, C.J. 2008. Prescott, Harley and Klein's Microbiology (7 <sup>th</sup> eds.). Mc Graw Hill, USA.	2008
2 ·	Playfair, J. and Bancroft, G. 2007. Infection and Immunity (3 <sup>rd</sup> eds.). Oxford University Press.	2007
3 ·	Chakravarty, A.K. 2008. Immunology and Immunotechnology (3 <sup>rd</sup> eds.). Oxford University Press.	2008
4 ·	Tizard. 2008. Immunology: An introduction (4 <sup>th</sup> eds.). Cengage learning.	2008
5 ·	Rao, C.V. 2008. Immunology: A text book. Narosa Publishing House.	2008

**Examination Scheme:**

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Cla ss Te st	Assignment/ Project/Seminar/Q uiz	
<b>Weight age (%)</b>	10	2 0	10	60

## **SEMESTER II**

### **FUNDAMENTALS OF INFECTIONS AND IMMUNITY**

**Course Code: CMBE-504a**

**Credit Units: 04**

**Pre-requisite:** Basic information of microbiology, infection, immunity.

#### **Course Outcome:**

- Students will be able to define and explain the fundamental principles of modern immunology.
- Students will be able to *classify* antibodies on the basis of their structures and functions.
- Students will be able to *understand* related immunological techniques and *apply* them in medical laboratory profession.

#### **Details of the course**

##### **UNIT-I: Introduction:**

History: Concept of Innate and Adaptive immunity; Structure, Functions and Properties of: Immune Cells; and (Primary and secondary Lymphoid organs). Active and Passive Immunity.

##### **UNIT – II: Antigens and Antibodies:**

Antigen, Immunogen, Factors contributing immunogenicity, Epitopes, Haptens; Adjuvants

Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic); Monoclonal and Chimeric antibodies, Hybridoma Technique. Principles of Precipitation, Agglutination, Immunodiffusion, Immunoelectrophoresis, ELISA, RIA, Immunofluorescence, Immunoelectron microscopy, Complement fixation test.

##### **UNIT – III: Major Histocompatibility Complex and Complement System:**



Organization of MHC locus (Mice & Human); Structure and Functions of MHC I & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways). Components of the Complement system; Activation pathways (Classical, Alternative and Lectin pathways).

#### **UNIT – IV: Generation of Immune Response:**

Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response, T-cell receptor, T-cell maturation, activation and differentiation.

#### **UNIT – V: Immunological Disorders, Tumor Immunity and vaccines:**

Autoimmunity and Autoimmune diseases, Hypersensitivity- Type I Hypersensitivity, Type II Hypersensitivity, Type III Hypersensitivity, Type IV Hypersensitivity; Types of tumors, tumor Antigens, causes and therapy for cancers, Vaccine.

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/ Reprint</b>
<b>Text Books</b>		
1.	Immunology, Goldsby RA, Kindt TJ, Osborne BA. Kuby's. 6th edition W.H. Freeman and Company, New York, 2007.	2007
2.	Essential Immunology, 10 <sup>th</sup> ed Roitt, Ivon; Delves, Peter (2001) Blackwell Scientific Publications Oxford.	2017
<b>References</b>		
1.	Basic and Clinical Immunology, Peakman M, and Vergani D. 2nd ed).Immunology on Churchill Livingstone Publishers, Edinberg, 2009	2009
2.	Richard C and Geiffrey S. 6th edition. Wiley Blackwell Publication. 2009.	2009
3.	Janeway's Immunobiology, Murphy K, Travers P, Walport M., 7 <sup>th</sup> edition Garland Science Publishers, New York. 2008.	2008

**Examination Scheme:**

Compon ents	Internal Assessment			External Evaluation
	Attendant e	Class Test	Assignment/ Project/Seminar/Q uiz	
Weight age (%)	10	2 0	10	60

**SEMESTER II**

**HUMAN PATHOLOGY**

**Course Code: CMBE-504b**

**Credit Units: 04**

**Pre-requisite:** Basic understanding of diseases and their pathogenesis

**Course Outcome:**

Students will be able to learn and understand the concepts of how human system works in altered and diseased stage under the influence of various internal and external stimuli.

**Details of the Course:-**

**Unit I:**

History of pathology, basic definitions and familiarization with the common terms used in pathology, techniques used in pathology.

## **Cellular Adaptations, Cell Injury and Cell Death:**

Causes and mechanisms of cell injury: reversible and irreversible injury, Cellular responses: Hyperplasia, Hypertrophy, Atrophy, Metaplasia, Necrosis, Apoptosis, subcellular and intracellular response, (with suitable examples of diseases), Cellular ageing.

## **Unit II: Role of Inflammation in diseases (with suitable examples):**

General features of acute and chronic inflammation: Vascular changes, cellular events, termination of acute inflammatory response. Cells and molecular mediators of inflammation, morphological effects and outcome of acute inflammation. Systemic effects of chronic inflammation, granulomatous inflammation.

## **Unit III: Tissue Renewal And Repair, Healing And Fibrosis:**

Mechanism of tissue regeneration, role of ECM, repair by healing, scar formation and fibrosis, cutaneous wound healing, tissue remodelling in liver (mechanism of fibrosis and cirrhosis).

## **Unit IV: Hemodynamic Pathology:**

Edema, hyperaemia, congestion, haemorrhage, haemostasis and thrombosis, Embolism, Infarction and shock and hypertension.

**Nutritional diseases:** Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc Iron and Calcium) and their deficiency diseases.

## **Unit V: Cell proliferation: Cancer:**

Definitions, nomenclature, characteristics of benign and malignant neoplasms, grading and staging of cancer, biology of tumor growth, mechanism of tumor invasion and metastasis, carcinogens and cancer, concept of oncogenes, tumor suppressor genes, DNA repair genes and cancer stem cells.

## **Pathophysiology diseases:**

**A. Aetiology and Pathophysiology of:** Diabetes, Arteriosclerosis, Myocardial infarction, restrictive and obstructive respiratory diseases (COPD), Parkinson, Schizophrenia, Silicosis

**B. Infectious Diseases:** Pathogenesis of diseases and overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

## **Suggested Books:**

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Repr int
<b>Text Books</b>		
1	Robbins and Cotran Pathologic Basis of Disease, 8th edition (2009), Vinay Kumar, Abul K. Abbas, Jon C. Aster, Nelson Fausto; Saunders Publishers, ISBN-13: 978-1416031215.	2009
2	Medical Laboratory Technology Methods and Interpretations Volume 1 and 2, 6th edition (2009), Ramnik Sood; Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496.	2009
<b>Reference Books</b>		
1	General and Systematic Pathology, 2nd edition (1996), J., Ed. Underwood and J. C. E. Underwood; Churchill Livingstone, ISBN-13:978-0443052828.	1996
2	Robbins Basic Pathology, 9th edition (2012), Kumar, Abbas, Fausto and Mitchell; Saunders Publication, ISBN-13: 978- 1437717815.	2012

#### Examination Scheme:

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Cla ss Te st	Assignment/ Project/Seminar/Q uiz	
Weight age (%)	10	2 0	10	60

## SEMESTER II

### HUMAN PHYSIOLOGY & ANATOMY

Course Code: CMBE-504c

Credit Units: 04

Pre-requisite: Basic information of Animal kingdom system

#### Course Outcome:

- Students will be able to define and explain the fundamental principles of heart.
- Students will be able to understand comparative Respiratory system, Renal Physiology, Reproductive system, Endocrine system and Gastrointestinal system.

- Students will acquire knowledge about the function of different types of organs in different animal kingdom.

## **Details of the Course:-**

### **Unit I: Scope of Physiology and Anatomy:**

Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes. Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue. Skelton System: Structure and function of Skelton .Classification of joints and their function. Joint disorders.

### **Unit II: Cardiovascular and Respiratory System:**

Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart .Arterial and venous system with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

### **Unit III: Urinary, Muscular and Central Nervous System:**

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema. Muscular System: Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. physiology of neuromuscular junction.

Central Nervous System: Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.

### **Unit IV: Sensory Organs and Digestive System:**

Sensory Organs: Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.

Digestive System: names of various parts of digestive system and their functions. structure and functions of liver, physiology of digestion and absorption.

### **Unit V: Endocrine system and Reproductive System:**

Endocrine System: Endocrine glands and Hormones. Location of glands, their hormones and functions. pituitary, thyroid. Adrenal and pancreas.

Reproductive system: Physiology and Anatomy of Reproductive system.

**Suggested Books:**

S. No	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books/References</b>		
1	Guyton and Hall Textbook of Medical Physiology, 11 <sup>th</sup> edition (2006), J.E. Hall; WB Saunders and Company, ISBN-13: 978-1416045748.	2006
2	Human Physiology, 9th edition (2006), Stuart I. Fox; Tata McGraw Hill, ISBN-13: 9780077350062.	2006
3	Principles of Anatomy and Physiology, 13th edition (2011), Gerard J. Tortora and Bryan H. Derrickson; Wiley and Sons, ISBN-13: 978-0470565100.	2011

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

**SEMESTER II**

**MICROBIAL GENETICS**

**Course Code: CMBE-506**

**Credit Units: 04**

**Pre-requisite:** Basic information of Genetics & Molecular Biology

**Course Outcome:**

Students will become familiar with basic principles of genetics and underlying mechanisms

- Students will acquire a comprehensive knowledge on molecular basis of cellular activities and mechanisms involved.
- Students will be able to learn about the concepts (structures, arrangements, functions) of nucleic acids and implement their knowledge in replication of lower and higher organisms' genetic material.
- Students will gain an insight into the molecular biology of cancer. They will be able to analyze the factors leading to damage of genetic material and in vivo mechanisms to combat these damages.

**Details of the Course:-**

**UNIT I :** Basic principles of inheritance and exception to Mendelian laws. Gene interaction, complementation, linkage, chromosomal aberrations. Population genetics: Hardy –Weinberg law. Quantitative genetics and applications

**UNIT II :**Chemical and Physical properties of nucleic acids: Nucleosides & Nucleotides. Structural and types of RNA and DNA. The Watson- Crick Model. DNA as genetic material. Different forms of DNA. Topological properties of DNA. DNA reassociation kinetics and cot curve. Packaging of DNA in the prokaryotic nucleoid and eukaryotic chromosomes. Genomic Organization: Unique DNA, Repetitive DNA, Transposable elements.

**UNIT III :**Mechanism of DNA replication in prokaryotes and eukaryotes, DNA Polymerases. DNA damage, DNA repair and recombination mechanism. Retrovirus and introduction to cancer, oncogenes, tumour suppressor genes.

**UNIT IV :**Mechanism of transcription in prokaryotes and eukaryotes. Posttranscriptional processing of RNA: (Capping- polyadenylation, splicing, RNA editing).Reverse transcription

**UNIT V :**Mechanism of translation in prokaryotes and eukaryotes. Post translational modifications. Concept of genetic code. Gene expression and regulation in prokaryotes (Lac operon and **tryptophan operon**). **Gene expression and regulation in eukaryotes, Gene Silencing, RNA Interference.**

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Genes IX, Lewin, Benjamin, Jones and Bartlett	2008
2.	Molecular Biology of the Gene, James D Watson et. al.,	2009

	(5 <sup>th</sup> Edition) Pearson.	
	<b>Reference Books</b>	
1.	Molecular Biology of the Cell. Alberts et. al. (5 th edn)	2007
2.	Molecular Cell Biology. Lodish et. al. (6 th edn.)	2008
3.	Principles of Genetics, E J Gardner et. al., (8 <sup>th</sup> Ed.,)	2011

**Examination Scheme:**

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Cl as s Te st	Assignment/ Project/Seminar/Q uiz	
<b>Weight age (%)</b>	10	2 0	10	60



**Pre-requisite:** Basic knowledge of Medical Oncology.

**Course Outcome:**

- Students would know about the cell cycle, its regulation and carcinogenesis.
- Students will be able to know about the basics of cancer and its types.
- Students will understand about the cancer diagnosis.
- Students will also have knowledge of cancer therapy.

**Details of the Course:**

**UNIT-1**

Modulations of Cell- Cell cycle- ligands and receptors, cell- cellinteractions, integrins, invasions by cancerous cells, angiogenesis, morphogens, mechanism of deregulation of cell cycle during cancer, Apoptosis.

**UNIT-2**

Types of tumor-Benign and malignant tumor, localized and metastasis disease, tumor classification-WHO classification, staging and grading, degree of malignancy, types of chromosomal translocations, Relationship between oncogene products and growth factors- Src, Wnt, GAP.

**UNIT-3**

Carcinogenesis-Oncogenic mutations in growth promoting proteins, Mutations causing loss of cell cycle control, evasion of growth inhibitory signals, cancer genes (oncogenes and tumor suppressor genes), necrosis.

**UNIT-4**

Cancer Diagnosis-Cancer Imaging Techniques, Drug targeting and anti-cancer delivery system, Targeted delivery of anticancer agents using Nanoparticles, colloidal systems for the delivery of anticancer agents.

**UNIT-5**

Cancer therapy-Modulations of immunue response, immunotherapy, Conventional chemotherapy, photodynamic therapy of cancer, Critical analysis of cancer therapy, Cancer vaccines.

**Suggested Books:**

<b>S. No</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Cell and Molecular Biology, 8th Edition, Eduardo D. P. DeRobertis, E. M. F. De Robertis Lippincott Williams & Wilkins, 2010	2010
2.	The Cell: A Molecular Approach, 6th Edition Geoffrey M. Cooper ASM Press, 2013.	2013
3.	Cell and Molecular Biology: Concepts and Experiments, 6th Edition Gerald Karp John Wiley & Sons, Inc. 2010	2010
4.	Molecular Biology of Cancer: Mechanisms, Targets and Therapeutics, Lauren Pecorino, Oxford University Press, 2008	2008
<b>Reference Books</b>		
1.	Introduction to Cancer Biology, Robin Hesketh, Cambridge University Press, 2013	2013

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER II**

### **RADIATION BIOPHYSICS**

**Course Code: CMBE-506b**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of Radiation Biology & Medical Physics.

#### **Course Outcome:**

At the end of this course, the student should be able:

- To describe the various types of radiation and their biological impact on living cells and tissue at the DNA, cellular, organ and whole animal levels.
- To describe applications of radiation in the research laboratory and to medicine, with emphasis on radiation oncology.
- To employ independent learning strategies to self-evaluate and update professional knowledge of innovations in medical radiation physics.
- To identify medical radiation related instrumentation and apply techniques associated with diagnostic imaging and radiation oncology.

#### **Details of the Course:**

##### **UNIT-1**

Introduction of radiations, basic concept of radioisotopes, types of radioactive decay (gamma and beta emitter), half-life, detection and measurement of radioactivity methods based upon ionization (GM counter), methods based upon excitation (scintillation counter). Use of radioisotopes in cell biology in understanding of DNA replication (bidirectional and theta replication), transcription (labeling of RNA) and labeling of protein using labeled amino acid. Use of radioisotopes in biology: Autoradiography, radioisotopes in diagnosis (thyroid disorders, cancer) and therapy (radiotherapy). Effect of radiations (ionizing and non-ionizing) on living systems, radiation induced damage to cell (chromosome and DNA damage), precautions and safety measures in handling radioisotopes.

##### **UNIT-2**

Electromagnetic spectrum, properties of non-ionizing and ionizing radiation & their biological effects, radiation units, radioactive decay, ionisation power of radiations, binding energy of nucleus, concept of stable and unstable nuclei, different regions of ionising radiations in detectors, hazards of non-ionizing radiation and their control, medical application of radiation sources principles of detection and different methods of counting and counters, dosimetry of high-energy photons, electrons and ions, mapping of gamma detector output.

**UNIT-3**

Biological effects of UV radiation, UV in treatment of skin disorders, Biological effects of LASER, application of LASER, application of microwave radiation and ultrasonic waves, chromosome aberration and gene mutation, molecular aspects of radiation damage and repair, somatic and genetic effects of radiation.

**UNIT-4**

Application of ionizing radiation in industry, agriculture and research, internally administered isotopes, radio-iodine in thyroid function analysis, principles of isotope dilution analysis, circulation time, renal, liver and lung function analysis, principles of X-ray diagnosis, high kV radiography, special procedures such as topography, fluoroscopy, stereoscopy, image intensifiers and television monitoring,

**UNIT-5**

Biomedical imaging techniques and principles of analogue and digital imaging, Ultrasound imaging, nuclear magnetic resonance imaging, X-ray imaging and CT scan, Principle of tomographic techniques, computerised tomography, position emission tomography, application and interpretation of images.

**Suggested Books:**

S. No	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Roy R.R& Nigam B.P. Nuclear Physics, Theory and Experiment, Wiley.	2016
2.	Knoll G.F. Radiation detection and measurements, John Wiley.	2014
<b>Reference Books</b>		
1.	Coggle J.E. Biological Effects of Radiation. 2 nd edition, Taylor & Francis	2006

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER II**

### **FORENSIC SCIENCE**

**Course Code: CMBE-506c**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of Forensic Science.

#### **Course Outcome:**

- Students will be able to understand about the basics and different branches of Forensic Sciences.
- Students will be able to know about the working and functioning of Forensic science laboratories.
- Students will learn the Police science, its role in criminal investigation and prevention of crime.
- Students will be able to know how forensic scientists operate and use scientific evidence in a legal context.
- Students will be able to learn the methods of securing, searching and documenting crime scenes.

#### **Details of the Course:**

##### **UNIT -1**

Definition and scope of Forensic Science, History and Development of Forensic Science, Development of Forensic Science in India. Scope and development of forensic science, Forensic science in India, Growth of Core laboratories, set up in country.

##### **UNIT -2**

Introduction to crime, Sociological aspect in society, Types of crimes, Crimes in India, Crime Scene Management, Crime Scene procedures, Protection of crime scene physical evidence- Scientific collection of physical evidence, Crime scene management in man made and natural disaster.

##### **UNIT -3**

Duties of forensic scientist, Various divisions of crime investigation – Toxicology Biology Serology Chemistry Physics Ballistics Prohibition Document and other divisions.

##### **UNIT -4**

Specialised facilities offered by forensic science laboratory – DNA fingerprinting Polygraph Narco analysis, Brain electrical oscillation, signature proficiency (BEOSP).  
Cyber forensic, Tape and video authentication, Speaker identification etc.

##### **UNIT -5**

Concepts of psychology, History of psychology, modern perspectives, types of psychological professionals psychology, The science and research methods, professional and ethical issues in psychology.

**Suggested Books:**

<b>S. No</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Introduction to Forensic Science in Crime Investigation –Dr.Rukmani and Krishnamurthy, Selective Scientific Books, 1st edition 2011.	2011
2.	Criminalistics - An Introduction to Forensic Science- Richard Saferstein, Pearson Prentice Hall, 8th Edition	2006
3	Introduction to Psychology, Morgan, King, Weiss and Schopler, VII edition, (1989) McGraw Hill, India.	1989
<b>Reference Books</b>		
1.	Abnormal psychology & modern life, Carson RC & Butcher JN (10th Ed) Harper- Collins	2007
2	The Counseling process Patterson, Lewis E.&Welfel, Elizabeth Reynold – [2000] Hilgard.	2000

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER II**

### **MICROBIAL PHYSIOLOGY AND DEVELOPMENT**

**Course Code: CMBE-508**

**Credit Units: 04**

**Pre-requisite:** Basic information of biology and microbiology.

#### **Course Outcome:**

At the end of the course, the students will be familiar with microbial technology. This would help students to launch themselves in industrial biotechnology which is the fastest growing industry in the developing country.

#### **Details of the Course:-**

##### **UNIT I:**

Introduction to bacteria, fungi, and viruses, structural and cellular organelles differences among different types and classes ; biochemical/microscopic/molecular methods to differentiate archaea, eubacteria and eukaryotes; microbial evolution, systematics and taxonomy- new approaches to bacterial taxonomy, classification including ribotyping, characteristics of primary domains, taxonomy, nomenclature and Bergey's manual, ribosomal RNA sequencing.

##### **UNIT II:**

Prokaryotic growth patterns and functions - microbial nutrition and growth - arithmetic and geometric growth expression, growth kinetics, growth curve, measurement of growth and growth yields, synchronous growth, continuous culture, diauxic growth, culture collection and maintenance of cultures.

##### **UNIT III:**

Microbial regulation of gene expression (attenuation and negative regulation with e.g. *trp* and *lac* operon), transfer of genetic material: plasmids, transposons, transduction, transformation and conjugation. Mutations and their chemical basis; mutagens and their use in biotechnology; modes of recombination; comparative prokaryotic genomics.

##### **UNIT IV:**

Normal micro flora of skin, oral cavity, gastrointestinal tract; entry of pathogens into the host, types of toxins (exo, endo, entero) and their mode of actions, plant -microbe interactions, microbial pathogenesis -disease reservoirs; epidemiological terminologies; infectious disease transmission.

##### **UNIT V:**

Antimicrobial agents, sulfa drugs, antibiotics -penicillin and cephalosporins, broad spectrum antibiotics, antibiotics from prokaryotes, antifungal antibiotics; mode of action, resistance to antibiotics. Bacteriophage therapy. Potential targets for drug design.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1	Pelczar Jr., M.J., Chan, E.C.S. and Krieg, Noel R., Microbiology, McGraw Hill (2003) 5th ed.	2003
2	Stanier, R.Y., Ingraham, J.L. and Wheelis, M.L., General Microbiology, MacMillan (2007) 5th ed.	2007
<b>References</b>		
1	Microbiology 10 <sup>th</sup> Edition. Prescott, L.M.; Harley, J.P. and Klein, D.A. (2003) McGraw Hill, USA.	2016
2	Foundations in Microbiology 10 <sup>th</sup> edition, Kathleen Park Talaro and Barry Chess.	2017
3	Microbiology- An Introduction. Tortora, G.J., Funke, B.R., and Case, C.L., Pearson Education (2015) 12 <sup>th</sup> ed.	2015
4	Principles of Virology, Vol I and Vol II, 4 <sup>th</sup> Edition, Jane Flint, Vincent Racaniello, Glenn Rall, Anna Marie Skalka, (2015), American Society of Microbiology	2015
5	Comparative Plant Virology, Roger Hull, 2 <sup>nd</sup> ed. Elsevier, Academic Press. (2009)	2009
6	Plant Viruses, Diseases and Their Management, Kajal Kumar Biswas, IK. International Publishing House Pvt Ltd, 2016.	2016
7	Animal cell culture and Virology, S. Nandi, New India Publishing agency, 1 <sup>st</sup> ed. (2009)	2009
8	Textbook of Medical Virology, Mishra B, CBS Publishing, 1 <sup>st</sup> edition, 2018	2018

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage	10	2	10	60



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## SEMESTER II

### ANIMAL TISSUE CULTURE

**Course Code: CMBE-508a**

**Credit Units: 04**

**Pre-requisite:** Basic information of materials chemistry, biochemistry, materials strength, celltissue biology.

#### **Course Outcome:**

To introduce students to the concepts underlie the mechanical and biological properties of synthetic and natural biomaterials and tissue engineering principles and scaffolding techniques.

- The students will be able to explain the concepts of stress and strain, and the parameters used to characterize the physical bulk and surface properties of materials.
- The students will be able to describe the composition, structure and mechanical properties of the main classes of biomaterials- metals, ceramics, polymers, composites and the body tissues; explain and give an example of how composition, structure and treatment modify the mechanical properties.
- The students will be able to explain how to determine the mechanical parameters of materials experimentally; interpret the results of tests and data sheets according to international standards.
- The students will be able to describe the interactions of biomaterials with the biological environment – stability, corrosion, histo-cyto and hemo-compatibility; explain how these interactions are assessed and influenced by material choice and modification.
- The students will be able to describe and the developments of biomaterials for regenerative therapies and tissue engineering; give an example of tissue engineering technique.
- The students will be able to describe and give an example of how biomaterials are used to fabricate devices for clinical use.

#### **Details of the Course:-**

##### **Unit –I**

Introduction of biomaterial, types of biomaterials, advantages and disadvantages, Bio ceramics for implant coating, calcium phosphates, hydroxy apatite, Ti6Al4V and other biomedical alloys, implant and tissue interaction.

## Unit –II

Advantages of Nanomaterials use as implants, biological response of implanted materials, desirable and undesirable reactions of the body with implanted materials, Materials used for orthopaedic implants, bioceramics, modes of failure.

## Unit –III

Materials used for dental, modes of dental implant failure, wear debris, materials used for cartilage and vascular, bladder, modes of cartilage implant, vascular implant, implant failure study, modes of bladder implant failure.

## Unit- IV

Protein interactions with implanted materials, cellular recognition of Proteins adsorbed on material surfaces, adhesion, migration, differentiation, Cellular Extra cellular Matrix deposition leading to tissue regeneration, foreign-body response, inflammatory response.

## Unit- V

Tissue engineering Introduction, Stem cells, Morphogenesis, Generation of tissue in the embryo, Tissue homeostasis, Cellular signaling, Extracellular matrix as a biologic scaffold for tissue engineering, Scaffold fabrication, bioactive scaffold, Natural polymers in tissue engineering applications, Degradable polymers for tissue engineering.

### Suggested Books:

S · N o ·	Name of Authors/Books/Publishers	Year of Publication/Repr int
	<b>Text Books</b>	
1 ·	William A. Goddard, Sergey Edward Lyshevski, Donald W. Brenner (Ed) Handbook of Nanoscience, Engineering and Technology CRC press 2003	2003
2 ·	Mark A. Ratner, Daniel Ratner (Ed) Nanotechnology; a gentle introduction to the next big idea; Prentice Hall PTR; 2003.	2003
	<b>Reference Books</b>	
1 ·	Joachim Schummer, Davis Baird (Ed) Nanotechnology Challenges: implications for philosophy, Ethics and society ; World scientific ; 2006	2006
2 ·	Richard S. Silbergliitt, Philip S. Anton, James Schneider (Ed.). The global technology revolution: Bio/nano/materials trends and	2001

	their synergies with information; Rand corporation;2001	
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**Examination Scheme:**

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Clas s Tes t	Assignment/ Project/Seminar/Q uiz	
<b>Weighta ge(%)</b>	10	20	10	60

## **SEMESTER II**

### **ANIMAL BIOTECHNOLOGY**

**Course Code: CMBE-508b**

**Credit Units: 04**

**Pre-requisite:** Basic information of Animal Biology

#### **Course Outcome:**

- Students will be able to understand various applications of biotechnology for livestock improvement.
- Students will develop skills for animal cells culture in laboratory.
- Students will learn about the cloning and livestock genetic characterization.
- Students will learn methods of micromanipulation.
- Students will be able to analyze the causes of different animal diseases and their diagnostics.

#### **Details of the Course:-**

##### **Unit I:**

Structure and organization of animal cell and equipments and material for animal cell culture technology. Primary cell culture & establishment of cell lines. History of Animal cell culture medium-balanced salt solution and simple growth medium role of CO<sub>2</sub> serum and supplements. Serum and protein free defined media.

##### **Unit II:**

Viability and cytotoxicity measurement, cell characterization, growth kinetics. Scaling-up of animal cell culture. Cell synchronization, Cellcloning & micro manipulation.

##### **Unit III:**

Recombinant approaches to vaccine production; Hybridoma technology; Diagnostic assays based on Antigen-antibody; radioi-mmuoassay and enzyme immunoassays; Immunoblotting; Nucleic acid Restriction endonuclease analysis; PCR, Real time PCR; Nucleic acid sequencing; Animal disease diagnostic kits; Probiotics.

##### **Unit IV:**

Cryopreservation of sperms and ova of livestock; Artificial insemination; Super ovulation; in vitro fertilization; Culture of embryos; Cryopreservation of embryos; Embryo transfer; Embryo-splitting; Embryo sexing; Micromanipulation of animal embryos.

##### **Unit V:**

Transgenic animal technology and its different applications; Animal cloning- basic concepts; Cloning from embryonic cells and adult cells; Ethical, social and moral issues related to cloning; in situ and ex situ preservation of germplasm; in uterotesting of foetus for genetic defects; Pregnancy diagnostic kits;

**Suggested Books:**

<b>S . N o .</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Repr int</b>
	<b>Text Books</b>	
1 .	Brown, T.A. Molecular biology Labfax II: Gene analysis. II Edition. Academic Press, California,USA.	1988
2 .	Butler, M. Animal cell culture and technology: The basics. II Edition. Bios scientific publishers.	2004
	<b>Reference Books</b>	
1 .	Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009). An introduction to genetic analysis. IX Edition. Freeman & Co., N.Y., USA	2009
2 .	Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K (2007). Recombinant DNA- genes and genomes- A short course.III Edition. Freeman and Co., N.Y., USA.	2007

**Examination Scheme:**

<b>Compon ents</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendanc e</b>	<b>Cl as s Te st</b>	<b>Assignment/ Project/Seminar/Q uiz</b>	
<b>Weight age (%)</b>	10	20	10	60

## SEMESTER II

### Research Methodology

**Course Code: CMBE-510**

**Credit Units: 03**

**Pre-requisite:** Basic information of Animal Biology

#### **Course Outcome:**

- Describe the measurable skills, abilities, knowledge or values.
- Students should be able to demonstrate as a result of a completing a course.
- They are student-centered rather than teacher-centered.
- They describe what the students will do, not what the instructor will teach.

#### **Details of the Course:-**

**Unit-I:** Meaning of Research - Function of Research Meaning of Research - Function of Research ,Characteristics of Research ,Steps involved in Research ,Research in Pure and Applied Sciences - Inter Disciplinary Research Factors which hinder Research ,Significance of Research - Research and scientific methods ,Research Process,Criteria of good Research ,Problems encountered by Researchers ,Literature review.

**Unit - II:** Identification of Research Problem Selecting the Research problem ,Necessity of defining the problem ,Goals and Criteria for identifying problems for research. Perception of Research problem ,Techniques involved in defining the problem ,Source of problems, Personal consideration. Methods of investigation-sampling techniques and theories, editing, classification and tabulation of data, and frequency distribution of data.

**Unit- III:** Research Design Formulation of Research design ,Need for Research design ,Features of a good design ,Important concepts related to Research design. Different research designs ,Basic principles of experimental designs ,Computer and internet in designs.

**Unit-IV:** Interpretation and Report Writing Meaning and Technique of interpretation ,Precautions in interpretation ,Significance of report writing ,Different steps in writing a report ,Layout of a Research report. Types of report ,Mechanics of writing a research report ,Precautions for writing a research report ,Conclusion.

**Unit -V:** Statistical Techniques and Tools Introduction of statistics, Functions, Limitations, Measures of central tendency - Arithmetic mean ,Median ,Mode ,Standard deviation – Co-efficient of variation (Discrete serious and continuous serious) ,Correlation - Regression Multiple Regression. Sampling distribution ,Standard error ,Concept of point and interval estimation ,Level of significance ,Degree of freedom ,Analysis of variance ,One way and two way classified data ,‘F’-test.

**Suggested Books:**

S · N o ·	Name of Authors/Books/Publishers	Year of Publication/Repr int
<b>Text Books</b>		
1	A Hand Book of Methodology of Research, Rajammall, P. Devadoss and K. Kulandaivel, RMM Vidyalaya press, 1976.	1976
2	Research Methodology Methods & Techniques, C.R. Kothari – New Age international Publishers, Reprint 2008.	2008
3	Thesis and Assignment Writing, J. Anderson, Wiley Eastern Ltd., 1997.	1997
4	Research Methodology, Mukul Gupta, Deepa Gupta – PHI Learning Private Ltd., New Delhi, 2011.	2011
5.	Fundamentals of Mathematical statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons, New Delhi, 1999.	1999

**Examination Scheme:**

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Cl as s T e s t	Assignment/ Project/Seminar/Q uiz	
<b>Weight age (%)</b>	10	2 0	10	60

## **SEMESTER II**

### **RESEARCH ETHICS**

**Course Code: CMBE-510a**

**Credit Units: 03**

**Pre-requisite:** Basic information of Animal Biology

#### **Course Outcome:**

- Describe the ethics related to the research.
- Students should be able to demonstrate an ethical experiment.
- They are student-centered rather than teacher-centered.
- They describe what the students will do, not what the instructor will teach.

#### **Details of the Course:-**

##### **Unit I:**

Introduction to Philosophy, definition, nature and scope, concept, branches. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

##### **Unit II:**

Scientific conduct (ethics with respect to science and research, Intellectual honest and research integrity.

##### **Unit III:**

Scientific Misconducts: Falsification, Fabrification, and Manipulation, Selective reporting and misrepresentation of data.

##### **Unit IV:**

Publication Ethics- Definition, introduction and importance, best practices and guide lines, identification of publication misconduct, complaints and appeals.

##### **Unit V:**

Predatory publishers and journals, approved and peer reviewed, research journals, plagiarism and how to detect plagiarism.



## SEMESTER II

### MOLECULAR BIOLOGY LAB

**Course Code: CMBE-552**

**Credit Units: 02**

**Pre-requisite:** Basic information of laboratory techniques used in molecular biology.

#### Course Outcomes:

- This course regarded as an introduction to basic Molecular biology techniques.
- The course uses simple protocols and available materials and instruments to understand Molecular materials.
- For it, medical Lab Science students have to get the minimum of manual skills during a research of molecular biology, eg. DNA isolation, electrophoresis, buffer preparation, PCR, etc.
- The given manual contains the Descriptions of the molecular methods of analysis which all the skills are required in.

#### Detail of the Course:

1. **Laboratory Safety and Techniques:** Safety regulations, aseptic techniques, pipette use, and basic laboratory equipment.
2. **DNA Isolation and Quantification:** Isolation of genomic DNA and plasmid DNA, DNA quantification using spectrophotometry.
3. **Polymerase Chain Reaction (PCR):** Basic PCR principles, designing primers, PCR optimization, and analysis of PCR products.
4. **Agarose Gel Electrophoresis:** Separation and visualization of DNA fragments.
5. **Restriction Enzyme Digestion:** Restriction enzyme digestion of DNA, analysis of restriction fragments.
6. **DNA Cloning:** Ligation of DNA fragments into vectors, transformation of competent cells, and selection of recombinant clones.
7. **Protein Expression and Purification:** Induction of protein expression, cell lysis, and protein purification techniques (e.g., affinity chromatography).
8. **Molecular Biology Applications:** Techniques like DNA sequencing, real-time PCR

#### Suggested Books:

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Repr int
	<b>Reference Books</b>	
1 .	S. K. Gakhar, Monika Miglani, Ashwani Kumar; Molecular Biology: A Laboratory Manual	2013

2	Gloria Doran, Essentials of Molecular Biology, 2018	2018
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**Examination Scheme:**

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Clas s Te st	Assignment/ Project/Seminar/Q uiz	
<b>Weight age (%)</b>	10	20	10	60

## SEMESTER II

### MICROBIAL GENETICS & MICROBIAL PHYSIOLOGY LAB

**Course Code: CMBE-554**

**Credit Units: 02**

**Pre-requisite:** Basic information of laboratory techniques used in microbial genetics & microbial physiology.

#### Course Outcomes:

- Develop practical skills in aseptic techniques, microbial culture, and laboratory techniques.
- Learn to design experiments, analyze data, and draw conclusions.
- Gain understanding of microbial growth, metabolism, genetic mechanisms, and biotechnological applications.
- Acquire problem-solving skills and adapt to experimental challenges.

#### Detail of the Course:

1. Aseptic Techniques: Mastering sterile techniques for handling microorganisms.
2. Media Preparation: Preparing various culture media (solid and liquid) for bacterial growth.
3. Microbial Growth Curve: Monitoring bacterial growth over time using spectrophotometry.
4. Effect of Physical and Chemical Factors on Microbial Growth: Studying the impact of factors like temperature, pH, and antibiotics.
5. Genetic Transformation: Introducing foreign DNA into bacteria using techniques like heat shock and electroporation.
6. DNA Isolation and Purification: Extracting and purifying genomic DNA and plasmid DNA.
7. PCR and Gel Electrophoresis: Amplifying specific DNA sequences and analyzing them using gel electrophoresis.
8. Microbial Enzyme Assays: Measuring enzyme activity under different conditions to understand metabolic pathways.

#### Suggested Books:

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Repr int
	<b>Reference Books</b>	
1 . .	Singh B.D., Singh R.P.; Microbial Physiology and Microbial Genetics, 2017	2017
2 . .	P.M. Swami; Laboratory manual on Biotechnology, Rastogi Publication, 2008	2008

**Examination Scheme:**

<b>Compon ents</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendanc e</b>	<b>Clas s Te st</b>	<b>Assignment/ Project/Seminar/Q uiz</b>	
<b>Weight age (%)</b>	10	20	10	60

## SEMESTER II

### SEMINAR II

Course Code: CMBE-582

Credit Units: 02

#### Course Outcomes:

- Describe the measurable skills, abilities, knowledge or values.
- Students should be able to demonstrate as a result of a completing a course.
- They are student-centered rather than teacher-centered.
- They describe what the students will do, not what the instructor will teach.

#### Detail of the course

**Research methods:** Lectures, seminars, and practical exercises that cover themes like what constitutes scientific knowledge

**Research problems:** How to identify and work through research problems

**Primary and secondary sources:** How to become familiar with sources and critique them, and how to research secondary sources

**Research databases:** How to use research database tools

**Research proposals:** How to prepare preliminary interdisciplinary research proposals

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER III

### RECOMBINANT DNA TECHNOLOGY

**Course Code: CMBE-601**

**Credit Units: 04**

**Pre-requisite:** In-depth knowledge of Recombinant DNA Technology

#### **Course Outcome:**

- The student will be familiar with the historical background and important milestones, biosafety and bioethics in genetic engineering.
- The student will be acquainted with tools of RDT like enzymes, vectors and hosts.
- The student will be acquainted with technical knowhow of gene cloning and expression and factors for optimizing the heterologous gene expression.
- The student will be acquainted with the techniques required for gainful applications of genetic engineering.
- The student will be able to apply RDT in different domains of life science, medical, agriculture, forensic and allied fields for the welfare of living beings.

#### **Details of the Course:-**

##### **Unit I: Introduction and scope of RDT:**

Recombinant DNA, Milestones in genetic engineering, Biosafety and Bioethics, Overview of Scope and Applications of Recombinant DNA Technology. Isolation of nucleic acid (plasmid, DNA and RNA), quantification and its purity.

##### **Unit II: Tools and strategies of molecular cloning:**

Enzymes in Recombinant DNA Technology and its applications: Nucleases, Restriction endonucleases, DNA Polymerases, Terminal transferase, Reverse transcriptase, Kinase and Phosphatase, DNA ligases (T4 DNA ligase and *E.coli* DNA ligase).

Structure and strategies of cloning and screening of vectors based upon: Plasmids, Cosmids, Phages, Artificial Chromosomes (BAC and YAC), and hybrid vectors, shuttle vectors, plant vectors (*Agrobacterium* and virus based), expression vectors.

##### **Unit III: Gene Cloning and Expression:**

Cloning and screening strategies (including directional cloning): Cutting and joining vector and insert DNA, transformation of recombinant DNA in host, methods for screening of Transformants. Introduction to gene expression (Prokaryotic and eukaryotic expression). Synthesis of cDNA, Construction of cDNA library and genomic DNA library.

##### **Unit IV: Methods in RDT:**

DNA, RNA and Protein analysis: Agarose gel electrophoresis, SDS-PAGE, Gel Shift Assay. Blotting

techniques: Southern-, Northern- and Western blotting, probe labeling and hybridization; Polymerase Chain Reaction: Principle, methodology and application; variants of PCR. Molecular markers and their applications; DNA microarray analysis; Chromosome walking; Site directed mutagenesis.

**Unit V: Application of RDT:**

Transgenic Technology: Types approaches and application (Plant and Animals); Gene therapy: Principles, strategies and ethics of human gene therapy; DNA Fingerprinting and application of DNA technology in forensics and parental disputes; Products of recombinant DNA technology: human therapeutic- insulin, hGH, recombinant vaccines.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	Gene Cloning and DNA Analysis, An Introduction, T. A. Brown (7 <sup>th</sup> edition), Wiley-Blackwell	2015
2.	Recombinant DNA: Genes and Genomes - A Short Course, James D. Watson , Richard M. Meyers, Amy A. Caudy, Jan A. Witkowski, (3rd Edition), W.H. Freeman	2007
	<b>Reference Books</b>	
1.	Molecular Cloning: A Laboratory Manual, Michael R. Green; Joseph Sambrook, (Fourth Edition), CSHL Press	2012
2.	Principles of Gene Manipulation and Genomics, Primrose, S.B. and Twyman, R.M., (7th ed.) Blackwell Publishing	2006

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER III

## NANOTECHNOLOGY

**Course Code: CMBE-601a**

**Credit Units: 04**

### Unit I

**Background to Nanoscience:** Definition of Nano, Scientific revolution-Atomic Structure and atomic size, emergence and challenges of nanoscience and nanotechnology, carbon age-new form of carbon (CNT to Graphene), influence of nano over micro/macro, size effects and crystals, large surface to volume ratio, surface effects on the properties.

### Unit II

**Types of nanostructure and properties of nanomaterials:** One dimensional, Two dimensional and Three dimensional nanostructured materials, Quantum Dots shell structures, metal oxides, semiconductors, composites, mechanical-physical-chemical properties.

### Unit III

**Application of Nanomaterial:** Ferroelectric materials, coating, molecular electronics and nanoelectronics, biological and environmental, membrane based application, polymer based application.

### Unit IV

**Surface Nanoscience:** Introduction to surface active agents. Theory and applications. Types of surfactants. Classification, synthesis of surfactant - Shape, size and structure of surfactants. Micelle, Emulsions, Microemulsions & Gels. Kraft temperature, surfactant geometry and packing.

### Unit V

**Colloidal Nanoscience:** Introduction to colloidal material, surface properties, origin of colloidal particles, preparation & characterization of colloidal particles. Applications of super hydrophilic hydrophobic surfaces, self-cleaning surfaces. Surface viscosity.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Reference Books</b>	
1.	Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et.al.	2012
2.	Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.	2004
3.	Instrument E L Principe, P Gnauck and P Hoffrogge, Microscopy and Microanalysis (2005), 11: 830- 831, Cambridge University Press.	2005



4.	Processing & properties of structural nanomaterials - Leon L. Shaw, Nanochemistry: A Chemical Approach to Nanomaterials, Royal Society of Chemistry, Cambridge UK 2005.	2005
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**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER III

### GENETIC ENGINEERING

**Course Code: CMBE-601b**

**Credit Units: 04**

**Pre-requisite:** In-depth knowledge of Genetic Engineering.

#### **Course Outcome:**

- The student will be familiar with the historical background and important milestones, biosafety and bioethics in genetic engineering.
- The student will be acquainted with tools of RDT like enzymes, vectors and hosts.
- The student will be acquainted with technical knowhow of gene cloning and expression and factors for optimizing the heterologous gene expression.

#### **Details of the Course:-**

##### **Unit I: Introduction and scope of RDT:**

Recombinant DNA, Milestones in genetic engineering, Biosafety and Bioethics, Overview of Scope and Applications of Recombinant DNA Technology. Isolation of nucleic acid (plasmid, DNA and RNA), quantification and its purity.

##### **Unit II: Tools and strategies of molecular cloning:**

Enzymes in Recombinant DNA Technology and its applications: Nucleases, Restriction endonucleases, DNA Polymerases, Terminal transferase, Reverse transcriptase, Kinase and Phosphatase, DNA ligases (T4 DNA ligase and *E.coli* DNA ligase).

Structure and strategies of cloning and screening of vectors based upon: Plasmids, Cosmids, Phages, Artificial Chromosomes (BAC and YAC), and hybrid vectors, shuttle vectors, plant vectors (*Agrobacterium* and virus based), expression vectors.

##### **Unit III: Gene Cloning and Expression:**

Cloning and screening strategies (including directional cloning): Cutting and joining vector and insert DNA, transformation of recombinant DNA in host, methods for screening of Transformants. Introduction to gene expression (Prokaryotic and eukaryotic expression). Synthesis of cDNA, of cDNA library and genomic DNA library.

##### **Unit IV: Methods in RDT:**

DNA, RNA and Protein analysis: Agarose gel electrophoresis, SDS-PAGE, Gel Shift Assay. Blotting techniques: Southern-, Northern- and Western blotting, probe labeling and hybridization; Polymerase

Chain Reaction: Principle, methodology and application; variants of PCR. Molecular markers and their applications; DNA microarray analysis; Chromosome walking; Site directed mutagenesis.

### Unit V: Application of RDT:

Transgenic Technology: Types approaches and application (Plant and Animals); Gene therapy: Principles, strategies and ethics of human gene therapy; DNA Fingerprinting and application of DNA technology in forensics and parental disputes; Products of recombinant DNA technology: human therapeutic- insulin, hGH, recombinant vaccines.

### Suggested Books:

S · N o ·	Name of Authors/Books/Publishers	Year of Publication/Repr int
	<b>Text Books</b>	
1 ·	Gene Cloning and DNA Analysis, An Introduction, T. A. Brown (7 <sup>th</sup> edition), Wiley-Blackwell	2015
2 ·	Recombinant DNA: Genes and Genomes – A Short Course, James D. Watson , Richard M. Meyers, Amy A. Caudy, Jan A. Witkowski, (3 <sup>rd</sup> Edition), W.H. Freeman	2007
	<b>Reference Books</b>	
1 ·	Molecular Cloning: A Laboratory Manual, Michael R. Green; Joseph Sambrook, (Fourth Edition), CSHL Press	2012
2 ·	Principles of Gene Manipulation and Genomics, Primrose, S.B. and Twyman, R.M., (7 <sup>th</sup> ed.) Blackwell Publishing	2006

### Examination Scheme:

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Cla ss Te st	Assignment/ Project/Seminar/Q uiz	
<b>Weight age (%)</b>	10	2 0	10	60

## **SEMESTER III**

### **GENOMICS & PROTEOMICS**

**Course Code: CMBE-601c**

**Credit Units: 04**

**Pre-requisite:** In-depth knowledge of genomics and proteomics.

#### **Course Outcome:**

- The student will be able to understand human genome, genome sequencing approaches, genome mapping, next generation DNA sequencing platforms and molecular markers.
- The student will be able to know the methods of functional genomics, gene annotation and modern techniques of gene editing, deletion and silencing.
- The student will be able to know introductory account of sub branches of genomics e.g comparative genomics, epigenomics, metagenomics, Pharmacogenomics etc. and selected model organisms used in genomic studies.
- The students will be able to know Proteomics and Transcriptomics along with its methods and application.

#### **Details of the Course:-**

##### **UNIT I: Structural Genomics:**

The Genome: Components and their organization; Genome mapping; Genetic and Physical mapping; Genome sequencing: shotgun sequencing and Clone contig methods; Conventional methods of DNA sequencing and next generation DNA sequencing strategies; Human Genome project.

##### **UNIT II: Functional genomics:**

Gene discovery-forward and reverse genetics approaches; Molecular mapping and tagging mutagenesis-insertional mutagenesis, directed mutagenesis by homologous recombination, Loss of function and gain of function mutants; RNA interference and Antisense technology; Gene editing technology.

##### **UNIT III:**

Introduction to Comparative genomics, Epigenetic and Epigenomics, Toxicogenomics, Pharmacogenomics and Metagenomics.

Model Organisms: *Saccharomyces cerevisiae* (yeast), *Mus musculus* (Mouse), *Arabidopsis thaliana* (Thale Cress) etc.

##### **UNIT IV: Proteome and Proteomics:**

2D SDS-PAGE, Isolation and sequence analysis of spots by Mass Spectroscopy; Cell free protein synthesis in wheat germ cells and Rabbit reticulocyte lysate; Protein-Protein Interaction: Yeast Two Hybrid System and Phage display.

## UNIT V:

Introduction to Transcriptomics; Quantitative (Real-Time) PCR, Nucleic acid Micro-arrays: and its applications.

### Suggested Books:

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1	Genome 4, T. A. Brown (4 <sup>th</sup> Ed.), Garland Science, New York	2017
2.	Molecular Biology the Gene, James D Watson et. Al., (5 <sup>th</sup> Edition) Pearson.	2009
3	Recombinant DNA: Genes and Genomes – A Short Course, James D. Watson , Richard M. Meyers, Amy A. Caudy, Jan A. Witkowski, (3 <sup>rd</sup> Edition), W.H. Freeman	2007
	<b>Reference Books</b>	
1	Lewin's Gene XI, Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick, (11 ed), Jones and Bartlett learning.	2014
2	Principles of Gene Manipulation and Genomics, Primrose, S.B. and Twyman, R.M., (7 <sup>th</sup> ed.) Blackwell Publishing	2006

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	

<b>Weight age (%)</b>	10	2 0	10	60
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### SEMESTER III

### GENE THERAPY

**Course Code: CMBE-601d**

**Credit Units: 04**

**Pre-requisite:** In-depth knowledge of genes and gene therapy

#### Course Outcomes:

- The student will be acquainted with the techniques required for gainful applications of gene therapy.
- The student will be able to apply gene modification techniques for better hereditary of life science, medical, agriculture, forensic and allied fields for the welfare of living beings.

#### Detail of the course:

##### Unit I

Systematic position of microorganisms in the living world. Classification of microorganisms: Haeckel's three kingdom concept, Whittaker's five kingdom concept, three domain concept of Carl Woese, Historical account of bacterial classification. Detailed account of bacterial classification according to the 1st edition of Bergey's Manual of Systematic Bacteriology (up to sections); Detailed account of bacterial classification according to the 2nd edition of Bergey's Manual of Systematic Bacteriology (up to orders).

##### Unit II

Characteristics, classification and economic importance of the following sections (Bergey's Manual of Systematic bacteriology 1st edition). Spirochetes, Gram – negative aerobic rods and cocci: Facultative anaerobic Gram - negative rods, Rickettsia and Chlamydia; Mycoplasma, Endospore-forming Gram - positive rods and cocci; Mycobacteria, Anoxygenic photosynthetic bacteria and Oxygenic photosynthetic bacteria; Aerobic chemolithotrophic bacteria, Archaea and Actinomycetes

##### Unit III

Brief account of discovery of viruses, chemical composition of viruses; morphology, architecture, principles of symmetry with reference to T4, TMV, Adeno, Polio, Influenza, Rhabdo, Reo and HIV viruses. Nucleic acid diversity in viruses; sub viral particle satellite viruses, viroids, DI particles and prions; Taxonomy of viruses: classification and nomenclature of viruses as per ICTV; Isolation, purification, cultivation, assay and characterization of plant, animal and bacterial viruses.

##### Unit IV

Life cycles of bacterial viruses; one step growth curve, lytic and lysogenic cycles with reference to T4, \_ and \_ X 174. Importance of phages; Classification and nomenclature of plant viruses, replication of TMV and CaMV; Classification and replication of animal viruses (Adeno, Influenza, Herpes, Hepatitis and Retro viruses); Transmission and management of plant and animal viral diseases (interferons, antiviral drugs and vaccines etc.)

#### Suggested Books:

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Repr int
<b>Reference Books</b>		
1 .	Sneath, P.H.A .and R.R. Sokal 1973 Numerical taxonomy .The Principles and Practice of Numerical Classification, San Francisco. W.H. Freeman	1973
2 .	Sneath, P.H.A 1989 Analysis and Interpretation of sequence data for bacterial Systematic. The view of a Numerical taxonomist .Syst.Appl.Microbiol.12:15-31	1989
3 .	Tom Parker, M. Lerline , H.Collier,1990,Principles of Bacteriology, Virology and Immunity, VIII Ed.	1990
4 .	Woese,C.R.,Kandler,O. and M.L.Wheelis 1990 Towards a natural System of organisms: Proposal for the Domains Archea, Bacteria and Eucarya. Proc. Nati, Acad, Sci. ,87: 4576- 4570	1990
5 .	Garrity George, M. Edieor-In Cheaf 2005 Bergey’s Manual of Systematic Bacteriology II Ed. (Vol- I-V) .J.Brenner,K.R.Krieg, J.T.Stanly. Editors. Springer-Verlog	2005
6 .	Prescott, L.M., J.P Harley and D.AKlein, 2007 Microbiology VII Ed. Mc Grow Hill,	2007

**Examination Scheme:**

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Cla ss Te st	Assignment/ Project/Seminar/Q uiz	
<b>Weight age (%)</b>	10	2 0	10	60

## **SEMESTER III**

### **GREY BIOTECHNOLOGY**

**Course Code: CMBE-601e**

**Credit Units: 04**

**Pre-requisite:** In-depth knowledge of environmental science and biotechnology implications

#### **Course Outcome:**

- The student will be able to understand human genome, genome sequencing approaches, genome mapping, next generation DNA sequencing platforms and molecular markers.
- The student will be able to know the methods of functional genomics, gene annotation and modern techniques of gene editing, deletion and silencing.
- The student will be able to know introductory account of sub branches of genomics e.g comparative genomics, epigenomics, metagenomics, pharmacogenomics etc. and selected model organisms used in genomic studies.
- The students will be able to know Proteomics and Transcriptomics along with its methods and application.

#### **UNIT I: Bioremediation**

The two main types of bioremediation are in situ and ex situ. Bioremediation is a biological clean-up process that uses microorganisms to eliminate chemical contamination.

#### **UNIT II: Bioaugmentation**

This process involves introducing indigenous and exogenous strains to increase the activity of enzymes that treat contaminated soil and water.

#### **UNIT III: Bioventing**

This is a cost-effective and efficient technology that remediates petroleum-contaminated sites by circulating air through the sub-surface.

#### **UNIT IV: Biocatalysts**

Biocatalysts have emerged as enablers in gray biotechnology. Some topics related to biocatalysts include:

Economics of biocatalytic processes Non-aqueous enzymology Enzyme immobilization Flow biocatalysis Whole cell biocatalysis and co-enzyme regeneration



**Suggested Books:**

<b>S . N o .</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Repr int</b>
	<b>Reference Books</b>	
1 .	Vandevivere and W. Verstraete, Environmental Applications, edited by C. Ratledge and B. Kristiansen, (Cambridge university Press, New York, 2006)	2006
2 .	G. Bitton, in Wastewater Microbiology (Wiley-Liss/Wiley, Hoboken, 2005)	2005

**Examination Scheme:**

<b>Compon ents</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendanc e</b>	<b>Cl as s Te st</b>	<b>Assignment/ Project/Seminar/Q uiz</b>	
<b>Weight age (%)</b>	10	20	10	60

## **SEMESTER III**

### **CELLULAR MICROBIOLOGY**

**Course Code: CMBE-603**

**Credit Units: 04**

**Pre-requisite:** Basic information of Cell Biology

#### **Course Outcome:**

- Students will acquire knowledge about basics of cell biology.
- Students will learn about how various functions of organelles and their working.
- Students will gain an insight into microscopic structures and chemical components of various regions of cells.
- Students will attain a comprehensive knowledge of functioning of cell and synchronization of activities of various organelles.
- Students will be able to learn about various signaling mechanism involved in a cell which ultimately leads to a visible physiological response.
- Students will be able to understand the architectural components involved in making cells rigid and how cells are connected to each other.
- Students will learn about molecular events involved in cell cycle.
- Students will apply the information gained in understanding the issues and conditions encountered if things go wrong with cell cycle and how our understanding of cell signaling generate drug targets.

#### **Details of the Course:-**

##### **Unit I:**

Introduction to prokaryotes, eukaryotes & cell theory, Introduction to microscopy, Plasma Membrane: structure – organization, lipid bilayer, proteins & glycoconjugates, liposomes, functions – ionic transport, types of transport (symport, antiport, active & passive), channel proteins, Intracellular compartmentalization: structure, organization and functions of nucleus, mitochondria, lysosome, golgi body chloroplast, peroxisome, endoplasmic reticulum (rough and smooth).

**Unit II:**

Vesicular traffic in the secretory and endocytic pathway: transport from endoplasmic reticulum through the golgi network to lysosome, endocytosis, exocytosis, molecular mechanisms of vesicular transport and the maintenance of compartments diversity.

Cell signaling: general mechanistic principles

Types of signaling, GPCR, RTK with examples, Calcium Signaling, Mechanism of Chemotaxis, signal transduction and vision.

**Unit III:**

Vesicular traffic in the secretory and endocytic pathway: transport from endoplasmic reticulum through the golgi network to lysosome, endocytosis, exocytosis, molecular mechanisms of vesicular transport and the maintenance of compartments diversity. Cell signaling: general mechanistic principles Types of signaling, GPCR, RTK with examples, Calcium Signaling, Mechanism of Chemotaxis, signal transduction and vision Significance of vesicular trafficking and cell signaling

**Unit IV:**

Cancer-Biology: Types of cancer, onset of cancer, proto- oncogenes and tumor suppresser genes, oncogenic mutations affecting cell proliferation, cell cycle and genome stability.

Programmed cell death & unprogrammed cell death.

Expression patterns of proteins & enzymes during cell proliferation

**Unit V:**

Introduction to Developmental Biology, History and Basic Concepts, Basics of model systems: Vertebrate Model Systems, Invertebrate and Plant Model Systems, basic patterning and development plan of model Plan, initial division pattern, and evolution and development biology

**Suggested Books:**

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Repr int
<b>Reference Books</b>		
1	Molecular Biology of cell, 4 <sup>th</sup> ed. Alberts, Bruce (et.al)(2002) Garland Science Publishing, New York.	2002
2	Cell Biology- Smith and Wood by Chapman and Hall. Cell Biology: Organelle structure and function, Sadava, D E. (2004) Panima pub., New Delhi. Cell and Molecular Biology, 8 <sup>th</sup> ed. Robertis, Edp De and RobertisEmf De (2002) Lippincott Williams and Wilkins Pvt. Ltd., (International Student Edition) Philadelphia.	2004, 2002

### Examination Scheme:

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Cl as s T e s t	Assignment/ Project/Seminar/Q uiz	
Weight age (%)	10	2 0	10	60

## SEMESTER III

### MOLECULAR DIAGNOSTIC

**Course Code: CMBE-603a**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of immunology and molecular biology

#### Course Outcome:

- Students will gain new insights about different diagnostic procedures.
- Students will be able to use critical thinking skills to trouble shoot problems as they occur and determined possible causes
- Students will be able to apply the knowledge of molecular testing to the most commonly performed applications in the clinical laboratory.

#### Details of the Course:-

##### UNIT I: Enzyme Immunoassays:

Solid phases, Comparison of enzymes, conjugation of enzymes, Use of polyclonal or monoclonal antibodies, Immunoblotting, Radioimmunoassay.

##### UNIT II: Molecular methods in diagnostics:

Applications of PCR, RFLP, Nuclear hybridization methods LAMP method in transgenics.

### **UNIT III: Prenatal diagnosis:**

Invasive techniques - Amniocentesis, Fetoscopy, Chorionic Villi Sampling (CVS), Non-invasive techniques - Ultrasonography, X-ray, TIFFA.

### **UNIT IV: Biochemical diagnostics:**

Inborn errors of metabolism, haemoglobinopathies, mucopolysaccharidoses, lipidoses, and glycogen storage disorders.

### **UNIT V: Automation in microbial diagnosis:**

Rapid diagnostic approach including technical purification and standardization of antigen and specific antibodies.

### Suggested Books:

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1	Buckingham, L., Flaws, M.L., Molecular Diagnostics: Fundamentals, Methods, & Clinical Applications, F A Davis Co., Philadelphia.	2007
2	Grody, W.W., Nakamura, R.M., Kiechle, F.K. & Strom, C., Molecular Diagnostics: Techniques and Applications for the Clinical Laboratory, Academic Press	2009
	<b>Reference Books</b>	
1	Ananthanarayan, R. & Paniker, C.K.J., Textbook of Microbiology. 7th edition, University Press Publication.	2005
2	Kindt, T J, Goldsby, R.A., Osborne, B.A. & Kuby, J., Immunology, 6th Edition, W.H. Freeman, New York	2007

### Examination Scheme:

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Cla ss Te st	Assignment/ Project/Seminar/Q uiz	
<b>Weight age (%)</b>	10	2 0	10	60

## **SEMESTTER III**

### **MEDICAL MICROBIOLOGY**

**Course Code: CMBE-605**

**Credit Units: 04**

**Pre-requisite:** Basic information of Medical Microbiology

#### **Course Outcome:**

Upon successful completion of this course the student will be able to:

- This course provides learning opportunities in the basic principles of medical microbiology and infectious disease.
- It covers mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- It also provides opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.
- Helps to understand the use of lab animals in medical field.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganisms' control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

#### **Details of the Course:-**

##### **UNIT I: General Microbiology:**

Morphology and classification of microorganisms. Growth, nutrition and multiplication of bacteria. Sterilization and Disinfection - Principles and use of equipment's of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptics and disinfectants. Immunology - antigen, Antibodies, Immunity, vaccines, types of vaccine and immunization schedule. Hospital acquired infection - Causative agents, transmission methods, investigation, prevention and control of hospital Acquired infections.

##### **UNIT II: Bacteriology:**

Classification of bacteria, morphology, infections, lab diagnosis, treatment and prevention of common bacterial infections. Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacterium diphtheriae, Clostridia, Enterobacteriaceae

- Shigella, Salmonella, Klebsiella, E.coli, Proteus, Vibrio cholerae, Pseudomonas and Spirochetes.

**UNIT III: Mycobacteriology & Parasitology:**

Mycobacteria- classification, pathogenesis, lab diagnosis and prevention. Classification, infections and lab diagnosis of following parasites. Entamoeba, Giardia, Malaria, Hookworm, Roundworm and Filarial worms.

**UNIT IV: Mycology:**

Morphology, disease caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi (Aspergillus, Zygomycetes and Penicillium).

**Unit V: Virology:**

General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Dengue, Influenza, Chikungunya, Rabies and Poliomyelitis.

**Suggested Books:**

S · N o ·	Name of Authors/Books/Publishers	Year of Publication/Repr int
	<b>Text Books</b>	
1 ·	Microbiology by Lansing M. Prescott and John P. Harley and Donald Klein; Ed. 6th; McGraw-Hill Science, 2004.	2004
2 ·	Allen and William M Janda and Paul C Schreckenberger and Washington C Winn; Ed. 6th; Lippincott Williams & Wilkins, 2005.	2005
	<b>Reference Books</b>	
1 ·	Essentials of diagnostic microbiology by Lisa Anne Shimeld and Anne T. Rodgers; Delmar Publishers, 1999.	1999
2 ·	Medical Microbiology by Geo. Brooks and Karen C. Carroll and Janet Butel and Stephen Morse; Ed. 24th; McGraw-Hill Medical, 2007.	2007

**Examination Scheme:**



<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## **SEMESTER III**

### **MEDICAL LAB DIAGNOSTIC**

**Course Code: CMBE-605a**

**Credit Units: 04**

**Pre-requisite:** Basic understanding of diseases and their pathogenesis

### **Course Outcome:**

Students will be able to learn and understand the concepts of how human system works in altered and diseased stage under the influence of various internal and external stimuli.

### **Details of the Course:-Unit I: Introduction:**

History of pathology, basic definitions and familiarization with the common terms used in pathology, techniques used in pathology.

### **Cellular Adaptations, Cell Injury and Cell Death:**

Causes and mechanisms of cell injury: reversible and irreversible injury, Cellular responses: Hyperplasia, Hypertrophy, Atrophy, Metaplasia, Necrosis, Apoptosis, subcellular and intracellular response, (with suitable examples of diseases), Cellular ageing.

### **Unit II: Role of Inflammation in diseases (with suitable examples):**

General features of acute and chronic inflammation: Vascular changes, cellular events, termination of acute inflammatory response. Cells and molecular mediators of inflammation, morphological effects and outcome of acute inflammation. Systemic effects of chronic inflammation, granulomatous inflammation.

### **Unit III: Tissue Renewal And Repair, Healing And Fibrosis:**

Mechanism of tissue regeneration, role of ECM, repair by healing, scar formation and fibrosis, cutaneous wound healing, tissue remodelling in liver (mechanism of fibrosis and cirrhosis).

### **Unit IV: Hemodynamic Pathology:**

Edema, hyperaemia, congestion, haemorrhage, haemostasis and thrombosis, Embolism, Infarction and shock and hypertension.

**Nutritional diseases:** Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc Iron and Calcium) and their deficiency diseases.

### **Unit V: Cell proliferation: Cancer:**

Definitions, nomenclature, characteristics of benign and malignant neoplasms, grading and staging of cancer, biology of tumor growth, mechanism of tumor invasion and metastasis, carcinogens and cancer, concept of oncogenes, tumor suppressor genes, DNA repair genes and cancer stem cells.

### Pathophysiology diseases:

**A. Aetiology and Pathophysiology of:** Diabetes, Arteriosclerosis, Myocardial infarction, restrictive and obstructive respiratory diseases (COPD), Parkinson, Schizophrenia, Silicosis

**B. Infectious Diseases:** Pathogenesis of diseases and overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

### Suggested Books:

S . N o .	Name of Authors/Books/Publishers	Year of Publication/Repr int
	<b>Text Books</b>	
1 .	Robbins and Cotran Pathologic Basis of Disease, 8th edition (2009), Vinay Kumar, Abul K. Abbas, Jon C. Aster, Nelson Fausto; SaundersPublishers, ISBN-13: 978-1416031215.	2009
2 .	Medical Laboratory Technology Methods and Interpretations Volume1 and 2, 6th edition (2009), Ramnik Sood; Jaypee Brothers Medical Publishers, ISBN-13: 978-8184484496.	2009
	<b>Reference Books</b>	
1 .	General and Systematic Pathology, 2nd edition (1996), J., Ed. Underwood and J. C. E. Underwood; Churchill Livingstone, ISBN-13:978-0443052828.	1996
2 .	Robbins Basic Pathology, 9th edition (2012), Kumar, Abbas, Fausto andMitchell; Saunders Publication, ISBN-13: 978- 1437717815.	2012

**Examination Scheme:**

Compon ents	Internal Assessment			External Evaluation
	Attendanc e	Clas s Te st	Assignment/ Project/Seminar/Q uiz	
Weight age (%)	10	20	10	60

## **SEMESTER III**

### **MICROBIAL TECHNOLOGY**

**Course Code: CMBE-607**

**Credit Units: 04**

**Pre-requisite:** Basic information of biotechnology and microbiology.

#### **Course Outcome:**

At the end of the course, the students will be familiar with microbial technology. This would help students to launch themselves in industrial biotechnology which is the fastest growing industry in the developing country.

#### **Details of the Course:-**

##### **Unit I:**

Introduction of microbes, taxonomy and classification, Introduction to bacteria, fungi, and viruses, structural and cellular organelles differences among different types and classes, biochemical/microscopic/molecular methods to differentiate archaea, eubacteria and eukaryotes; microbial evolution, systematics and taxonomy- new approaches to bacterial taxonomy, classification including ribotyping, characteristics of primary domains, taxonomy, nomenclature and Bergey's manual, ribosomal RNA sequencing.

##### **Unit II:**

Prokaryotic growth patterns and functions - microbial nutrition and growth - arithmetic and geometric growth expression, growth kinetics, growth curve, measurement of growth and growth yields, synchronous growth, continuous culture, diauxic growth, culture collection and maintenance of cultures.

##### **Unit III:**

Microbial regulation of gene expression (attenuation and negative regulation with e.g. trp and lac operon), transfer of genetic material: plasmids, transposons, transduction, transformation and conjugation.

Mutations and their chemical basis; mutagens and their use in biotechnology; modes of recombination; comparative prokaryotic genomics.

##### **Unit IV:**

Normal micro flora of skin, oral cavity, gastrointestinal tract; entry of pathogens into the host, types of toxins (exo, endo, entero) and their mode of actions, plant -microbe interactions, microbial pathogenesis –disease reservoirs; epidemiological terminologies; infectious disease transmission.

##### **Unit V:**

Antimicrobial agents, sulfa drugs, antibiotics -penicillin and cephalosporins, broad spectrum antibiotics, antibiotics from prokaryotes. Antifungal antibiotics; mode of action, resistance to antibiotics. Bacteriophage therapy. Potential targets for drug design.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Pelczar Jr., M.J., Chan, E.C.S. and Krieg, Noel R., Microbiology, McGraw Hill (2003) 5th ed.	2003
2.	Stanier, R. Y., Ingraham, J.L. and Wheelis, M.L., General Microbiology, MacMillan (2007) 5thed.	2007
<b>Reference Books</b>		
1.	Microbiology 10th Edition. Prescott, L.M.; Harley, J.P. and Klein, D.A. (2003) McGraw Hill, USA.	2003
2.	Foundations in Microbiology 10th edition, Kathleen Park Talaro and Barry Chess.	2017

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER III

### RECOMBINANT DNA TECHNOLOGY LAB

**Course Code: CMBE-651**

**Credit Units: 03**

**Pre-requisite: Basic experience of molecular biology techniques**

#### **Course Outcome:**

- Students will be able to isolate and analyze DNA/plasmid DNA and protein.
- Students will be able to digest and ligate the DNA molecules.
- Students will be able to design primers and amplification of DNA by PCR.
- Students will be able to learn the techniques of cloning gene in plasmid vectors.
- Students will be able to screen the positive transformant with the gene cloned through reporter based assays.

#### **Details of the Course:-**

1. Isolation of Vector/plasmid DNA and its analysis
2. RNaseA digestion of isolated plasmid/vector DNA
3. Restriction digestion of DNA
4. Primer designing
5. Amplification of DNA by polymerase chain reaction
6. Ligation of DNA molecules
7. Competent cell formation
8. Transformation in *E. coli*
9. Reporter gene assay for plasmid vectors
10. Expression of cloned gene in prokaryotic system

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Methods in yeast genetics: a Cold Spring Harbor Laboratory course manual. David C. Amberg, Daniel Burke, Jeffrey Strathern Cold Spring Harbor Laboratory Press, c2005 2005 ed.	2005
2.	Departmental Laboratory Manual	2018
	<b>Reference Books</b>	
1.	Molecular Cloning- A Laboratory Manual: 3 rd Edition, 2001, Vol. 1 -3 . Sambrook J and Russell D.W.(2001 ). Cold spring Harbor Laboratory Press, New York.	2001
2.	DNA cloning: A Practical Approach. Glover and Hames ( 2001) Oxford Univ. Press.	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



## SEMESTER III

### MEDICAL MICROBIOLOGY LAB

**Course Code: CMBE-653**

**Credit Units: 03**

**Pre-requisite:** Basic information of Medical Microbiology Lab

#### Course Outcome:

Upon successful completion of this course the student will be able to:

- This course provides learning opportunities in the basic principles of medical microbiology and infectious disease.
- It covers mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- It also provides opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases.

#### Details of the Course:-

1. Study of composition and use of important differential media for identification of bacteria: EMBAgar, McConkey agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS
2. Study of bacterial flora of skin by swab method
3. Perform antibacterial sensitivity by Kirby-Bauer method
4. Identification of human blood groups.
5. To perform Total Leukocyte Count of the given blood sample.
6. To perform Differential Leukocyte Count of the given blood sample.
7. To separate serum from the blood sample (demonstration).
8. To perform immunodiffusion by Ouchterlony method.

#### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	Ananthanarayan R. and Paniker C.K.J. Textbook of Microbiology. 8th edition, University Press Publication	2009
2.	Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication	2013
3.	Goering R., Dockrell H., Zuckerman M. and Wakelin D. Mims' Medical Microbiology. 4th edition. Elsevier	2007
4.	Willey JM, Sherwood LM, and Woolverton CJ. Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education	2013

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER III

### MINOR PROJECT/ FIELD WORK

**Course Code: CMBE-653**

**Credit Units: 02**

#### Course Outcome:

- Forty five days of Sixth Semester of the B.Sc. Curriculum is devoted to major project/field work.
- Students, with the help of their mentor and faculty colleagues will identify a lab in India & abroad for the research work.
- The student should stay for a minimum prescribed Semester period at the place of work.
- Students not staying for the prescribed period will be marked absent as per the University Rules.
- At the end of their project the students shall submit the dissertation as per the Guidelines prescribed below.

#### The Aims of the Project

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award a B.Sc. Degree.

#### Objectives

- To provide the students an opportunity to demonstrate the ability to devise, select and use a range of methodologies appropriate to the chosen topic of research.
- To allow students to show the application of skills of data collection, critical analysis and concept synthesis necessary for formation of defensible conclusions and/or recommendations.
- To allow students the opportunity to demonstrate ability to draw appropriate conclusions argued from the evidence presented. [Should the research produce negative or inconclusive results, the conclusions should be critically examined to ascertain the reasons].
- To provide a forum to demonstrate the skills of structuring and present a balanced informed complete, clear and concise written argument.

#### Examination Scheme:

Components	Theme of Project	Quality of Project
Weightage (%)	30	70

## **SEMESTER IV**

### **Industrial Training/ Presentation**

**CMBE-692-** Dissertation

#### **Course Objective:**

The students are expected to utilize their scheduled periods by undertaking the project that would be completed during the semester. Every student shall undertake a major Project. The major Project shall be undertaken in some biotechnology industry or laboratory of repute. Each student shall be assigned to a faculty who shall continuously monitor the progress of the Project in the concerned laboratory or industry. The faculty, in consultation with the concerned scientist of the industry/laboratory, shall decide the topic of the project. At the conclusion of the project the student shall submit a seminar and a dissertation. The dissertation shall be evaluated by the internal faculty/examiner. The student then shall have to appear for the viva voce examination.

#### **Guidelines for Project file:**

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student. Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage. The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

#### **In general, the File should be comprehensive and include:**

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

#### **Report Layout**

The report should contain the following components:

##### **Title or Cover Page.**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

##### **Acknowledgements (optional)**

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

##### **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph

should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

### **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

### **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

### **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

### **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in “point” form.

### **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

### **Future prospects**

### **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

### **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognized system. Examples:

#### **For research article:**

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic Escherichia coli O157: H7. Clin Microbiol Infect , **8** (suppl 1): 116–117.

#### **For book:**

Kowalski,M.(1976) Transduction of effectiveness in Rhizobium meliloti. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), 7: 63-67

**Assessment for Project file:**

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following **assessment objectives:**

- **Range of Research Methods used to obtain information**
- **Execution of Research**
- **Data Analysis**  
Analyze Quantitative/ Qualitative information Control Quality
- **Draw Conclusions**
- **Reference for further information:**  
Clifford Hawkins and Marco Sorgi; Research: How to Plan, Speak and write about it; Narosa Publishing House, New Delhi 1994



# **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

**School of Biological Engineering and Sciences**

**Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Science (B.Sc.) Three Year Programme**

**Semester Pattern  
(w.e.f. session 2017-18)**

**Approved and adopted in the year 2017 (1<sup>st</sup> meeting of Board of Studies)**

**(Scheme & syllabus from 2017-2019)**

## **PEOs: Program Educational Objectives POs: Program Outcomes PSOs: Program Specific Outcomes**

**Name of the Department:** Department of Microbiology

**Name of the Program:** B.Sc. Microbiology

**Duration of the degree:** 3 Years

Microbiology programme endeavors to instill in students the skills to identify individual microbial species, use aseptic techniques to grow them in pure culture, safely handle and examine them by microbiological methods. The knowledge of microbiology will enable the students to improve the quality of human lives in relation to environment, fighting disease and to exploit microbes in the production of food. Microbiology plays a key role in genetic engineering and other modern biotechnologies such as antibiotic production and the exploitation of new sources of food and energy. The regimens for this program are specifically designed to allow students to fulfill below program educational objectives:

### **Program Educational Objectives (PEOs)**

**PEO 1:** The graduates will learn the importance of microorganisms in environment, brewing, food processing and preservation, pharmaceuticals and biotechnology industries.

**PEO 2:** The graduates will be provided with understanding of healthcare systems especially in pathological, immunological and environmental monitoring laboratories.

**PEO 3:** The graduates will demonstrate the skills necessary to understand and apply scientific concepts and reasoning, including the analysis and interpretation of various types of data.

### **Program Specific Outcomes (PSOs)**

#### **Students who graduate with a Bachelor of Science in Microbiology will**

**PSO 1:** Acquire knowledge on fundamentals of Microbiology.

**PSO 2:** Understand details of bacterial, fungal, algal and viral morphology and physiology.

**PSO 3:** Competently be able to cultivate and characterize bacterial and fungal forms.

**PSO 4:** Grasp the fundamental concepts of immunity and the contribution of organs and cells in the development of immune response.

**PSO 5:** Gain insight into the various aspects of microbial genetics.

**PSO 6:** Be proficient on cloning vectors and rDNA technology.

**PSO 7:** Assimilate technical skills on microbial genetics and molecular biology.

**PSO 8:** Realize the application oriented aspects of Microbiology.

**PSO 9:** Understand the concepts and development of microbial diseases in animals & plants.

**PSO 10:** Realize the principles of prevention and treatment of microbial diseases.



## **Program Outcomes Objectives (POOs)**

**Upon completion of B.Sc. Microbiology programme, the students will be able to:**

**POO 1:** demonstrate advanced knowledge and understand the central facts and concepts of microbiology.

**POO 2:** acquire knowledge and understanding of organism biology and genetics, evolution, molecular biology and basic biological chemistry.

**POO 3:** instill the intellectual skills to analyze and solve biology-related problem, formulate and test hypothesis using experimental design.

**POO 4:** demonstrate an understanding of professional ethics in science and of the principles that can guide ethical decision-making in biological controversies.

**POO 5:** explore the scientific literature effectively and use computational tools.

**POO 6:** communicate ideas and principles effectively through oral presentations, computer based tools and written reports.

**POO 7:** manage resources, time and work independently as well as in multi-disciplinary team towards a common goal/outcome.

## B. Sc. (Microbiology) PROGRAMME STRUCTURE(2019-20)

### FIRST SEMESTER

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
CMBE-101 / <b>CMBE-101 a/</b> <b>CMBE-101 b</b>	Biochemistry and Metabolism/ Introductory Biology /Fundamentals of Biology	CC	3	0	0	3
CMBE-103/ <b>CMBE-103a</b>	Cell Biology/Inorganic & Physical Chemistry	CC	3	0	0	3
CMBE-105/ <b>CMBE-105a</b>	Environmental Sciences/Agro Biotechnology	CC	3	0	0	3
CMBE-151	Biochemistry and Metabolism Lab	CC	-	--	1	1
CMBE-153	Cell Biology Lab	CC	-	-	1	1
CMBE-155	Environmental Sciences Lab	CC	-	-	1	1
<b>Generic Electives (Select any one of following)</b>						
GMBE-101/ <b>GMBE-101a</b>	Biosafety and Bioethics/Computer Fundamentals	GE	3	-	-	3
GMBE-103/ <b>GMBE-103a/</b> <b>GMBE-103b/</b> <b>GMBE-103c</b>	Intellectual Property Rights for Biologist/General Proficiency/Physical Education & Yoga/Health & Nutrition	GE	3	-	-	3
<b>Ability Enhancement Compulsory Course</b>						
AECC-103/ <b>AECC-103a/</b> <b>AECC-103b</b>	Elementary Maths/Statistics/Basic and Applied Mathematics	AECC	2	-	-	2
	<b>TOTAL</b>					<b>17</b>

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
CMBE-102/ <b>CMBE-102 a/</b> <b>CMBE-102b/</b> <b>CMBE-102c</b>	Inheritance Biology/Organic & Analytical Chemistry/Observational Chemistry/Basic & Applied Chemistry	CC	3	0	0	3
CMBE-104 / <b>CMBE-104 a/</b> <b>CMBE-104 b/</b> <b>CMBE-104 c/</b> <b>CMBE-104 d</b>	Introduction and Scope of Microbiology/Elements of Biochemistry/ Fundamentals of Biochemistry/Introductory Human Physiology/Chemicals and Health	CC	3	0	0	3
CMBE-106	Biostatistics	CC	3	0	0	3
CMBE-152	Inheritance Biology Lab	CC	-	-	1	1
CMBE-154	Introduction and Scope of Microbiology Lab	CC	-	-	1	1
<b>Generic Electives (Select any one of following)</b>						
GMBE-103	Bridging Information Technology and Biotechnology	GE	3	0	0	3
GMBE-104	Bacteriology	GE	3	0	0	3
GMBE-153	Bridging Information Technology and Biotechnology Lab	GE	-	-	1	1
GMBE-154	Bacteriology Lab	GE	-	-	1	1
<b>Ability Enhancement Compulsory Course</b>						
AECC-102	Professional Communication	AECC	2	-	-	2
	<b>TOTAL</b>					<b>17</b>

## SECOND SEMESTER

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
CMBE-201/ <b>CMBE-201a/</b> <b>CMBE-201b/</b> <b>CMBE-201c</b>	Virology/Inheritance & Evolutionary Microbiology/Microbiological Basis of Inheritance/Food Engineering	CC	3	1	0	4
CMBE-203/ <b>CMBE-203a</b>	Environmental Microbiology/Global Ecology	CC	3	1	0	4
CMBE-205/ <b>CMBE-205 a</b>	Medical Microbiology/Public health & pandemics	CC	3	1	0	4
CMBE-251	Virology Lab	CC	-	-	1	1
CMBE-253	Environmental Microbiology Lab	CC	-	-	1	1
CMBE-255	Medical Microbiolov Lab	CC	0	0	2	2
<b>Generic Electives</b>						
GMBE-203	Microbial Metabolism	GE	3	1	0	4
<b>Skill Enhancement Course</b>						
SMBE201	Seminar	SM	0	0	1	1
	<b>TOTAL</b>					<b>26</b>

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
CMBE-202 / CMBE-202a/ CMBE-202b/ CMBE-202c	Immunology/Economic Biology/Gender studies/International Business in dairy science	CC	3	1	0	4
CMBE-204/ CMBE-204a/ CMBE-204b/ CMBE-204c/ CMBE-204d	Molecular Biology/ Anthropology/Neurobiology/Nanotechnology/Aerobiology	CC	3	1	0	4
CMBE-206 CMBE-206a CMBE-206b CMBE-206c	Recombinant DNA Technology/Microbial Physiology & Metabolism/Entomology /Agrostology	CC	3	1	0	4
CMBE-252	Immunology Lab	CC	-	-	1	1
CMBE-254	Molecular Biology Lab	CC	-	-	1	1
CMBE-256	Recombinant DNA Technology Lab	CC	-	-	1	1
<b>Generic Electives (Select any one of the following)</b>						
GMBE-202	Microbes in Environment	GE	3	0	0	3
GMBE-202	Microbes in Sustainable Agriculture and Development	GE	3	0	0	3
<b>Skill Enhancement Course</b>						
SMBE-202	Management of Human Microbial Disease	GP	3	1	0	4
	<b>TOTAL</b>					<b>22</b>

### THIRD SEMESTER

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
CMBE-301/ CMBE-301a/ CMBE-301b/ CMBE-301c/	Bioinformatics/Microbiological Analysis of Air and Water/Hospital Management/Soil & Water Microbiology	CC	3	1	0	4
CMBE-303/ CMBE-303a/ CMBE-301b/	Instrumentation and Biotechniques/Marine Microbiology/Veterinary Science.	CC	3	1	0	4
DMBE-301/ DMBE-301a/ DMBE-301b	Food and Dairy Microbiology/Developmental biology and embryology/Population biology	CC	3	1	0	4
CMBE-351	Bioinformatics Lab	CC	-	-	1	1
CMBE-353	Instrumentation and Biotechniques Lab	CC	-	-	1	1
DMBE-351	Minor Project	CC	-	-	-	1

Generic Electives						
GMBE-201	Genetic Engineering and Biotechnology	GE	3	0	0	3
GMBE-503	Genome Organisation and Function	GE	3	0	0	3
Skill Enhancement Course (Select anyone of following)						
SMBE-501	Industrial Biotechnology	SEC	3	1	0	4
SMBE-551	Industrial Biotechnology Lab	SEC	-	-	1	1
DMBE-305	Food Fermentation Techniques	SEC	3	1	0	4
DMBE-355	Food Fermentation Techniques Lab	SEC	-	-	1	1
<b>TOTAL</b>						<b>20</b>

Course Code	Course Title	Component	(L)	(T)	(P)	Credits
CMBE-302 / CMBE-302a	Plant Pathology/ Medicinal Microbiology	CC	3	1	0	4
CMBE-304 / CMBE-304a/ CMBE-304b	Marine Microbiology/Soil and Water Analysis of Microbes/Palaentology	CC	3	1	0	4
CMBE-602/ CMBE-602a	Microbial Technology /Bio-Analytical Tools	CC	3	1	0	4
CMBE-310 / CMBE-310 a	Major Project	CC	-	-	-	6
Generic Electives (Select any one of the following)						
GMBE-602	Entrepreneurship Development	GE	3	1	0	4
DMBE-304	Microbial quality Control in Food and Pharmaceutical Industries	GE	3	1	0	4
Skill Enhancement Course (Select anyone of following)						
DMBE-302	Microbiological Analysis of Air and Water	SEC	3	1	0	4
SMBE-604	Animal Biotechnology	SEC	3	1	0	4
<b>TOTAL</b>						<b>22</b>

### Project/Dissertation

**Note:** Students must submit their project report in June /July and the same would be evaluated for 6 credit units, which would be included in the Sixth Semester marks.

### Examination Scheme:

Components	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	EE
<b>Weightage (%)</b>	10	20	10	60

## Semester-I

### BIOCHEMISTRY AND METABOLISM

**Course Code: CMBE-101**

**Credit Units: 03**

#### **Course Outcome**

1. **Molecular Foundations:** Understand the structure and function of biomolecules such as carbohydrates, proteins, lipids, and nucleic acids.
2. **Metabolic Pathways:** Analyze key metabolic pathways (glycolysis, Krebs cycle, oxidative phosphorylation) and their regulation.
3. **Enzyme Kinetics:** Explain enzyme mechanisms, kinetics, and the role of cofactors in biochemical reactions.
4. **Energy and Metabolism:** Relate the biochemical basis of energy production, storage, and utilization in living organisms.
5. **Disease and Applications:** Apply knowledge of metabolic dysfunctions to understand diseases and biotechnological advancements.

First and second laws of Thermodynamics. Definitions of Gibb's Free Energy, enthalpy, and Entropy and mathematical relationship among them, Standard free energy change and equilibrium constant, Coupled reactions and additive nature of standard free energy change, Energy rich compounds: Phosphoenolpyruvate, 1,3- Bisphosphoglycerate, Thioesters, ATP.

## **Unit 2: Carbohydrates**

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Mutarotation and anomers of glucose. Furanose and pyranose forms of glucose and fructose, Haworth projection formulae for glucose; chair and boat forms of glucose, Sugar derivatives, glucosamine, galactosamine, muramic acid, N- acetyl neuraminic acid, Disaccharides; concept of reducing and non-reducing sugars, occurrence and Haworth projections of maltose, lactose, and sucrose, Polysaccharides, storage polysaccharides, starch and glycogen. Structural Polysaccharides, cellulose, peptidoglycan and chitin.

## **Unit 3: Lipids**

Definition and major classes of storage and structural lipids. Storage lipids. Fatty acids structure and functions. Essential fatty acids. Triacyl glycerols structure, functions and properties. Saponification Structural lipids. Phosphoglycerides: Building blocks, General structure, functions and properties. Structure of phosphatidylethanolamine and phosphatidylcholine, Sphingolipids: building blocks, structure of sphingosine, ceramide. Special mention of sphingomyelins, cerebroside and gangliosides, Lipid functions: cell signals, cofactors, prostaglandins, Introduction of lipid micelles, monolayers, and bilayers.

## **Unit 4: Proteins**

Functions of proteins, Primary structures of proteins: Amino acids, the building blocks of proteins. General formula of amino acid and concept of zwitterion. Titration curve of amino acid and its Significance, Classification, biochemical structure and notation of standard protein amino acids, Ninhydrin reaction. Natural modifications of amino acids in proteins hydroxylysine, cystine and hydroxyproline, Non protein amino acids: Gramicidin, beta-alanine, D-alanine and D- glutamic acid, Oligopeptides: Structure and functions of naturally occurring glutathione and insulin and synthetic aspartame, Secondary structure of proteins: Peptide unit and its salient features. The alpha helix, the beta pleated sheet and their occurrence in proteins, Tertiary and quaternary structures of proteins. Forces holding the polypeptide together. Human haemoglobin structure, Quaternary structures of proteins.

## **Unit 5: Enzymes**

Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme, NAD, metal cofactors, Classification of enzymes, Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis. Significance of hyperbolic, double reciprocal plots of enzyme activity,  $K_m$ , and allosteric mechanism. Definitions of terms – enzyme unit, specific activity and turnover number, Multienzyme complex: pyruvate dehydrogenase; isozyme: lactate dehydrogenase, Effect of pH and temperature on enzyme activity. Enzyme inhibition: competitive- sulfa drugs; non- competitive-heavy metal salts.

### Unit 6: Vitamins

Classification and characteristics with suitable examples, sources and importance.

#### References:

1. Campbell, MK (2012) Biochemistry, 7<sup>th</sup> ed., Published by Cengage Learning.
2. Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4<sup>th</sup> ed., Published by Churchill Livingstone.
3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2<sup>nd</sup> ed., W.H. Freeman.
4. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H. Freeman and Company.
5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5<sup>th</sup> Edition., W.H. Freeman and Company.
6. Willey MJ, Sherwood, LM & Woolverton C J (2013) Prescott, Harley and Klein's Microbiology by. 9<sup>th</sup> Ed., McGrawHill.

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage(%)	10	20	10	60



## **INTRODUCTORY BIOLOGY**

Course Code: CMBE--101a

Credit Units: 03

**Pre-requisite:** Basic information of Introductory Biology

Course Outcome:

1. Basic chemical composition of living matter.
2. Structural characteristics of prokaryotic and eukaryotic cells.
3. Taxonomy and characteristics of the major kingdoms.
4. Mechanics of membrane transport.
5. Basic concepts of bioenergetics, photosynthesis, and cellular respiration.
6. Mechanics of cellular reproduction.
7. Mendelian genetics and genetic change<sup>1</sup>

## 8. Nucleic acids and basic concepts of protein synthesis and gene regulation.

Details of the Course:-

### UNIT I: Cell:

Introduction and classification of organisms by cell structure, cytosol, Compartmentalization of eukaryotic cells, cell fractionation Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model

### UNIT II: Cell Membrane and Permeability

Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport. Sex-limited and sex- influenced inheritance, Transposons. Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments

### UNIT III: Endoplasmic reticulum:

Endoplasmic reticulum: Structure, function including role in protein segregation.

Golgi complex: Structure, biogenesis and functions including role in protein secretion.

Lysosomes: Vacuoles and micro bodies: Structure and functions Ribosomes: Structures and function including role in protein Synthesis.

### UNIT IV: Mitochondria:

Structure and function, Genomes, biogenesis. Chloroplasts: Structure and function, genomes, biogenesis. Nucleus: Structure and function, chromosomes and their structure. Extracellular Matrix: Composition, molecules that mediate cell adhesion

### UNIT V: Membrane receptors:

For extra cellular matrix, macromolecules, regulation of receptor expression and function. Signal transduction. Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer.

### Suggested Books:

1. **Molecular Biology of the Cell, 4th ed.** Authors: Bruce Alberts et al. Year of Publication: 2002 Publisher: Garland Science Publishing, New York
2. **Cell Biology** Authors: Smith and Wood Publisher: Chapman and Hall
3. **Cell Biology: Organelle Structure and Function** Author: Sadava, D. E. Year of Publication: 2004 Publisher: Panima Publishing, New Delhi
4. **Cell and Molecular Biology, 8th ed.** Authors: Robertis, Edp De, and Robertis Emf De Year of Publication: 2002 Publisher: Lippincott Williams and Wilkins Pvt. Ltd., Philadelphia (International Student Edition)

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

# FUNDAMENTALS OF BIOLOGY

**Course Code: CMBE--101b**

**Credit Units: 03**

**Pre-requisite:** Basic information of Introductory Biology

**Course Outcome:**

1. Basic chemical composition of living matter.
2. Structural characteristics of prokaryotic and eukaryotic cells.
3. Taxonomy and characteristics of the major kingdoms.
4. Mechanics of membrane transport.
5. Basic concepts of bioenergetics, photosynthesis, and cellular respiration.
6. Mechanics of cellular reproduction.
7. Mendelian genetics and genetic change.
8. Nucleic acids and basic concepts of protein synthesis and gene regulation.

**Details of the Course:-**

**UNIT I: Cell Membrane and Permeability:**

Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport. Sex-limited and sex- influenced inheritance, Transposons. Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments

**UNIT II: Cell:**

Introduction and classification of organisms by cell structure, cytosol, Compartmentalization of eukaryotic cells, cell fractionation Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model

**UNIT III: Endoplasmic reticulum:**

Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion.

Lysosomes: Vacuoles and micro bodies: Structure and functions Ribosomes: Structures andfunction including role in protein Synthesis.

**UNIT IV: Mitochondria:**

Structure and function, Genomes, biogenesis. Chloroplasts: Structure and function, genomes, biogenesis. Nucleus: Structure and function, chromosomes and their structure. Extracellular Matrix: Composition, molecules that mediate cell adhesion

**UNIT V: Membrane receptors:**

For extra cellular matrix, macromolecules, regulation of receptor expression and function. Signal transduction. Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Reference Books</b>		
1.	Molecular Biology of cell, 4 <sup>th</sup> ed. Alberts, Bruce (et.al) (2002) Garland Science Publishing, New York.	2002
2.	Cell Biology- Smith and Wood by Chapman and Hall. Cell Biology: Organelle structure and function, Sadava, D E. (2004) Panima pub., New Delhi. Cell and Molecular Biology, 8 <sup>th</sup> ed. Robertis, Edp De and Robertis Emf De (2002) Lippincott Williams and Wilkins Pvt. Ltd., (International Student Edition) Philadelphia.	2004, 2002

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

# CELL BIOLOGY

**Course Code: CMBE-103**

**Credit Units: 03**

**Pre-requisite:** Basic information of Cell Biology

Course Outcome:

1. Understand the basic cell components and processes.
2. Know membrane structure, function, and transport mechanisms.
3. Comprehend cell communication and signal transduction.
4. Understand cell division and regulation.
5. Know sexual reproduction and inheritance patterns.
6. Understand cancer development and characteristics.
7. Know stem cell properties and applications.
8. Stay updated on recent advancements in cell biology.

**Details of the Course:-**

## **Unit 1: Structure and organization of Cell**

Cell Organization: Eukaryotic (Plant and animal cells) and prokaryotic, Plasma membrane: Structure and transport of small molecules, Cell Wall: Eukaryotic cell wall, Extra cellular matrix and cell matrix interactions, Cell-Cell Interactions: adhesion junctions, tight junctions, gap junctions, and plasmodesmata (only structural aspects), Mitochondria, chloroplasts and peroxisomes, Cytoskeleton: Structure and organization of actin filaments, association of actin filaments with plasma membrane, cell surface protrusions, intermediate filaments, microtubules.

## **Unit 2: Nucleus**

Nuclear envelope, nuclear pore complex and nuclear lamina, Chromatin – Molecular organization, Nucleolus.

## **Unit 3: Protein Sorting and Transport**

Ribosomes, Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing and quality control in ER, smooth ER and lipid synthesis, export of proteins and lipids, Golgi Apparatus – Organization, protein glycosylation, protein sorting and export from Golgi Apparatus, Lysosomes.

## **Unit 4: Cell Signalling**

Signalling molecules and their receptors, Function of cell surface receptors, Pathways of intracellular receptors – Cyclic AMP pathway, cyclic GMP and MAP kinase pathway.

## Unit 5: Cell Cycle, Cell Death and Cell

Eukaryotic cell cycle and its regulation, Mitosis and Meiosis, Development of cancer, causes and types of programmed cell death, Stem cells, Embryonic stem cell, induced pluripotent stem cells .

### References:

1. Hardin J, Bertoni G and Kleinsmith LJ. (2010). Becker's World of the Cell. 8<sup>th</sup> edition. Pearson.
2. Karp G. (2010) Cell and Molecular Biology: Concepts and Experiments. 6<sup>th</sup> edition. John Wiley & Sons. Inc.
3. De Robertis, EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8<sup>th</sup> edition. Lipincott Williams and Wilkins, Philadelphia.
4. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5<sup>th</sup> Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

**Pre-requisite:** Basic information of Chemistry

Course Outcome:

- a) Understand periodic properties and its application in the characterization of chemical compounds
- b) Understand the various properties of materials depending upon bond formation.
- c) Utilize the concept of hardness in the purification of water for industrial and domestic purpose
- d) Distinguish the rate laws and application to different chemical reaction mechanism
- e) Learn and apply the concepts of analytical chemistry for sample analysis by chemical methods
- f) Learn the basic concepts of Chemistry and its application in different fields

Details of the Course:-

**UNIT I: Periodic Properties:**

Position of elements in the periodic table, effective nuclear charge, atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination, trends in periodic table and applications in predicting and explaining the chemical behavior.

**UNIT II: Atomic and Molecular Structure:**

VSPER theory and its application for structure of  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{H}_2\text{O}$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SO}_2$  and  $\text{XeF}_4$   
Molecular Orbital Theory, Formation of homo and heteronuclear diatomic molecules  
Hydrogen Bonding and its application  
Metallic Bonding (Band theory); role of doping  
Coordination compounds: Introduction, Werner's coordination theory, naming of compounds.

**UNIT III: Water Chemistry:**

Hardness of water and its measurement, Softening of water by L-S process, Zeolite process and Reverse osmosis process, Ion Exchange process, Calgon Process, Numerical problems based on L-S Process, Zeolite Process and hardness of water.



#### UNIT IV: Chemical Kinetics:

Ionic reactions and molecular reactions, Molecularity and Order of reactions, Integrated equations of 1st, 2nd and zero order reactions, Activation Energy and Activated complexes, numerical problems based upon them.

#### UNIT V: Analytical Chemistry:

Qualitative and Quantitative Chemistry, Volumetric and Gravimetric Analysis; Principles of Volumetric Analysis; Concept of pH, buffer, Henderson equation, Concept of strength and concentration of solution; Normality, Molarity, Molality and interconversion of strength Titration-Principles and Classification: Redox, Acid-Base, Complexometric, Redox and Precipitation, Oxidation Number and calculation of oxidation number in compounds.

#### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
	<b>Reference Books</b>	
1.	Inorganic Chemistry, J.D.Lee	2008
2.	Fundamentals of Analytical Chemistry, Skoog and West	2013
3.	Physical Chemistry, Atkins	2009

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

**Course Code: CMBE-105**

**Credit Units: 03**

**Pre-requisite:** Basic Knowledge of Environmental science

Course Outcome:

1. Understand ecosystems, biodiversity, and ecological processes.
2. Analyze pollution types, sources, and impacts.
3. Understand climate change causes, impacts, and mitigation strategies.
4. Evaluate sustainable resource management practices.
5. Analyze environmental policies and regulations.
6. Conduct environmental impact assessments.
7. Utilize monitoring techniques and data analysis.

Details of the Course:-

### **Unit 1: Introduction to environmental studies**

Multidisciplinary nature of environmental studies; Scope and importance; Need for public awareness.

### **Unit 2: Ecosystems**

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:

- a) Forest ecosystem
- b) Grassland ecosystem
- c) Desert ecosystem
- d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

### **Unit 3: Natural Resources: Renewable and Non-renewable Resources**

Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

### **Unit 4: Biodiversity and Conservation**

Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India, Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-

situ conservation of biodiversity. Biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

**Unit 5: Environmental Pollution**

Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution. Nuclear hazards and human health risks. Solid waste management: Control measures of urban and industrial waste. Pollution case studies.

**Unit 6: Environmental Policies & Practices**

Sustainability and sustainable development. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

**References:**

1. Bharuch, E. 2003, Textbook for Environmental Studies, University Grants Commission, New Delhi and Bharati Vidyapeeth Institute of Environmental Education and Research, Pune. 361.
2. Carson, Rachel. 1962. Silent Spring (Boston: Houghton Mifflin, 1962), Mariner Books, 2002.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## AGROBIOTECHNOLOGY

Course Code: CMBE-105a

Credit Units: 03

**Pre-requisite:** Basic knowledge of environmental science.

### Course Outcome:

- Students will be able to acquire knowledge about environmental pollution- sources, effects and control measures.
- Students will understand the concept of BOD and analyze the need for different waste water treatment methods.
- Students will be able to understand and implement the methods and importance of solid waste management.
- Students will be able to understand the application of bioreactors.
- Students will be able to apply their knowledge about toxic compounds degradation using microbes.
- Students will understand the role of biopesticides.
- Students will analyze the national and international concern for environment for protecting the environment and sustainable development.
- Students will be able to understand the global issues related to environmental pollution.

### UNIT-I

Environmental Pollution: types of pollution, methods for the measurement of pollution, Methodology of environmental management- the problem solving approach, its limitations.

Air pollution and its control through Biotechnology. Water pollution and its control: Water as a scarce natural resource. Need for water management, Measurement of water pollution, sources of water pollution.

### UNIT-II

Microbiology of Waste water Treatments, Aerobic Process: Activated sludge, Oxidation ditches, trickling filter, rotations discs, rotating drums, oxidation ponds.

Anaerobic processes: Anaerobic digestion, anaerobic filters. Up flow anaerobic sludge blanket reactors. Treatment schemes for waste waters of dairy, distillery, tannery, sugar antibiotic industries.

**UNIT-III** Solid wastes: sources and management composting, vermicomposting and methane production). Hospital wastes, hazardous wastes and their management. Biopesticides in integrated pest management.

### UNIT-IV

Microbiology of degradation of Xenobiotics in Environment Ecological consideration, decay behaviour & degradative plastics; Hydrocarbons, oil pollution, & pesticides. Bioremediation of contaminated soils and waste land.

### UNIT-V

Basic concepts of Environmental impact Assessment (EIA) Restoration of waste land/degraded ecosystem. Global Environmental Problems: Ozone depletion, UV-B, green- house effect and acid rain, their impact and biotechnological approaches for management.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1	Alan Scragg, Environmental Biotechnology, Second Edition, Oxford University Press.	2005
2.	J., Pichtel, Waste Management Practices: Municipal, Hazardous and Industrial, Taylor and Francis.	2005
3.	B.C. Bhattacharya & Ritu Banerjee Environmental Biotechnology, Oxford Press.	2007
4.	Shree Nath Singh, Microbial Degradation of Xenobiotics, Springer Science & Business Media.	2011

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## Biochemistry and Metabolism Lab

Course Code: CMBE-151

Credit Units: 01

**Pre-requisite:** Basic knowledge of biochemistry and cellular metabolism.

Course Outcome:

After completion of the course, students will be able to:

1. Understand the principles of biochemical analysis and metabolic processes.
2. Perform qualitative and quantitative estimation of biomolecules.
3. Analyze enzyme kinetics and metabolic pathways.
4. Gain proficiency in the preparation and handling of biological samples.
5. Apply biochemical techniques to study metabolic functions in living systems.

Details of the Laboratory Course:

**Note:** A college must offer 70% of the below-listed experiments. The remaining 30% experiments may be modified by the college according to available facilities.

S. No.	Contents	Contact Hours
1	<b>Qualitative Tests for Biomolecules:</b> Detection of carbohydrates, proteins, and lipids in biological samples.	2
2	<b>Quantitative Estimation of Glucose:</b> Using the DNSA or glucose oxidase-peroxidase (GOD-POD) method.	3
3	<b>Protein Estimation:</b> Lowry's method or Bradford assay.	3
4	<b>Enzyme Assay:</b> Study of enzyme activity (e.g., amylase or urease) and calculation of specific activity.	3
5	<b>Enzyme Kinetics:</b> Determination of $K_m$ and $V_{max}$ of an enzyme using Lineweaver-Burk plots.	3
6	<b>Lipid Analysis:</b> Extraction of lipids by Folch or Bligh and Dyer method.	2
7	<b>Estimation of Nucleic Acids:</b> Quantification of DNA and RNA using spectrophotometry.	3
8	<b>Chromatographic Techniques:</b> Separation of amino acids or sugars by paper or thin-layer chromatography (TLC).	3
9	<b>pH and Buffer Preparation:</b> Understanding buffer systems and their role in metabolism.	2
10	<b>Estimation of Cholesterol:</b> Colorimetric method or enzymatic assay.	2

**Suggested Books:**

**Text Books**

1. **Biochemistry Laboratory: Modern Theory and Techniques** – Rodney Boyer, Pearson, 2nd Edition, 2012.
2. **Introduction to Practical Biochemistry** – David Plummer, McGraw Hill Education, 2009.

3. **Practical Biochemistry for Colleges** – Pattabiraman T. N., Gajanan Book Publishers, 2010.

### References

1. **Fundamentals of Biochemistry** – Donald Voet, Judith Voet, Wiley, 5th Edition, 2021.
2. **Principles of Biochemistry** – Lehninger, Nelson, and Cox, W.H. Freeman, 7th Edition, 2017.
3. **Biochemical Methods** – S. Sadasivam and A. Manickam, New Age International Publishers, 2nd Edition, 2005.
4. **Experimental Biochemistry** – Switzer and Garrity, W.H. Freeman, 3rd Edition, 1999.

### Examination Scheme:

<b>Components</b>	<b>Project Proposal</b>	<b>Execution of the Work</b>	<b>Practical Skills</b>	<b>Final Report</b>	<b>Oral Presentation</b>
<b>Weightage (%)</b>	10%	30%	20%	20%	20%

## Cell Biology Lab

Course Code: CMBE-153

Credit Units: 01

**Pre-requisite:** Basic information of Cell Biology

Course Outcome:

- a) Students will learn about the varieties of plants and their diversity.
- b) Students will gain a comprehensive knowledge on categories of plants and apply the same in identification of monocots and dicots
- c) Students will become familiar with plant cell anatomy.
- d) Students will be able to learn about the functioning of plant cell and understand their importance in plant life.
- e) Students will be able to implement different strategies to test the present of storage food material in plant parts.
- f) Students will be able to understand the methods of solute and solvent uptake in plant cells and their role in life processes.
- g) Students will be able to analyze the mechanism of transpiration by different plants.
- h) Students will be able to learn the mechanism underlying seed growth and development.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Study the effect of temperature and organic solvents on semi permeable membrane.	2
2	Demonstration of dialysis.	2
3	Study of plasmolysis and de-plasmolysis.	2
4	Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.	2

**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
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	<b>Reference Books</b>	
1.	Experiments in Plant Physiology: A Laboratory Manual. Bajracharya, D., Narosa publishers, New Delhi	1999
2.	Practicals in Plant Physiology and Biochemistry. Bala, M. Gupta, S. , Gupta N.K. and Sangha, M.K. , Scientific Publishers, India	2016

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## Environmental Sciences Lab

Course Code: CMBE-155

Credit Units: 01

**Pre-requisite:** Basic knowledge of environmental science and ecological principles.

Course Outcome:

After completion of the course, students will be able to:

1. Analyze the physical, chemical, and biological parameters of environmental samples.
2. Develop skills to monitor pollution levels in air, water, and soil.
3. Understand techniques for assessing biodiversity and ecosystem health.
4. Explore sustainable solutions to mitigate environmental problems.
5. Conduct environmental impact analysis using scientific tools and techniques.

Details of the Laboratory Course:

**Note:** A college must offer 70% of the below-listed experiments. The remaining 30% experiments may be modified by the college according to available facilities.

S. No.	Contents	Contact Hours
1	<b>Analysis of Water Quality:</b> Determination of pH, turbidity, and total dissolved solids (TDS), and dissolved oxygen (DO).	3
2	<b>Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD):</b> Measurement in water samples.	3
3	<b>Soil Analysis:</b> Determination of pH, moisture content, and organic matter.	3
4	<b>Air Quality Monitoring:</b> Estimation of particulate matter and gaseous pollutants using air samplers.	3
5	<b>Biodiversity Assessment:</b> Quadrant method for species richness and abundance in a terrestrial habitat.	3
6	<b>Wastewater Treatment:</b> Study of physical, chemical, and biological treatment methods.	3
7	<b>Heavy Metal Analysis:</b> Detection of metals in water and soil samples using spectrophotometry.	3
8	<b>Study of Eutrophication:</b> Observation of algal blooms and their impact on aquatic ecosystems.	2
9	<b>Vermicomposting:</b> Setting up a vermicomposting unit and observing its progress.	3
10	<b>Ecological Footprint Assessment:</b> Calculation and interpretation of human impact on the environment.	2

Suggested Books:

**Text Books**

1. **Environmental Science: A Global Concern** – William Cunningham and Mary Cunningham, McGraw Hill Education, 14th Edition, 2018.
2. **Textbook of Environmental Studies for Undergraduate Courses** – Erach Bharucha, University Grants Commission (UGC), 3rd Edition, 2013.

### References

1. **Fundamentals of Ecology** – Eugene P. Odum and Gary W. Barrett, Cengage Learning, 5th Edition, 2005.
2. **Environmental Monitoring and Assessment** – D. Adriano and J. Fridovich, Springer, 2004.
3. **Practical Environmental Analysis** – M. S. Cresser, Royal Society of Chemistry, 1994.
4. **Environmental Chemistry** – A. K. De, New Age International Publishers, 9th Edition, 2017.

### Examination Scheme:

Components	Attendance	Viva-Voce	Practical Record	Final Practical Exam
Weightage (%)	10%	20%	10%	60%

## BIOSAFETY AND BIOETHICS

Course Code: **GMBE-101**

**Credit Units: 03**

### Course Outcome

1. **Understand Biosafety Protocols:** Apply biosafety measures in research and laboratory settings.
2. **Analyze Ethical Issues:** Critically assess ethical challenges in biotechnology, including gene editing and biopiracy.
3. **Apply Bioethics in Research:** Use bioethical principles in human/animal research and biotechnological applications.
4. **Comprehend Regulations:** Understand global and national biosafety laws and frameworks.
5. **Propose Ethical Solutions:** Develop solutions for bioethical dilemmas in biotechnology and innovation.

### Unit 1: Introduction to Biosafety and Bioethics

- **Overview of Biosafety:** Definition, importance, principles, and goals of biosafety.
- **Introduction to Bioethics:** Definition, significance, key principles (autonomy, justice, beneficence, non-maleficence).
- **Interconnection of Biosafety and Bioethics:** Ethical considerations in biosafety management and biotechnology.

### Unit 2: Biosafety in Biotechnology and Laboratory Practices

- **Biosafety Levels:** Description of different biosafety levels (BSL-1 to BSL-4) and their relevance in laboratory settings.
- **Biosafety Protocols and Guidelines:** Procedures for handling biological agents, recombinant DNA, and genetically modified organisms (GMOs).
- **Risk Assessment:** Process of identifying hazards, risk evaluation, and management in biological research.
- **Personal Protective Equipment (PPE):** Types, uses, and best practices in biosafety.
- **Laboratory Design and Waste Management:** Containment measures, disposal of biohazardous waste, and laboratory facility requirements.

### Unit 3: Ethical Considerations in Biotechnology and Research

- **Ethical Issues in Genetic Engineering:** Gene editing (CRISPR), genetically modified organisms (GMOs), and designer organisms.
- **Use of Human and Animal Subjects:** Ethical guidelines for experimentation involving humans and animals in research (Institutional Review Boards, informed consent, animal welfare).
- **Environmental Ethics:** Environmental impact of biotechnology (biosafety concerns related to GMOs, synthetic biology, and environmental releases).
- **Public Engagement and Policy Making:** The role of the public, ethical review boards, and policymakers in guiding and overseeing biotechnological research.

### Unit 4: Biosafety Regulations and Guidelines

- **International Biosafety Regulations:** Cartagena Protocol on Biosafety, BWC (Biological Weapons Convention), WHO guidelines, FAO regulations.
- **National Biosafety Laws and Frameworks:** Overview of biosafety laws in India and other countries, including the National Biotechnology Regulatory Authority (NBRA) in India, Genetic Engineering Appraisal Committee (GEAC).
- **Regulations on GMOs:** Legal framework for the release, import, and export of GMOs and their products, including GM crops and pharmaceuticals.
- **Biosafety in Agriculture and Food Industry:** Guidelines for field trials, commercial release of GM crops, and biosafety in food products.

## Unit 5: Ethical Issues in Modern Biotechnology

- **Biopiracy:** Definition, ethical concerns, case studies (e.g., neem patent controversy, Hoodia case).
- **Biodiversity and Access to Genetic Resources:** Ethical issues related to access and benefit-sharing under the Convention on Biological Diversity (CBD).
- **Synthetic Biology and Bioengineering:** Ethical questions surrounding the creation of artificial life, biohacking, and biotechnological manipulation of ecosystems.
- **Patents and Ownership of Biotechnological Innovations:** Ownership, patenting of life forms, ethical concerns about patenting genes, and the commodification of biological resources.

## Unit 6: Case Studies in Biosafety and Bioethics

- **Biosafety Breaches and Failures:** Examination of historical biosafety incidents, such as the 2001 anthrax attacks, laboratory-acquired infections.
- **Ethical Dilemmas in Biotechnology:** Review of controversial case studies such as cloning (Dolly the sheep), gene therapy, and the commercialization of genetic research.
- **Regulatory Failures and Ethical Oversight:** Analysis of instances where lack of proper ethical review or biosafety measures led to public health risks or ethical concerns (e.g., the Tuskegee syphilis study, gene editing of embryos).
- **International and National Bioethics Panels:** Study of ethical committees like the National Bioethics Commission (India), UNESCO's bioethics committee, and their role in setting guidelines.

## Unit 7: Key Business Concerns in Biotechnology, Biosafety, and Bioethics

- **Regulation of Biotech Companies:** Business regulations for biotech companies, including biosafety compliance, risk management, and ethical standards.
- **Intellectual Property and Ethics:** Ethical issues around patenting biotechnology products, traditional knowledge, and access to genetic resources.
- **Corporate Responsibility:** Role of companies in maintaining biosafety standards, ethical conduct in genetic research, and transparency in business practices.
- **Biotechnology and Public Health:** Ethical dilemmas in commercialization of biotechnological innovations and their implications for public health policies.

## References:

1. **Biosafety and Bioethics in Biotechnology**, David T. Lee, 2nd Edition, 2019.
2. **Biotechnology: Ethics, Law, and Policy**, D. J. Whelan, 3rd Edition, 2018.
3. **Introduction to Biotechnology Ethics**, Dr. P. R. Joshi, 2021.
4. **Biosafety: Principles and Practices**, Michael R. O'Brien, 4th Edition, 2020.

## Computer Fundamentals

**Course Code: GMBE-101a**

**Credit Units: 03**

**Pre-requisite:** Basic knowledge of Computer application

### **Course Outcome:**

A student who successfully fulfills the course requirements will be able to

1. be able to define and appropriately use information technology terms;
2. be able to identify computer hardware components and describe their function;
3. be able to describe the essential elements of the computer's architecture and discuss how this architecture functions;
4. be able to describe the characteristics and representations of data, and interpret and compare data in different representations;
5. be able to identify and describe telecommunication components;
6. be able to describe the characteristics of operating systems and compare different operating systems;
7. be able to use a hypertext markup language to produce basic Web documents;
8. be able to discuss the general trends in technologies including examples of leading edge developments;
9. be able to compare the roles of different sectors of the information technology.

### **Details of the course:**

#### **-Unit I: Computer Basics:**

Introduction, Characteristics of a Computer, Criteria for Using Computers, History of Computers, Generations of Computer, Classification of Computers, Applications of Computer, Basic Components of PC, Computer Architecture.

#### **Unit II: Number Systems:**

Introduction, Classification of Number System, Types of Number System, Conversions from One Base to Another, Conversion using Shortcut Method.

### Unit III: Hardware and Software:

Introduction, Computer Memory, Secondary Memory, Computer Peripherals, Output Devices, Software requirements.

Windows XP: Introduction, Features, Comparison between Professional and Home edition, Windows XP installation, Activating Windows XP, Security features of Windows XP, Accessing User Accounts, Getting Help.

### Unit IV: MS Word:

Introduction, Windows 2007 Interface, Customizing the Word Application, Document Views, Basic Formatting in MS Word 2007, Advanced Formatting, Navigating through a Word Document, Performing a Mail Merge, A Quick Look at Macros, Printing Documents, Print Preview.

Excel 2007: Introduction, Workbook, Worksheet, Formatting in excel, Advanced formatting in Excel, Working with formulas, Printing worksheets.

MS PowerPoint: Introduction, Creating a Presentation, Basic Formatting in PowerPoint, Advanced Formatting, Using Templates, Inserting charts, Inserting tables, Printing presentations.

### Unit V: Security and Networking:

Introduction, Simple File Sharing, Internet Information Services, Peer to Peer Networking

#### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1	Norton, Peter, "Introduction to Computers", McGraw-Hill.	2005
2	Rajaraman, V., "Fundamentals of Computers", PHI.	2005
3	PK SINHA "Computer Fundamentals", BPB	Fourth edition
4	Yashwant Kanetker, "Let us C", BPB.	2005

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

**Course Code: GMBE-103**

**Credit Units: 03**

1. **Understand IPR Concepts:** Gain a foundational understanding of intellectual property rights (IPR) and their importance in biological research.
2. **Identify Different IPR Types:** Recognize and differentiate between copyrights, trademarks, patents, and trade secrets.
3. **Apply Patent Law:** Understand patent processes and apply knowledge to biotechnological inventions.
4. **Analyze IPR in Biotechnology:** Evaluate ethical and legal issues surrounding biotechnological innovations and genetic resources.
5. **Commercialize IPR:** Develop strategies for managing and commercializing intellectual property in the biotechnology industry.

### **Unit 1: Introduction to IPR**

Importance of IPR, advantages of IP protection, relationship with trade, Product / design patent and Terminologies.

### **Unit 2: Types of IPRs**

Copyrights, trademarks, Trade Secrets, Patents, and Geographical indicators, IC layout design, plant variety protection.

- i. **Copyrights** - Nature of Copyright, Author & ownership of Copyright, Rights Conferred by Copyright, Assignment, Transmission, Licensing of Copyrights, Copyright Societies, Office, Board, Registration of Copyrights & Appeals, International Conventions, Copyright pertaining to Software/Internet, Database, Copyright Protection/Database Protection, IP issues in cyber space, Legal Position in USA/Indian Law/WIPO Copyright Treaty.
- ii. **Trademarks**- Meaning of Trademarks, Different kinds of marks (brand names, logos, signatures, symbols), Use of a Mark, Registration of Trademarks-Procedure, Opposition to Registration-Procedure, What Marks are Registrable/Not Registrable, Concurrent Registration, Similarity of Marks, Assignment/Transmission/Licensing of Trademarks, Infringement of Trademarks, Passing off Action.
- iii. **Patents**-
  - i. General Introduction: Definition, Product / Process /Design Patents Claims, Dates Associated with patent, Patent Life and Geographical Boundaries, Patent Infringement, Utilization of Intellectual Assets, Ownership of Patents.
  - ii. Patent Search, Patent Databases & Library (USPTO, WIPO, EPO), Practical Search



Training.

- iii. Patent Terminology: (Abstract, Summary, Background, Drawings, Description, Claims).
- iv. Geographical Indicators- Nature of Geographical Indicators, Conditions & Procedure for Registration, Offences, Penalties.

**Unit 3: Highlights of Indian patent Law (as amended in 2005)**

Elements of patentability - Patentable subject matter, Utility, novelty and non-obviousness, Patentability of biotechnological inventions –, biochemical and software. Worldwide patent protection Paris Convention, World Trade Organization, World Intellectual Property organization, TRIPS Agreement, PCT, UPOV convention, Convention on Biological Diversity, Biopiracy, Traditional knowledge and benefit sharing.

**Unit 4: Case studies**

(a) Infringement cases; (b) Biopiracy cases (Hoodia case, the Quinoa case, the Enola bean case, The neem patents); (c) Traditional knowledge and IP system; (d) Patents as assets; (e) Trade secrets; (f) Drug pricing as a result of patent filing. (f) Patenting of genetically-engineered micro-organism (Diamond Vs Chakravathy); (g) Recent cases related to the provisions of Section 3(d) of The Patents Act (Novartis vs Generic Manufacturers, Roche vs Cipla, Astra Zeneca Vs Natco Pharma).

**Unit 5: Key Business concerns in commercializing Intellectual Property Rights**

Competition and Confidentiality issues, Antitrust Laws; Employee Confidentiality; Assignment of Intellectual Property Rights; Technology Transfer Agreements; Intellectual Property Issues in the Sale of Business. Future Developments of Intellectual Property Rights–Indian Traditional Medicine & IP Protection, Folklore, Patenting of Life Forms, International-Traditional Medicines & Health Foods.

**References:**

- 1. Law Relating to Intellectual Property Rights, V K Ahuja, ISBN 9788131251652, 3rd Edition 2017.

**Examination Scheme:**

	<b>Internal Assessment</b>	
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<b>Components</b>	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	<b>External Evaluation</b>
<b>Weightage (%)</b>	10	20	10	60

## **General Proficiency**

**Course Code: GMBE-103a**

**Credit Units: 03**

### **Course Outcome:**

After completion of the course, students will be able to:

1. Develop effective communication and interpersonal skills.
2. Enhance problem-solving and decision-making abilities in academic and professional settings.
3. Foster ethical and responsible behavior in the workplace and society.
4. Strengthen team collaboration and leadership skills.
5. Build a professional attitude with proficiency in report writing and presentation.

### **Details of the Course:**

**Note:** A college must cover at least 70% of the topics listed below. The remaining 30% may be modified according to institutional requirements and resources.

S. No.	Contents	Contact Hours
1	<b>Communication Skills:</b> Verbal and non-verbal communication, active listening, and feedback.	3
2	<b>Technical Writing:</b> Preparation of lab reports, project proposals, and scientific documentation.	3
3	<b>Presentation Skills:</b> Use of visual aids, structuring content, and delivering effective presentations.	3
4	<b>Time Management:</b> Techniques to prioritize and manage academic and professional tasks efficiently.	2
5	<b>Teamwork and Leadership:</b> Collaborative exercises and role-playing to enhance group dynamics.	3
6	<b>Critical Thinking and Problem Solving:</b> Case studies and situational analysis exercises.	3
7	<b>Professional Ethics:</b> Discussion on ethics in research, laboratory safety, and societal responsibilities.	3
8	<b>Career Development Skills:</b> Resume writing, interview preparation, and professional networking.	3
9	<b>Basics of Data Representation:</b> Graphical representation of data and use of statistical tools in microbiology.	2
10	<b>Soft Skills Development:</b> Conflict resolution, adaptability, and stress management techniques.	3

### Suggested Books:

#### Text Books

1. **Soft Skills** – G. R. K. Murthy, Pearson Education, 1st Edition, 2014.
2. **The Elements of Style** – William Strunk Jr. and E.B. White, Pearson, 4th Edition, 2000.

#### References

1. **Developing Communication Skills** – Krishna Mohan and Meera Banerjee, Macmillan India Ltd., 2nd Edition, 2009.
2. **Technical Communication: Principles and Practice** – Meenakshi Raman and Sangeeta Sharma, Oxford University Press, 3rd Edition, 2018.
3. **Soft Skills for Personality Development** – S. Balasubramanian, Wiley, 2012.

#### Examination Scheme:

Components	Attendance	Viva-Voce	Practical Record	Presentation/Skill Assessment
Weightage (%)	10%	20%	10%	60%

**Course Code:** GMBE-103B

**Credit Units:** 03

**Pre-requisite:** Basic understanding of physical fitness and interest in yoga.

**Course Outcome:**

After completion of the course, students will be able to:

1. Understand the importance of physical activity for overall health.
2. Learn the principles and practices of yoga for mental and physical well-being.
3. Develop knowledge about fitness regimes and their applications.
4. Manage stress through physical exercises and relaxation techniques.
5. Build awareness of lifelong fitness practices.

**Details of the Course:**

S. No.	Contents	Contact Hours
1	Introduction to Physical Education: Importance and benefits of fitness and exercise.	2
2	Basics of Yoga: History, significance, and types of yoga.	3
3	Asanas and Pranayama: Practice of basic postures and breathing techniques.	3
4	Stress Management Techniques: Relaxation, meditation, and mindfulness.	2
5	Fitness Activities: Aerobics, stretching, and bodyweight exercises.	3

**Suggested Books:**

**Yoga for Health and Wellness – K. Pattabhi Jois, New Age Publishers, 2016.**

1. **Fitness and Wellness** – Werner W. K. Hoeger, 13th Edition, Cengage Learning, 2020.

**2. Examination Scheme:**

Components	Attendance	Practical Skills	Participation	Final Assessment
Weightage (%)	10%	20%	30%	40%

Health and Nutrition

**Course Code:** GMBE-103C

**Credit Units:** 03

**Pre-requisite:** Basic understanding of food and health.

### Course Outcome:

After completion of the course, students will be able to:

1. Understand the principles of balanced nutrition and dietary requirements.
2. Identify the role of nutrients in maintaining health.
3. Develop knowledge about lifestyle diseases and their prevention through diet.
4. Learn the importance of food safety and hygiene.
5. Promote healthy living practices for individuals and communities.

### Details of the Course:

S. No.	Contents	Contact Hours
1	Basics of Nutrition: Macronutrients and micronutrients, their sources and functions.	3
2	Balanced Diet: Concept, components, and formulation.	2
3	Malnutrition and Lifestyle Diseases: Causes, prevention, and management.	3
4	Food Safety: Hygiene practices and foodborne illnesses.	2
5	Dietary Guidelines: Planning diets for various age groups and health conditions.	3

### Suggested Books:

1. **Nutrition Science** – B. Srilakshmi, New Age International, 8th Edition, 2021.
2. **Modern Nutrition in Health and Disease** – A. Catharine Ross, Lippincott, 12th Edition, 2020.

### Examination Scheme:

Components	Attendance	Assignments	Practical Knowledge	Final Exam
Weightage (%)	10%	20%	30%	40%

## ELEMENTARY MATHS

**Course Code: AECC-103**

**Credit Units: 02**

1. **Master Basic Mathematical Concepts:** Understand fundamental mathematical principles like arithmetic, algebra, and geometry.

2. **Apply Problem-Solving Techniques:** Develop skills to solve real-world mathematical problems using appropriate methods.
3. **Understand Mathematical Relationships:** Recognize patterns, functions, and relationships in mathematical equations and expressions.
4. **Use Mathematical Tools and Techniques:** Apply basic tools (e.g., calculators, graphs) to analyze and solve mathematical problems.
5. **Develop Logical and Analytical Thinking:** Enhance critical thinking and logical reasoning through mathematical exercises and proofs.

### **UNIT 1: Principle of Mathematical Induction**

Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.

### **UNIT 2: Complex Numbers and Quadratic Equations**

Need for complex numbers, especially  $-1$ , to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system, Square-root of a Complex number.

### **UNIT 3: Linear Inequalities**

Linear inequalities, Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables - graphically.

### **UNIT 4: Permutations and Combinations**

Fundamental principle of counting. Factorial  $n$ . Permutations and combinations derivation of formula and their connections, simple applications.

### **UNIT 5: Binomial Theorem**

History, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, general and middle term in binomial expansion, simple applications.

### **UNIT 6: Sequence and Series**

Sequence and Series. Arithmetic Progression (A.P.), Arithmetic Mean (A.M.), Geometric Progression (G.P.), general term of a G.P., sum of  $n$  terms of a G.P. Arithmetic and geometric series, infinite G.P. and its sum, geometric mean (G.M.). Relation between A.M. and G.M. Sum

to  $n$  terms of the special series UNIT 7: Integral

Definite integrals as a limit of a sum. Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals. Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type –

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}},$$

$$\int \frac{(px + q)}{ax^2 + bx + c} dx, \int \frac{(px + q)}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx \text{ and } \int \sqrt{x^2 - a^2} dx,$$

$$\int \sqrt{ax^2 + bx + c} dx \text{ and } \int (px + q)\sqrt{ax^2 + bx + c} dx$$

to be evaluated.

### UNIT 8: Probability

Multiplications theorem on probability. Conditional probability, independent events, total probability, Bayes' theorem. Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution.

#### References:

1.11<sup>th</sup> and 12<sup>th</sup> NCERT Mathematics.

#### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## INHERITANCE BIOLOGY

Course Code: CMBE-102

Credit Unit: 03

- 1. Understand Genetic Principles:** Grasp basic principles of inheritance, including Mendelian genetics and patterns of heredity.

2. **Analyze Genetic Crosses:** Apply Punnett squares and other tools to predict genetic outcomes in offspring.
3. **Explore Genetic Variability:** Understand the role of mutations, genetic recombination, and chromosomal variations in inheritance.
4. **Study Inheritance Mechanisms:** Learn about non-Mendelian inheritance patterns such as incomplete dominance, co-dominance, and sex-linked traits.
5. **Relate Genetics to Evolution:** Connect inheritance patterns to evolutionary processes and genetic diversity in populations.

### **Unit 1: Introduction to Genetics**

Historical developments, Model organisms in genetic analyses and experimentation: *Escherichia coli*, *Saccharomyces cerevisiae*, *Neurospora crassa*, *Caenorhabditis elegans*, *Drosophila melanogaster*, *Arabidopsis thaliana*.

### **Unit 2: Mendelian Principles**

Mendel's Laws: Dominance, segregation, independent assortment, deviation from Mendelian inheritance, Rediscovery of Mendel's principles, Chromosome theory of inheritance: Allele, multiple alleles, pseudoallele, complementation tests, Extensions of Mendelian genetics: Allelic interactions, concept of dominance, recessiveness, Incomplete dominance and co-dominance, Multiple alleles, Epistasis, penetrance and expressivity.

### **Unit 3: Linkage and Crossing over**

Linkage and recombination of genes, Cytological basis of crossing over, Crossing over at four-strand stage, Molecular mechanism of crossing over, mapping, Homologous and non-homologous recombination, including transposition, site-specific recombination.

### **Unit 4: Extra-Chromosomal Inheritance**

Rules of extra nuclear inheritance, Organelle heredity - Chloroplast mutations in *Chlamydomonas*, mitochondrial, mutations in *Saccharomyces*, Maternal effects – Shell coiling in *Limnaea peregra* Infectious heredity - Kappa particles in *Paramecium*.

### **Unit 5: Characteristics of Chromosomes**

Structural organization of chromosomes - centromeres, telomeres and repetitive DNA, Packaging DNA molecules into chromosomes, Concept of euchromatin and heterochromatin, Normal and abnormal karyotypes of human chromosomes<sup>42</sup>, Chromosome banding, Giant chromosomes:



Polytene and lampbrush chromosomes, Variations in chromosome structure: Deletion, duplication, inversion and translocation, Variation in chromosomal number and structural abnormalities - Klinefelter syndrome, Turner syndrome, Down syndrome.

Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders. Polygenic inheritance, heritability and its measurements, QTL mapping.

**References:**

1. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8<sup>th</sup> Ed. Wiley-India.
2. Snustad DP, Simmons MJ (2011). Principles of Genetics. 6<sup>th</sup> Ed. John Wiley and Sons Inc.
3. Weaver RF, Hedrick PW (1997). Genetics. 3<sup>rd</sup> Ed. McGraw-Hill Education.
4. Klug WS, Cummings MR, Spencer CA, Palladino M (2012). Concepts of Genetics. 10<sup>th</sup> Ed. Benjamin Cummings.
5. Griffith AJF, Wessler SR, Lewontin RC, Carroll SB. (2007). Introduction to Genetic Analysis.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER II

### Organic & Analytical Chemistry

**Course Code: CMBE-102a**

**Credit Units: 03**

**Pre-requisite:** Basic information of Chemistry

#### **Course Outcome:**

1. Understand periodic properties and its application in the characterization of chemical compounds
2. Understand the various properties of materials depending upon bond formation.
3. Utilize the concept of hardness in the purification of water for industrial and domestic purpose
4. Distinguish the rate laws and application to different chemical reaction mechanism
5. Learn and apply the concepts of analytical chemistry for sample analysis by chemical methods
6. Learn the basic concepts of Chemistry and its application in different fields

#### **Details of the Course:-**

##### **UNIT I: Periodic Properties:**

Position of elements in the periodic table, effective nuclear charge, atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination, trends in periodic table and applications in predicting and explaining the chemical behavior.

##### **UNIT II: Atomic and Molecular Structure:**

VSEPR theory and its application for structure of  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{H}_2\text{O}$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SO}_2$  and  $\text{XeF}_4$   
Molecular Orbital Theory, Formation of homo and heteronuclear diatomic molecules  
Hydrogen Bonding and its application  
Metallic Bonding (Band theory); role of doping  
Coordination compounds: Introduction, Werner's coordination theory, naming of compounds.

##### **UNIT III: Water Chemistry:**

Hardness of water and its measurement, Softening of water by L-S process, Zeolite process and Reverse osmosis process, Ion Exchange process, Calgon Process, Numerical problems based on L-S Process, Zeolite Process and hardness of water.

## UNIT IV: Chemical Kinetics:

Ionic reactions and molecular reactions, Molecularity and Order of reactions, Integrated equations of 1st, 2nd and zero order reactions, Activation Energy and Activated complexes, numerical problems based upon them.

## UNIT V: Analytical Chemistry:

Qualitative and Quantitative Chemistry, Volumetric and Gravimetric Analysis; Principles of Volumetric Analysis; Concept of pH, buffer, Henderson equation, Concept of strength and concentration of solution; Normality, Molarity, Molality and interconversion of strength Titration-Principles and Classification: Redox, Acid-Base, Complexometric, Redox and Precipitation, Oxidation Number and calculation of oxidation number in compounds.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
	<b>Reference Books</b>	
1.	Inorganic Chemistry, J.D.Lee	2008
2.	Fundamentals of Analytical Chemistry, Skoog and West	2013
3.	Physical Chemistry, Atkins	2009

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## OBSERVATIONAL CHEMISTRY

**Course Code: CMBE-102b**

**Credit Units: 03**

**Pre-requisite:** Basic information of Chemistry

### **Course Outcome:**

1. Understand periodic properties and its application in the characterization of chemical compounds
2. Understand the various properties of materials depending upon bond formation.
3. Utilize the concept of hardness in the purification of water for industrial and domestic purpose
4. Distinguish the rate laws and application to different chemical reaction mechanism
5. Learn and apply the concepts of analytical chemistry for sample analysis by chemical methods
6. Learn the basic concepts of Chemistry and its application in different fields

### **Details of the Course:-**

#### **UNIT I: Periodic Properties:**

Position of elements in the periodic table, effective nuclear charge, atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination, trends in periodic table and applications in predicting and explaining the chemical behavior.

#### **UNIT II: Atomic and Molecular Structure:**

VSEPR theory and its application for structure of  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{H}_2\text{O}$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SO}_2$  and  $\text{XeF}_4$   
Molecular Orbital Theory, Formation of homo and heteronuclear diatomic molecules  
Hydrogen Bonding and its application  
Metallic Bonding (Band theory); role of doping  
Coordination compounds: Introduction, Werner's coordination theory, naming of compounds.

#### **UNIT III: Water Chemistry:**

Hardness of water and its measurement, Softening of water by L-S process, Zeolite process and Reverse osmosis process, Ion Exchange process, Calgon Process, Numerical problems based on L-S Process, Zeolite Process and hardness of water.

## UNIT IV: Chemical Kinetics:

Ionic reactions and molecular reactions, Molecularity and Order of reactions, Integrated equations of 1st, 2nd and zero order reactions, Activation Energy and Activated complexes, numerical problems based upon them.

## UNIT V: Analytical Chemistry:

Qualitative and Quantitative Chemistry, Volumetric and Gravimetric Analysis; Principles of Volumetric Analysis; Concept of pH, buffer, Henderson equation, Concept of strength and concentration of solution; Normality, Molarity, Molality and interconversion of strength Titration-Principles and Classification: Redox, Acid-Base, Complexometric, Redox and Precipitation, Oxidation Number and calculation of oxidation number in compounds.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
	<b>Reference Books</b>	
1.	Inorganic Chemistry, J.D.Lee	2008
2.	Fundamentals of Analytical Chemistry, Skoog and West	2013
3.	Physical Chemistry, Atkins	2009

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## BASIC AND APPLIED CHEMISTRY

Course Code: CMBE-102c

Credit Units: 03

**Pre-requisite:** Basic information of Chemistry

Course Outcome:

1. Understand periodic properties and its application in the characterization of chemical compounds
2. Understand the various properties of materials depending upon bond formation.
3. Utilize the concept of hardness in the purification of water for industrial and domestic purpose
4. Distinguish the rate laws and application to different chemical reaction mechanism
5. Learn and apply the concepts of analytical chemistry for sample analysis by chemical methods
6. Learn the basic concepts of Chemistry and its application in different fields

**Details of the Course:-**

### UNIT I: Periodic Properties:

Position of elements in the periodic table, effective nuclear charge, atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination, trends in periodic table and applications in predicting and explaining the chemical behavior.

### UNIT II: Atomic and Molecular Structure:

VSEPR theory and its application for structure of  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{H}_2\text{O}$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SO}_2$  and  $\text{XeF}_4$   
Molecular Orbital Theory, Formation of homo and heteronuclear diatomic molecules  
Hydrogen Bonding and its application  
Metallic Bonding (Band theory); role of doping  
Coordination compounds: Introduction, Werner's coordination theory, naming of compounds.

### UNIT III: Water Chemistry:

Hardness of water and its measurement, Softening of water by L-S process, Zeolite process and Reverse osmosis process, Ion Exchange process, Calgon Process, Numerical problems based on L-S Process, Zeolite Process and hardness of water.

### UNIT IV: Chemical Kinetics:

Ionic reactions and molecular reactions, Molecularity and Order of reactions, Integrated equations of 1st, 2nd and zero order reactions, Activation Energy and Activated complexes, numerical

problems based upon them.

UNIT V: Analytical Chemistry:

Qualitative and Quantitative Chemistry, Volumetric and Gravimetric Analysis; Principles of Volumetric Analysis; Concept of pH, buffer, Henderson equation, Concept of strength and concentration of solution; Normality, Molarity, Molality and interconversion of strength Titration-Principles and Classification: Redox, Acid-Base, Complexometric, Redox and Precipitation, Oxidation Number and calculation of oxidation number in compounds.

Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
	<b>Reference Books</b>	
1.	Inorganic Chemistry, J.D.Lee	2008
2.	Fundamentals of Analytical Chemistry, Skoog and West	2013
3.	Physical Chemistry, Atkins	2009

Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## Statistics

**Course Code: AECC-103A**

**Credit Units: 02**

**Pre-requisite:** Basic mathematical skills.

### Course Outcome:

After completion of the course, students will be able to:

1. Apply statistical tools for analyzing experimental data.
2. Understand probability concepts and their applications in biological studies.
3. Perform hypothesis testing and data interpretation.
4. Use graphical and tabular methods for data presentation.
5. Enhance research skills through statistical analysis.

### Details of the Course:

S. No.	Contents	Contact Hours
1	Introduction to Statistics: Importance, scope, and types of data.	4
2	Descriptive Statistics: Mean, median, mode, standard deviation, and variance.	4
3	Probability Concepts: Basics and applications in biological systems.	4
4	Hypothesis Testing: t-test, chi-square test, and ANOVA.	4
5	Data Representation: Graphs, charts, and tables for experimental results.	4

### Suggested Books:

1. **Biostatistics: A Foundation for Analysis in Health Sciences** – Wayne W. Daniel, Wiley, 10th Edition, 2013.
2. **Introduction to Biostatistics** – P. N. Arora and P. K. Malhan, Himalaya Publishing, 2017.

### Examination Scheme:

Components	Attendance	Assignments	Midterm Exam	Final Exam
Weightage (%)	10%	20%	20%	50%



**Pre-requisite:** Basic mathematical understanding.

**Course Outcome:**

After completion of the course, students will be able to:

1. Develop mathematical skills required for biological data analysis.
2. Understand applications of matrices, calculus, and algebra in microbiology.
3. Solve biological problems using differential equations.
4. Perform numerical methods for data interpretation.
5. Apply mathematical models in research and analysis.

**Details of the Course:**

S. No.	Contents	Contact Hours
1	Matrices and Determinants: Basics and applications in biological systems.	4
2	Calculus: Differentiation, integration, and their uses in microbial growth analysis.	4
3	Algebra: Basic concepts and solving biological equations.	4
4	Differential Equations: Solving equations related to population dynamics and enzymatic reactions.	4
5	Basics of Numerical Methods: Interpolation and regression analysis.	4

**Suggested Books:**

1. **Mathematics for Biological Scientists** – Mike Aitken and W. Heard, Garland Science, 2009.
2. **Mathematics for Biologists** – E. Batschelet, Springer, 3rd Edition, 1979.

**Examination Scheme:**

Components	Attendance	Assignments	Midterm Exam	Final Exam
Weightage (%)	10%	20%	20%	50%

# INHERITANCE BIOLOGY

**Course Code: CMBE-102**

**Credit Unit: 03**

6. **Understand Genetic Principles:** Grasp basic principles of inheritance, including Mendelian genetics and patterns of heredity.
7. **Analyze Genetic Crosses:** Apply Punnett squares and other tools to predict genetic outcomes in offspring.
8. **Explore Genetic Variability:** Understand the role of mutations, genetic recombination, and chromosomal variations in inheritance.
9. **Study Inheritance Mechanisms:** Learn about non-Mendelian inheritance patterns such as incomplete dominance, co-dominance, and sex-linked traits.
10. **Relate Genetics to Evolution:** Connect inheritance patterns to evolutionary processes and genetic diversity in populations.

## **Unit 1: Introduction to Genetics**

Historical developments, Model organisms in genetic analyses and experimentation: *Escherichia coli*, *Saccharomyces cerevisiae*, *Neurospora crassa*, *Caenorhabditis elegans*, *Drosophila melanogaster*, *Arabidopsis thaliana*.

## **Unit 2: Mendelian Principles**

Mendel's Laws: Dominance, segregation, independent assortment, deviation from Mendelian inheritance, Rediscovery of Mendel's principles, Chromosome theory of inheritance: Allele, multiple alleles, pseudoallele, complementation tests, Extensions of Mendelian genetics: Allelic interactions, concept of dominance, recessiveness, Incomplete dominance and co-dominance, Multiple alleles, Epistasis, penetrance and expressivity.

## **Unit 3: Linkage and Crossing over**

Linkage and recombination of genes, Cytological basis of crossing over, Crossing over at four-strand stage, Molecular mechanism of crossing over, mapping, Homologous and non-homologous recombination, including transposition, site-specific recombination.

## **Unit 4: Extra-Chromosomal Inheritance**

Rules of extra nuclear inheritance, Organelle heredity - Chloroplast mutations in *Chlamydomonas*,

mitochondrial, mutations in Saccharomyces, Maternal effects – Shell coiling in Limnaea peregra  
 Infectious heredity - Kappa particles in Paramecium.

**Unit 5: Characteristics of Chromosomes**

Structural organization of chromosomes - centromeres, telomeres and repetitive DNA, Packaging DNA molecules into chromosomes, Concept of euchromatin and heterochromatin, Normal and abnormal karyotypes of human chromosomes, Chromosome banding, Giant chromosomes: Polytene and lampbrush chromosomes, Variations in chromosome structure: Deletion, duplication, inversion and translocation, Variation in chromosomal number and structural abnormalities - Klinefelter syndrome, Turner syndrome, Down syndrome.

Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders. Polygenic inheritance, heritability and its measurements, QTL mapping.

**References:**

6. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8<sup>th</sup> Ed. Wiley-India.
7. Snustad DP, Simmons MJ (2011). Principles of Genetics. 6<sup>th</sup> Ed. John Wiley and Sons Inc.
8. Weaver RF, Hedrick PW (1997). Genetics. 3<sup>rd</sup> Ed. McGraw-Hill Education.
9. Klug WS, Cummings MR, Spencer CA, Palladino M (2012). Concepts of Genetics. 10<sup>th</sup> Ed. Benjamin Cummings.
10. Griffith AJF, Wessler SR, Lewontin RC, Carroll SB. (2007). Introduction to Genetic Analysis.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

# Organic & Analytical Chemistry

**Course Code: CMBE-102a**

**Credit Units: 03**

**Pre-requisite:** Basic information of Chemistry

## **Course Outcome:**

7. Understand periodic properties and its application in the characterization of chemical compounds
8. Understand the various properties of materials depending upon bond formation.
9. Utilize the concept of hardness in the purification of water for industrial and domestic purpose
10. Distinguish the rate laws and application to different chemical reaction mechanism
11. Learn and apply the concepts of analytical chemistry for sample analysis by chemical methods
12. Learn the basic concepts of Chemistry and its application in different fields

## **Details of the Course:-**

### **UNIT I: Periodic Properties:**

Position of elements in the periodic table, effective nuclear charge, atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination, trends in periodic table and applications in predicting and explaining the chemical behavior.

### **UNIT II: Atomic and Molecular Structure:**

VSEPR theory and its application for structure of  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{H}_2\text{O}$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SO}_2$  and  $\text{XeF}_4$   
Molecular Orbital Theory, Formation of homo and heteronuclear diatomic molecules  
Hydrogen Bonding and its application  
Metallic Bonding (Band theory); role of doping  
Coordination compounds: Introduction, Werner's coordination theory, naming of compounds.

### **UNIT III: Water Chemistry:**

Hardness of water and its measurement, Softening of water by L-S process, Zeolite process and Reverse osmosis process, Ion Exchange process, Calgon Process, Numerical problems based on L-S Process, Zeolite Process and hardness of water.

### **UNIT IV: Chemical Kinetics:**

Ionic reactions and molecular reactions, Molecularity and Order of reactions, Integrated equations of 1st, 2nd and zero order reactions, Activation Energy and Activated complexes, numerical

problems based upon them.

### UNIT V: Analytical Chemistry:

Qualitative and Quantitative Chemistry, Volumetric and Gravimetric Analysis; Principles of Volumetric Analysis; Concept of pH, buffer, Henderson equation, Concept of strength and concentration of solution; Normality, Molarity, Molality and interconversion of strength Titration-Principles and Classification: Redox, Acid-Base, Complexometric, Redox and Precipitation, Oxidation Number and calculation of oxidation number in compounds.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
	<b>Reference Books</b>	
1.	Inorganic Chemistry, J.D.Lee	2008
2.	Fundamentals of Analytical Chemistry, Skoog and West	2013
3.	Physical Chemistry, Atkins	2009

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## OBSERVATIONAL CHEMISTRY

**Course Code: CMBE-102b**

**Credit Units: 03**

**Pre-requisite:** Basic information of Chemistry

### **Course Outcome:**

7. Understand periodic properties and its application in the characterization of chemical compounds
8. Understand the various properties of materials depending upon bond formation.
9. Utilize the concept of hardness in the purification of water for industrial and domestic purpose
10. Distinguish the rate laws and application to different chemical reaction mechanism
11. Learn and apply the concepts of analytical chemistry for sample analysis by chemical methods
12. Learn the basic concepts of Chemistry and its application in different fields

### **Details of the Course:-**

#### **UNIT I: Periodic Properties:**

Position of elements in the periodic table, effective nuclear charge, atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination, trends in periodic table and applications in predicting and explaining the chemical behavior.

#### **UNIT II: Atomic and Molecular Structure:**

VSEPR theory and its application for structure of  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{H}_2\text{O}$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SO}_2$  and  $\text{XeF}_4$   
Molecular Orbital Theory, Formation of homo and heteronuclear diatomic molecules  
Hydrogen Bonding and its application  
Metallic Bonding (Band theory); role of doping  
Coordination compounds: Introduction, Werner's coordination theory, naming of compounds.

#### **UNIT III: Water Chemistry:**

Hardness of water and its measurement, Softening of water by L-S process, Zeolite process and Reverse osmosis process, Ion Exchange process, Calgon Process, Numerical problems based on L-S Process, Zeolite Process and hardness of water.

#### **UNIT IV: Chemical Kinetics:**

Ionic reactions and molecular reactions, Molecularity and Order of reactions, Integrated equations of 1st, 2nd and zero order reactions, Activation Energy and Activated complexes, numerical problems based upon them.

#### **UNIT V: Analytical Chemistry:**

Qualitative and Quantitative Chemistry, Volumetric and Gravimetric Analysis; Principles of Volumetric Analysis; Concept of pH, buffer, Henderson equation, Concept of strength and concentration of solution; Normality, Molarity, Molality and interconversion of strength Titration-Principles and Classification: Redox, Acid-Base, Complexometric, Redox and Precipitation, Oxidation Number and calculation of oxidation number in compounds.

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
	<b>Reference Books</b>	
1.	Inorganic Chemistry, J.D.Lee	2008
2.	Fundamentals of Analytical Chemistry, Skoog and West	2013
3.	Physical Chemistry, Atkins	2009

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## BASIC AND APPLIED CHEMISTRY

**Course Code: CMBE-102c**

**Credit Units: 03**

**Pre-requisite:** Basic information of Chemistry

### **Course Outcome:**

7. Understand periodic properties and its application in the characterization of chemical compounds
8. Understand the various properties of materials depending upon bond formation.
9. Utilize the concept of hardness in the purification of water for industrial and domestic purpose
10. Distinguish the rate laws and application to different chemical reaction mechanism
11. Learn and apply the concepts of analytical chemistry for sample analysis by chemical methods
12. Learn the basic concepts of Chemistry and its application in different fields

### **Details of the Course:-**

#### **UNIT I: Periodic Properties:**

Position of elements in the periodic table, effective nuclear charge, atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, methods of determination, trends in periodic table and applications in predicting and explaining the chemical behavior.

#### **UNIT II: Atomic and Molecular Structure:**

VSEPR theory and its application for structure of  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{H}_2\text{O}$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SO}_2$  and  $\text{XeF}_4$   
Molecular Orbital Theory, Formation of homo and heteronuclear diatomic molecules  
Hydrogen Bonding and its application

Metallic Bonding (Band theory); role of doping

Coordination compounds: Introduction, Werner's coordination theory, naming of compounds.

#### **UNIT III: Water Chemistry:**

Hardness of water and its measurement, Softening of water by L-S process, Zeolite process and Reverse osmosis process, Ion Exchange process, Calgon Process, Numerical problems based on L-S Process, Zeolite Process and hardness of water.

#### **UNIT IV: Chemical Kinetics:**

Ionic reactions and molecular reactions, Molecularity and Order of reactions, Integrated equations of 1st, 2nd and zero order reactions, Activation Energy and Activated complexes, numerical



problems based upon them.

### UNIT V: Analytical Chemistry:

Qualitative and Quantitative Chemistry, Volumetric and Gravimetric Analysis; Principles of Volumetric Analysis; Concept of pH, buffer, Henderson equation, Concept of strength and concentration of solution; Normality, Molarity, Molality and interconversion of strength Titration-Principles and Classification: Redox, Acid-Base, Complexometric, Redox and Precipitation, Oxidation Number and calculation of oxidation number in compounds.

### Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
	<b>Reference Books</b>	
1.	Inorganic Chemistry, J.D.Lee	2008
2.	Fundamentals of Analytical Chemistry, Skoog and West	2013
3.	Physical Chemistry, Atkins	2009

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER II**

### **INTRODUCTION AND SCOPE OF MICROBIOLOGY**

**Course Code: CMBE-104**

**Credit Unit: 03**

1. **Understand Microbiology Fundamentals:** Grasp the basic principles and concepts of microbiology, including microorganisms and their classification.
2. **Identify Microbial Diversity:** Recognize various types of microorganisms such as bacteria, viruses, fungi, and protozoa.
3. **Understand Microbial Physiology:** Learn about the structure, function, and metabolism of microorganisms.
4. **Explore Microbial Applications:** Understand the role of microbes in various fields like medicine, agriculture, and industry.
5. **Recognize Microbial Impact:** Appreciate the significance of microbiology in public health, disease prevention, and environmental sustainability.

#### **UNIT 1: History of Development of Microbiology**

Fundamentals, History and Evolution of Microbiology. Classification of microorganisms: Microbial taxonomy, criteria used including molecular approaches, Microbial phylogeny and current classification of bacteria. Microbial Diversity: Distribution and characterization Prokaryotic and Eukaryotic cells, Morphology and cell structure of major groups of microorganisms eg. Bacteria, Algae, Fungi, Protozoa and Unique features of viruses.

## **UNIT 2: Cultivation and Maintenance**

Cultivation and Maintenance of microorganisms: Nutritional categories of microorganisms, methods of isolation, Purification and preservation.

## **UNIT 3: Microbial Growth, Metabolism and Reproduction**

Microbial growth: Growth curve, Generation time, synchronous batch and continuous culture, measurement of growth and factors affecting growth of bacteria. Microbial Metabolism: Metabolic pathways, amphi-catabolic and biosynthetic pathways. Bacterial Reproduction: Transformation, Transduction and Conjugation. Endospores and sporulation in bacteria.

## **UNIT 4: Sterilization**

Control of Microorganisms: By physical, chemical and chemotherapeutic Agents.

## **UNIT 5: Water and Food Microbiology**

Water Microbiology: Bacterial pollutants of water, coliforms and non-coliforms. Sewage composition and its disposal. Food Microbiology: Important microorganism in food Microbiology: Moulds, Yeasts, bacteria. Major food born infections and intoxications, Preservation of various types of foods. Fermented Foods.

References:

1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9<sup>th</sup> edition. Pearson Education.
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14<sup>th</sup> edition. Pearson International Edition.
3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9<sup>th</sup> edition. Pearson Education Limited.
4. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9<sup>th</sup> Edition. McGraw Hill International.
5. Atlas RM. (1997). Principles of Microbiology. 2<sup>nd</sup> edition. W.M.T.Brown Publishers.

## Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER II

### Elements of Biochemistry

**Course Code: CMBE-104a**

**Credit Units: 03**

**Pre-requisite:** Basic understanding of biomolecules and concepts of general chemistry

#### Course Outcome:

1. Students will be able to define biomolecules and buffers.
2. Students will understand the structure and functions of biomolecules.
3. Students will be able to classify and explain the role of various biomolecules in human body.
4. Students will be able to analyze the causes of diseases on biochemical basis.
5. Students will be able to understand various biochemical process and cell metabolism.

#### Details of the

#### Course:-UnitI:

A historical prospective, Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular proteins.

## Unit II:

Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines,. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA.

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.

## Unit III:

Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.

## Unit IV:

Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, enzyme specificity: types & theories, Biocatalysts from extreme thermophilic and hyperthermophilic archaea and bacteria.

Role of:  $\text{NAD}^+$ ,  $\text{NADP}^+$ , FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, lipoic-acid, Biotin vitamin B12, Tetrahydrofolate and metallic ions

## Unit V:

Carbohydrates Metabolism: Reactions, energetics and regulation. Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle, Electron Transport Chain, Oxidative phosphorylation.  $\beta$ -oxidation of fatty acids.

## Suggested Books:

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	<b>Text Books</b>	
1	Biochemistry, Lubert Stryer, 8th Edition, WH Freeman, 2015	2015
2	Harper's illustrated Biochemistry by Robert K. Murray, David A Bender, Kathleen M.Botham, PEsEr J. Kennelly, Victor W. Rodwell, P. Anthony Weil. 30th Edition, McGrawHill, 2015.	2015

3	Biochemistry by Mary K.Campbell & Shawn O.Farrell, 9th Edition, Cenage Learning, 2018.	2018
4	Biochemistry, Donald Voet and Judith Voet, 4th Edition, Publisher: John Wiley andSons,	2010
<b>Reference Books</b>		
1	The Organic Chemistry of Enzyme-catalyzed Reactions Richard B. Silverman Academic Press	2002
2	Practical Enzymology Hans Bisswanger Wiley–VCH 2012.	2012
3	Fundamentals of Enzyme Kinetics Athel Cornish-Bowden Portland Press 4th edition, 2012.	2012
4	Fundamentals of Enzymology Nicholas Price and Lewis Steven Oxford University Press 3rd edition 2009.	2009

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## SEMESTER II

### Fundamentals of Biochemistry

**Course Code: CMBE-104b**

**Credit Units: 03**

**Pre-requisite:** Basic understanding of biomolecules and concepts of general chemistry

### Course Outcome:

1. Students will be able to define biomolecules and buffers.
2. Students will understand the structure and functions of biomolecules.
3. .Students will be able to classify and explain the role of various biomolecules in human body.
4. .Students will be able to analyze the causes of diseases on biochemical basis.
5. Students will be able to understand various biochemical process and cell metabolism.

### Details of the

#### Course:-UnitI:

A historical prospective, Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation

and renaturation of proteins. Fibrous and globular proteins.

### **Unit II:**

Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines,. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA.

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.

### **Unit III:**

Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.

### **Unit IV:**

Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, enzyme specificity: types & theories, Biocatalysts from extreme thermophilic and hyperthermophilic archaea and bacteria.

Role of:  $\text{NAD}^+$ ,  $\text{NADP}^+$ , FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, lipoic-acid, Biotin vitamin B12, Tetrahydrofolate and metallic ions

### **Unit V:**

Carbohydrates Metabolism: Reactions, energetics and regulation. Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle, Electron Transport Chain, Oxidative phosphorylation.  $\beta$ -oxidation of fatty acids.

### **Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1	Biochemistry, Lubert Stryer, 8th Edition, WH Freeman, 2015	2015

2	Harper's illustrated Biochemistry by Robert K. Murray, David A Bender, Kathleen M.Botham, P. Anthony Weil. 30th Edition, McGrawHill, 2015.	2015
3	Biochemistry by Mary K.Campbell & Shawn O.Farrell, 9th Edition, Cengage Learning, 2018.	2018
4	Biochemistry, Donald Voet and Judith Voet, 4th Edition, Publisher: John Wiley andSons,	2010
<b>Reference Books</b>		
1	The Organic Chemistry of Enzyme-catalyzed Reactions Richard B. Silverman Academic Press	2002
2	Practical Enzymology Hans Bisswanger Wiley–VCH 2012.	2012
3	Fundamentals of Enzyme Kinetics Athel Cornish-Bowden Portland Press 4th edition, 2012.	2012
4	Fundamentals of Enzymology Nicholas Price and Lewis Steven Oxford University Press 3rd edition 2009.	2009

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## **SEMESTER II**

### **Introductory Human Physiology**

**Course Code: CMBE-104c**

**Credit Units: 03**

**Pre-requisite:** Basic information of Animal kingdom system

#### **Course Outcome:**

- i. Students will be able to *define* and explain the fundamental principles of heart.
- ii. Students will be able to *understand* comparative Respiratory system, Renal Physiology, Reproductive system, Endocrine system and Gastrointestinal system.
- iii. Students will *acquire* knowledge about the function of different types of organs in different animal kingdom.

#### **Details of the Course:-**

##### **Unit I: Scope of Physiology and Anatomy:**

Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes. Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue. Skelatal System: Structure and function of Skelton .Classification of joints and their function. Joint disorders.

## **Unit II: Cardiovascular and Respiratory System:**

Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart .Arterial and venous system with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

## **Unit III: Urinary, Muscular and Central Nervous System:**

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema. Muscular System: Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. physiology of neuromuscular junction.

Central Nervous System: Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.

#### **Unit IV: Sensory Organs and Digestive System:**

Sensory Organs: Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.

Digestive System: names of various parts of digestive system and their functions. structure and functions of liver, physiology of digestion and absorption.

#### **Unit V: Endocrine system and Reproductive System:**

Endocrine System: Endocrine glands and Hormones. Location of glands, their hormones and functions. pituitary, thyroid. Adrenal and pancreas.

Reproductive system: Physiology and Anatomy of Reproductive system.

#### **Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books/References</b>		
1.	Guyton and Hall Textbook of Medical Physiology, 11 <sup>th</sup> edition (2006), J.E. Hall; WB Saunders and Company, ISBN-13: 978-1416045748.	2006
2.	Human Physiology, 9th edition (2006), Stuart I. Fox; Tata McGraw Hill, ISBN-13: 9780077350062.	2006
3.	Principles of Anatomy and Physiology, 13th edition (2011), Gerard J. Tortora and Bryan H. Derrickson; Wiley and Sons, ISBN-13: 978-0470565100.	2011

#### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## Chemicals and Health

Course Code: CMBE-104d

Credit Units: 03

**Pre-requisite:** Basic knowledge of chemistry and biology.

### Course Outcome:

After completing this course, students will be able to:

1. Understand the role of chemicals in human health and the environment.
2. Analyze the health effects of exposure to natural and synthetic chemicals.
3. Learn the mechanisms of chemical toxicity and detoxification pathways.
4. Explore the regulations and guidelines for chemical safety and management.
5. Evaluate the benefits and risks of chemicals in food, medicine, and industry.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Chemicals and Health:</b> Overview of natural and synthetic chemicals, their roles, and impact on human health.	6
2	<b>Toxicology of Chemicals:</b> Basic principles of toxicology, dose-response relationships, and types of chemical toxicity.	6
3	<b>Routes of Chemical Exposure:</b> Inhalation, ingestion, dermal absorption, and injection; acute vs. chronic exposure.	6
4	<b>Environmental Chemicals and Health:</b> Pesticides, heavy metals, endocrine disruptors, and their long-term health effects.	6
5	<b>Chemicals in Food and Water:</b> Additives, preservatives, contaminants, and their health implications.	6
6	<b>Pharmaceutical Chemicals:</b> Benefits and side effects of drugs, drug interactions, and resistance.	6
7	<b>Chemical Safety and Regulations:</b> National and international guidelines for chemical usage, disposal, and safety.	6
8	<b>Emerging Concerns:</b> Nanoparticles, microplastics, and new synthetic chemicals impacting health.	6

### Suggested Books:

#### Text Books

1. **Casarett and Doull's Essentials of Toxicology** – Curtis Klaassen and John B. Watkins, McGraw-Hill, 3rd Edition, 2015.
2. **Principles of Toxicology** – Karen Stine and Thomas M. Brown, CRC Press, 3rd Edition, 2015.

#### References

1. **Introduction to Environmental Toxicology: Molecular Substructures to Ecological Landscapes** – Wayne G. Landis, CRC Press, 5th Edition, 2017.
2. **Handbook on Chemicals and Health** – Edited by Nicholas A. Ashford and Claudia Miller, Cambridge University Press, 2nd Edition, 2015.
3. **Silent Spring** – Rachel Carson, Houghton Mifflin, 50th Anniversary Edition, 2012.

**Examination Scheme:**

<b>Components</b>	<b>Attendance</b>	<b>Assignments</b>	<b>Midterm Exam</b>	<b>Final Exam</b>
<b>Weightage (%)</b>	10%	20%	30%	40%

This syllabus provides a broad understanding of the interplay between chemicals and human health,

# BIOSTATISTICS

**Course Code: CMBE-106**

**Credit Unit: 03**

1. **Understand Statistical Concepts:** Grasp fundamental statistical concepts such as probability, data distribution, and hypothesis testing.
2. **Analyze Biological Data:** Apply statistical methods to analyze and interpret biological and experimental data.
3. **Use Statistical Tools:** Gain proficiency in using statistical software for data analysis and visualization.
4. **Conduct Statistical Inference:** Make inferences about populations based on sample data, including confidence intervals and significance tests.
5. **Interpret Statistical Results:** Develop the ability to interpret and communicate statistical findings in biological research and health studies.

## **Unit 1**

Variable and attribute, Population vs. Sample, Census vs. Sample survey, Arrangement of data, Frequency distribution.

## **Unit 2**

Line diagram, Bar Diagram, Pie chart and Histograms.

## **Unit 3**

Measures of Central Tendency: Arithmetic Mean, Median and Mode.

## **Unit 4**

Variance, Standard deviation, Standard error of mean, standard score.

## **Unit 5**

Testing of hypothesis and goodness of fit: Null Hypothesis, Level of Significance, Probability, Normal Distribution, Error of inference, Student's t-test, Paired t-test, Fisher's

t-test, and Chi- square test.

**References:**

1. H. S. Bear: Understanding Calculus, John Wiley and Sons (Second Edition); 2003.
2. E. Batschelet: Introduction to Mathematics for Life Scientists, Springer Verlag, International Student Edition, Narosa Publishing House, New Delhi (1971, 1975).
3. A. Edmondson and D. Druce: Advanced Biology Statistics, Oxford University Press; 1996.
4. W. Danial: Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons Inc; 2004.

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## Inheritance Biology Laboratory

**Course Code:** CMBE-152

**Credit Units:** 01

**Pre-requisite:** Basic knowledge of genetics and inheritance principles.

### Course Outcome:

After completion of the course, students will be able to:

1. Perform experiments demonstrating Mendelian and non-Mendelian inheritance patterns.
2. Analyze genetic variations using laboratory techniques.
3. Use pedigree analysis to study inheritance in human populations.
4. Understand molecular basis and tools for studying heredity.
5. Apply knowledge of inheritance in real-world biological research.

### Details of the Laboratory Course:

S. No.	Contents	Contact Hours
1	<b>Study of Mendelian Genetics:</b> Monohybrid and dihybrid crosses using model organisms (e.g., <i>Drosophila</i> or plants).	3
2	<b>Chi-Square Analysis:</b> Statistical validation of observed and expected genetic ratios.	2
3	<b>Pedigree Analysis:</b> Interpretation and construction of family trees for genetic disorders.	2
4	<b>DNA Isolation and Visualization:</b> Extraction of genomic DNA and analysis by gel electrophoresis.	3
5	<b>Mutation Studies:</b> Analysis of phenotypic effects of induced or spontaneous mutations.	3
6	<b>Sex Linkage and Inheritance Patterns:</b> Study of sex-linked traits using model organisms or simulated datasets.	2
7	<b>Polygenic Traits Analysis:</b> Study of quantitative inheritance (e.g., kernel color in maize).	2
8	<b>Epistasis and Gene Interactions:</b> Experimental demonstration of gene interactions.	3
9	<b>Human Chromosomal Analysis:</b> Study of karyotypes to identify chromosomal abnormalities.	2
10	<b>Use of Genetic Databases:</b> Introduction to bioinformatics tools for inheritance analysis.	2

### Suggested Books:

#### Text Books

1. **Principles of Genetics** – D. Peter Snustad and Michael J. Simmons, Wiley, 7th Edition, 2020.
2. **Genetics: Analysis and Principles** – Robert J. Brooker, McGraw Hill, 6th Edition, 2020.

#### References

1. **Practical Manual of Genetics and Cytogenetics** – A.K. Sharma, New Age Publishers, 2017.
2. **Genetics: Laboratory Investigations** – Thomas L. Mertens and Robert D. Hammersmith, Pearson, 14th Edition, 2014.



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**Examination Scheme:**

<b>Components</b>	<b>Attendance</b>	<b>Practical Record</b>	<b>Viva-Voce</b>	<b>Final Practical Exam</b>
<b>Weightage (%)</b>	10%	20%	20%	50%

## Introduction and Scope of Microbiology Laboratory

Course Code: CMBE-154

Credit Units: 01

**Pre-requisite:** Basic knowledge of biology and laboratory safety practices.

### Course Outcome:

After completion of the course, students will be able to:

1. Understand the fundamental principles of microbiology laboratory practices.
2. Perform basic microbiological techniques for isolation and identification of microorganisms.
3. Apply aseptic techniques to ensure contamination-free experiments.
4. Gain practical knowledge of microbial growth and their applications.
5. Explore the relevance and scope of microbiology in various fields.

### Details of the Laboratory Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Laboratory Safety and Practices:</b> Understanding biosafety levels, proper disposal of microbial waste.	2
2	<b>Microscopy:</b> Use and handling of compound microscope; observation of microbial cells using prepared slides.	3
3	<b>Aseptic Techniques:</b> Methods for sterilization, disinfection, and handling microbial cultures safely.	3
4	<b>Preparation of Culture Media:</b> Preparation of nutrient agar and nutrient broth.	3
5	<b>Isolation of Microorganisms:</b> Streak plate, spread plate, and pour plate techniques.	3
6	<b>Staining Techniques:</b> Simple staining, Gram staining, and observation of results.	3
7	<b>Growth Curve Analysis:</b> Study of microbial growth under controlled conditions.	3
8	<b>Quantification of Microbes:</b> Serial dilution and estimation of colony-forming units (CFU).	3
9	<b>Applications of Microbiology:</b> Case studies in food, health, and industrial microbiology.	2

### Suggested Books:

#### Text Books

1. **Experiments in Microbiology, Plant Pathology, and Biotechnology** – K.R. Aneja, New Age International Publishers, 5th Edition, 2017.
3. **Microbiology: A Laboratory Manual** – Cappuccino J. and Sherman N., Pearson, 10th Edition, 2013.

#### References

1. **Laboratory Exercises in Microbiology** – Harley J.P. and Prescott L.M., McGraw-Hill, 9th Edition, 2013.
2. **Benson's Microbiological Applications** – Alfred E. Brown, McGraw Hill, 14th Edition, 2016.

**Examination Scheme:**

<b>Components</b>	<b>Attendance</b>	<b>Practical Record</b>	<b>Viva-Voce</b>	<b>Final Practical Exam</b>
<b>Weightage (%)</b>	10%	20%	20%	50%

## Bridging Information Technology and Biotechnology

Course Code: GMBE-103

Credit Units: 03

**Pre-requisite:** Basic understanding of biotechnology and computer applications.

### Course Outcome:

After completion of the course, students will be able to:

1. Understand the role of information technology in advancing biotechnology research and applications.
2. Learn bioinformatics tools for data analysis and interpretation.
3. Explore computational approaches for biological sequence alignment, modeling, and simulation.
4. Develop skills in managing biological databases and data visualization.
5. Apply IT solutions to solve real-world problems in biotechnology.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to IT in Biotechnology:</b> Role of computational tools in genomics, proteomics, and systems biology.	4
2	<b>Biological Databases:</b> Understanding primary and secondary databases like GenBank, PDB, and Swiss-Prot.	4
3	<b>Sequence Analysis:</b> Concepts of sequence alignment (pairwise and multiple), tools like BLAST and ClustalW.	4
4	<b>Data Visualization Tools:</b> Techniques to represent complex biological data graphically using software like R, Python, or Cytoscape.	4
5	<b>Molecular Modeling:</b> Basics of protein structure prediction, molecular docking, and simulations.	4
6	<b>Bioinformatics Tools:</b> Introduction to software tools like MEGA, T-Coffee, and Primer3.	4
7	<b>Application in Omics:</b> Genomics, transcriptomics, proteomics, and metabolomics integration using computational tools.	4
8	<b>Case Studies:</b> Applications of IT in drug discovery, agriculture, and personalized medicine.	2

### Suggested Books:

#### Text Books

1. **Bioinformatics: Sequence and Genome Analysis** – David W. Mount, Cold Spring Harbor Laboratory Press, 2nd Edition, 2004.
2. **Introduction to Bioinformatics** – Arthur M. Lesk, Oxford University Press, 5th Edition, 2019.

#### References

1. **Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids** – R. Durbin, S.R. Eddy, A. Krogh, and G. Mitchison, Cambridge University Press, 1998.
2. **Bioinformatics: Principles and Applications** – Zhumur Ghosh and Bibekanand Mallick, Oxford University Press, 2011.

3. **Essential Bioinformatics** – Jin Xiong, Cambridge University Press, 2006.

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**Examination Scheme:**

<b>Components</b>	<b>Attendance</b>	<b>Assignments</b>	<b>Midterm Exam</b>	<b>Final Exam</b>
<b>Weightage (%)</b>	10%	20%	30%	40%

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This syllabus provides an interdisciplinary foundation in bioinformatics and computational biology, preparing students to harness IT solutions for addressing challenges in modern biotechnology.

## Breeding Information Technology Lab

**Course Code: GMBE-153**

**Credit Units: 01**

**Pre-requisite:** Basic knowledge of Genetics and Biotechnology

**Course Outcome:**

After completion of the course, the students will be able to:

1. Understand good laboratory practices in the context of breeding data management.
2. Gain hands-on experience with bioinformatics tools and software used in breeding programs.
3. Analyze genetic data and interpret results to support plant and animal breeding decisions.
4. Learn to apply molecular markers and genomic data for breeding purposes.
5. Utilize statistical and computational methods for breeding program design and evaluation.

**Details of the Laboratory Course:**

**Note:** A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by the college according to facilities available.

**Details of the Laboratory Course:**

**Note:** A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by the college according to facilities available.

S. No.	Contents	Contact Hours
1	Introduction to Bioinformatics Tools for Breeding: Software like TASSEL, QTL Cartographer, etc.	2
2	Data Collection and Analysis: Using breeding data for statistical analysis and interpretation.	3
3	Molecular Marker Analysis: Application of SSR, SNP, and RAPD markers in breeding.	3
4	Marker-Assisted Selection: Identifying and selecting genetic markers for breeding programs.	2
5	Genomic Selection: Introduction to genomic selection and its application in breeding.	3
6	Design and Evaluation of Breeding Programs: Statistical methods for designing breeding strategies.	3
7	QTL Mapping: Identifying Quantitative Trait Loci using genetic data.	3
8	Gene Editing Tools in Breeding: Practical applications of CRISPR/Cas9 in plant and animal breeding.	3

S. No.	Contents	Contact Hours
9	Simulation of Breeding Programs: Using simulation software to predict outcomes of breeding efforts.	3
10	Ethical Considerations in Breeding and Biotechnology: Discussion on ethical issues in breeding research.	2

### Suggested Books:

#### Text Books

1. **Plant Breeding and Biotechnology** – R.K. Jain, 2nd Edition, Oxford & IBH Publishing, 2010.
2. **Principles of Plant Genetics and Breeding** – George Acquaah, Wiley-Blackwell, 2012.
3. **Introduction to Statistical Methods in Genetics** – K.P. Singh, New Age International, 2007.

#### References

1. **Genomics and Breeding for Climate-Resilient Crops** – Parvaiz Ahmad, Springer, 2016.
2. **Biotechnology in Agriculture and Forestry** – Vol. 58, Springer, 2006.
3. **Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins** – Baxevanis, A.D. & Ouellette, B.F., Wiley-Blackwell, 2010.
4. **Principles of Animal Breeding and Genetics** – Allendorf, F.W., University of California Press, 2016.

# BACTERIOLOGY

**Course Code: GMBE-104**

**Credit Unit: 03**

1. **Understand Bacterial Classification:** Grasp the classification, structure, and characteristics of different types of bacteria.
2. **Study Bacterial Growth and Physiology:** Learn about bacterial metabolism, growth conditions, and environmental influences.
3. **Identify Bacterial Infections:** Recognize pathogenic bacteria and their role in human, animal, and plant diseases.
4. **Apply Laboratory Techniques:** Develop skills in culturing, isolating, and identifying bacteria in the laboratory.
5. **Understand Antimicrobial Resistance:** Explore mechanisms of bacterial resistance to antibiotics and methods for controlling bacterial infections.

## **Unit 1: Cell organization**

Cell size, shape and arrangement, glycocalyx, capsule, flagella, endoflagella, fimbriae and pili. Cell wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaeobacterial cell wall, Gram and acid-fast staining mechanisms, lipopolysaccharide (LPS), Sphaeroplasts, protoplasts, and L-forms. Effect of antibiotics and enzymes on the cell wall. Cell Membrane: Structure, function and chemical composition of bacterial and archaeal cell membranes. Cytoplasm: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids. Endospore: Structure, formation, stages of sporulation.

## **Unit 2: Bacteriological techniques**

Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and accessing non-culturable bacteria, Microscopy.

## **Unit 3: Growth and nutrition**

Nutritional requirements in bacteria and nutritional categories; Culture media: components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media Physical methods of microbial control: heat, low temperature, high pressure, filtration, desiccation, osmotic pressure, radiation



Chemical methods of microbial control: disinfectants, types and mode of action.

#### **Unit 4: Reproduction in Bacteria**

Asexual methods of reproduction, logarithmic representation of bacterial populations, phases of growth, calculation of generation time and specific growth rate.

#### **Unit 5: Bacterial Systematics**

Aim and principles of classification, systematics and taxonomy, concept of species, taxa, strain; Conventional, molecular and recent approaches to polyphasic bacterial taxonomy, evolutionary Chronometers, rRNA oligonucleotide sequencing, signature sequences, and protein sequences.

#### **References:**

2. Atlas RM. (1997). Principles of Microbiology. 2<sup>nd</sup> edition. WM.T.Brown Publishers.
3. Black JG. (2008). Microbiology: Principles and Explorations. 7<sup>th</sup> edition. Prentice Hall.
4. Madigan MT, and Martinko JM. (2014). Brock Biology of Micro-organisms. 14<sup>th</sup> edition.
5. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology. 5<sup>th</sup> edition Tata McGraw Hill.

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	<b>10</b>	<b>20</b>	<b>10</b>	<b>60</b>

## Bacteriology Lab

**Course Code: BMB-154**

**Credit Units: 01**

**Pre-requisite:** Basic information of Bacteriology and Virology

### Course Outcome:

After completion of the course the students will be able

1. To learn good laboratory practices.
2. To learn the principle and working of microbiology instruments and equipment in accordance with current laboratory safety protocol.
3. To utilize the microbial flora for various applications.
4. To learn microbiology laboratory techniques.

### Details of the Laboratory Course:-

**Note:** A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by college according to facilities available.

S. No.	Contents	Contact Hours
1.	Preparation of different media: Complex media-Nutrient agar, McConkey agar, EMB agar.	2
2.	Simple staining, Negative staining, Gram's staining, Capsule staining, Endospore staining	5
3.	Isolation of pure cultures of bacteria by streaking method.	2
4.	Preservation of bacterial cultures by various techniques.	2
5.	Estimation of CFU count by spread plate method/pour plate method.	2
6.	Motility by hanging drop method.	2
7.	Isolation of coliphages from sewage water sample.	2
8.	One step growth curve for determination of virus titre.	2
9.	Immunological assays for virus detection.	2
10.	Cultivation and morphological identification of animal cell lines.	2

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Experiments in Microbiology, Plant Pathology and Biotechnology. 4th Edition. Aneja, K.R. (2003). New Age International Publishers, New Delhi. 5th ed.	2017
	<b>References</b>	
1.	Microbiology: A Laboratory Manual. Benjamin Cummings. 10 <sup>th</sup> edition. Cappuccino J. and Sherman N. (2013)	2013
2.	Laboratory exercises in Microbiology by Harley Prescott. 7 <sup>th</sup> edition, McGraw-Hill Higher Education.	2008
3.	Benson's Microbiology Application, laboratory Manual Concise version (2016) McGraw Hill Publisher- 14 <sup>th</sup> ed	2016
4.	Applied Microbiology laboratory Manual (2016) Kendall Hunt Publisher- 5 <sup>th</sup> Edition, Frances Duncan	2016

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

# PROFESSIONAL COMMUNICATION

**Course Code: AECC-102**

**Credit Unit: 02**

1. **Enhance Communication Skills:** Develop effective verbal, non-verbal, and written communication skills for professional settings.
2. **Master Business Writing:** Learn to write clear and concise emails, reports, memos, and proposals.
3. **Improve Presentation Skills:** Gain proficiency in preparing and delivering professional presentations.
4. **Understand Communication Etiquette:** Understand and apply proper professional behavior and etiquette in diverse communication contexts.
5. **Collaborate Effectively:** Strengthen interpersonal skills for successful teamwork, negotiation, and conflict resolution in professional environments.

## **Unit 1: Fundamentals of Communication**

Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; the flow of Communication: Downward, Upward, Lateral of Horizontal Importance of technical communication; Barriers to Communication.

## **Unit 2: Constituents of Technical Written Communication**

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation- various steps.

## **Unit 3: Business Communication**

Principles, Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance. Negotiation & Business Presentation skills.

## **Unit 4: Presentation Strategies and Listening Skills.**

Defining Purpose; Audience & Local; Organizing<sup>86</sup> Contents; Preparing Outline; Audio-visual Aids;

Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. Methods for improving Listening Skills.

### **Unit 5: Value-Based Text Readings**

Following essays form the suggested textbook with emphasis on Mechanics of writing.

- (i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
- (ii) The Language of Literature and Science by A. Huxley
- (iii) Man and Nature by J. Bronowski
- (iv) The Social Function of Literature by Ian Watt
- (v) Science and Survival by Barry Commoner
- (vi) The Mother of the Sciences by A. J. Bahm.

### **References:**

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning, New Delhi-2011.
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press,2007, New Delhi.

### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

# VIROLOGY

**Course Code: CMBE-201**

**Credit Unit: 04**

1. **Understand Viral Classification:** Learn the classification, structure, and types of viruses.
2. **Study Viral Replication:** Grasp the processes of viral replication and life cycles in host cells.
3. **Identify Viral Diseases:** Recognize the role of viruses in causing diseases in humans, animals, and plants.
4. **Explore Antiviral Mechanisms:** Understand the mechanisms of antiviral drugs and immune responses against viral infections.
5. **Apply Laboratory Techniques:** Develop skills in isolating, culturing, and identifying viruses using laboratory methods.

## **Unit 1: Nature and Properties of Viruses**

Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Theories of viral origin Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses Isolation, purification and cultivation of viruses, Classification and nomenclature of different groups of viruses.

## **Unit 2: Bacteriophages**

Diversity, classification, one-step multiplication curve, lytic and lysogenic phages (lambda phage) concept of early and late proteins, regulation of transcription in lambda phage.

## **Unit 3: Viral Transmission, Salient features of viral nucleic acids and Replication**

Viral Transmission, Salient features of viral nucleic acids and Replication, Persistent, non-persistent, vertical and horizontal, Unusual bases (TMV, T4 phage), overlapping genes ( $\phi$ X174, Hepatitis B virus), alternate splicing (HIV), terminal redundancy (T4 phage), terminal cohesive ends (lambda phage), partial double stranded genomes (Hepatitis B), long terminal repeats (retrovirus), segmented (Influenza virus), and non-segmented genomes (picornavirus), capping and tailing (TMV), Interaction of viruses with cellular receptors and entry of viruses. Replication strategies of viruses as per Baltimore classification (phi X 174, Retroviridae, Vaccinia, Picorna), Assembly, maturation and release of virions.

## **Unit 4: Viruses and Cancer**

Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses: Concepts of oncogenes and proto-oncogenes.

## Unit 5: Prevention & control of viral disease

Prevention & control of viral diseases, Antiviral compounds and their mode of action, Interferon and their mode of action, General principles of viral vaccination.

### References:

1. Dimmock, NJ, Easton, AL, Leppard, KN (2007). Introduction to Modern Virology. 6<sup>th</sup> edition, Blackwell Publishing Ltd.
2. Carter J and Saunders V (2007). Virology: Principles and Applications. John Wiley and Sons.
3. Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR, Skalka, AM (2004). Principles of Virology, Molecular biology, Pathogenesis and Control: 2<sup>nd</sup> edition. ASM press Washington DC.
4. Levy JA, Conrat HF, Owens RA. (2000). Virology. 3<sup>rd</sup> edition. Prentice Hall publication, New Jersey.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## **SEMESTER III**

### **INHERITANCE AND EVOLUTIONARY MICROBIOLOGY**

**Course Code:CMBE-201a**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of microbial cells.

#### **Course Outcome:**

After completion of the course the students should be able

6. To understand the structural similarities and differences among microorganisms and the unique structure/function relationships of prokaryotic cells.
7. To understand the science of microbiology, its development and importance in human welfare.
8. To apply laboratory practices used in the study of microorganisms.
9. To recognize and compare structure and function of microbes and factors affecting microbial growth.
10. To explain and apply aseptic microbiological techniques in the laboratory and check sources of microbial contamination and their control.

#### **Details of the**

##### **Course:-Unit – I:**

History and scope of microbiology, Development of Microbiology, various branches of microbiology and applications of microbiology. Classification of microorganisms, Microbial Taxonomy- criteria used including molecular approaches. Microbial phylogeny and Bergey's manual.

##### **Unit – II:**

Introduction to bacteria, Morphology (size, shape and arrangement of cells), Ultra structure of bacteria, cell wall and cell membrane: structure, composition and function. Eubacteria, archaeobacteria, Gram positive and Gram negative bacteria, acid-fast and non-acid-fast bacteria.

##### **Unit – III:**

Principles of microbial nutrition, Basic nutritional requirement of bacteria for carbon, nitrogen, sulphur and growth factors. Nutritional categories of microorganisms. Cultivation and Maintenance of Microorganisms, Culture media: principle and types, Methods of isolation, purification and preservation. Pure culture techniques.



## Unit – IV:

Microbial Growth, Growth curve (normal and biphasic) and generation time, aerobic and anaerobic culture, shaker and still culture, asynchronous and synchronous growth, growth curve generation time, growth kinetics, batch and continuous cultures. Measurement of growth, factors affecting growth. Control of Bacteria, Different modes of sterilization. Physical and chemical agents-examples and mode of action.

## Unit – V:

Introduction to Virology, Morphology and ultra-structure, types on the basis of morphology, isolation and cultivation of viruses. Bacterial Viruses (Bacteriophage), Structure, life cycle and application, antiviral agents.

## Suggested Books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Pelczar Jr., M.J., Chan, E.C.S. and Krieg, Noel R., Microbiology, McGraw Hill (2003) 5th ed.	2003
2.	Stanier, R.Y., Ingraham, J.L. and Wheelis, M.L., General Microbiology, MacMillan (2007) 5th ed.	2007
<b>References</b>		
1.	Microbiology 10 <sup>th</sup> Edition. Prescott, L.M.; Harley, J.P. and Klein, D.A. (2003) McGraw Hill, USA.	2016
2.	Foundations in Microbiology 10 <sup>th</sup> edition, Kathleen Park Talaro and Barry Chess.	2017
3.	Microbiology- An Introduction. Tortora, G.J., Funke, B.R., and Case, C.L., , Pearson Education (2015) 12 <sup>th</sup> ed.	2015
4.	Principles of Virology, Vol I and Vol II, 4 <sup>th</sup> Edition, Jane Flint, Vincent Racaniello, Glenn Rall, Anna Marie Skalka, (2015), American Society of Microbiology	2015
5.	Comparative Plant Virology, Roger Hull, 2 <sup>nd</sup> ed. Elsevier, Academic Press. (2009)	2009
6.	Plant Viruses, Diseases and Their Management, Kajal Kumar Biswas, IK. International Publishing House Pvt Ltd, 2016.	2016
7.	Animal cell culture and Virology, S. Nandi, New India Publishing agency, 1 <sup>st</sup> ed. (2009)	2009
8.	Textbook of Medical Virology, Mishra B, CBS Publishing, 1 <sup>st</sup> edition, 2018	2018

## SEMESTER III

### MICROBIOLOGICAL BASIS OF INHERITANCE

Course Code: CMBE-201b

Credit Units: 04

Pre-requisite: Basic information of Cell Biology

#### Course Outcome:

- Students will be able to *define* and explain the fundamental laws of genetics
- Students will be able to *understand* the main modes of Mendelian and non-Mendelian inheritance
- Students will *acquire* knowledge about the chromosome structure, sex linked chromosomes and inherited disorders
- Students will be able to *understand* how alterations in chromosome number or structure may cause various types of diseases
- To describe how mutation is caused in DNA and how DNA damage can be repaired
- Students will be able to *value* role of Genetics within a population and in causing evolution
- Students will be able to *apply* their knowledge to healthy and disease contexts.

#### Details of the Course:-

##### Unit – I: Principles of heredity and variation:

Mendel and his experiments, monohybrid crosses, incomplete dominance and codominance, dihybrid crosses, multiple alleles (blood group systems), epistasis, lethal genes. Probability in prediction and analysis of genetic data, pedigree analysis.

**Genes and chromosomes:** General features of chromosomes, cell division. Chromosomal theory of inheritance, variation in chromosome number and structure, gene concept, gene structure.

##### Unit – II: Molecular organization of chromosomes:

Genome size and evolutionary complexity, supercoiling of DNA, structure of bacterial chromosome, structure of eukaryotic chromosome, satellite DNA, barr bodies and types of chromosomes- salivary gland chromosomes, lamp brush chromosomes, nucleosome model, sex determination. Sex-linked, sex-limited and sex- influenced inheritance, Transposons.

##### Unit – III: Gene linkage and chromosome mapping:

Linkage and recombination of genes in a chromosome, crossing over and genetic mapping, gene mapping by 2-point and three point test crosses

### **Unit – IV: Gene mutation and DNA repair:**

Classification of mutations, detection of mutations, spontaneous mutations, application of mutagen, chemical mutagen, radiation induced mutations, Forward mutation, Reverse mutation, nutritional mutation.

### **Unit – V: Population Genetics and Evolution:**

Hardy-Weinberg principle, allele frequencies and genotype frequencies, random mating. Genetics and evolution (Mutation and migration, natural selection, random genetics drift). Concept of population size, inbreeding.

**Quantitative Genetics:** Quantitative heritability inheritance, causes of variation.

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Genetics: Analysis of Genes and Genomes.5 <sup>th</sup> edition. Hartl, D. L. and Jones, E.W., Jones and Bartlet Publishers, Boston.	2001
2.	Genetics. 5 <sup>th</sup> edition. Russell, P.J., Addison Wesley Longman, Inc., California.	1998
3	Principles of Genetics. E J Gardner et. al., (8 <sup>th</sup> Ed.,)	2011
<b>Reference Books</b>		
1.	Basic Genetics. Miglani, G.S., Narosa Publishing House, New Delhi	2000
2.	Genetics: Analysis and Principles. Brooker, R.J. McGraw Hill, New York.	1999

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

# FOOD ENGINEERING

**Course Code: CMBE-201c**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of food technology

## **Course Outcome:**

- Students will be able to know about the basics of food technology.
- Students would know about the microorganisms associated with food.
- Students will understand various principles of food technology.
- Students will also have knowledge of food preservation methods.

### **UNIT-1**

History of microorganisms in food, historical developments. Role and significance of microorganisms in foods. Intrinsic and Extrinsic. Parameters of foods that affect microbial growth. Basic principles, unit operations, and equipment involved in the commercially important food processing methods and unit operations.

### **UNIT-2**

Microorganisms in fresh meats and poultry, processed meats, seafood's, fermented and fermented dairy products and miscellaneous food products. Starter cultures, cheeses, beer, wine and distilled spirits, SCP, medical foods, probiotics and health benefits of fermented milk and foods products.

Brewing, malting, mashing, hops, primary & secondary fermentation: Biotechnological improvements: catabolic repression, High gravity brewing, B-glucan problem, getting rid of diacetyl. Beer, wine and distilled spirits.

### **UNIT-3**

Nutritional boosts and flavor enhancers: Emerging processing and preservation technologies for milk and dairy products. Microbiological examination of surfaces, air sampling, metabolically injured organisms. Enumeration and detection of food-borne organisms. Bioassay and related methods.

### **UNIT-4**

Food preservation methods. Radappertization, radicidation, and radurization of foods. Legal status of food irradiation, effect of irradiation on food constituents.

### **UNIT-5**

Storage stability food preservation with low temperature, hightemperature and drying. Indicator and food-borne pathogens. Rheology of food production.

**Suggested Books:**

<b>S.No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	N.Jogdan Industrial Biotechnology, Himalaya Publishing House	2006
2.	Perlman D. Annual Reports of Fermentation Processes.	1997-1979
3.	Prescott SC & Dunn CG.. Industrial Microbiology. McGraw Hill.	1959
4.	Bains W. Biotechnology from A to Z. Oxford Univ. Press.	1993
<b>Reference Books</b>		
1.	Introduction to Food Biotechnology. Author; Perry Johnson.	2002

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

# ENVIRONMENTAL MICROBIOLOGY

**Course Code: CMBE-203**

**Credit Unit: 04**

## **Unit 1: Microorganisms and their Habitats**

Structure and function of ecosystems. Terrestrial Environment: Soil profile and soil microflora  
Aquatic Environment: Microflora of fresh water and marine habitats. Atmosphere: Aeromicroflora and dispersal of microbes. Animal Environment: Microbes in/on human body (Microbiomics) & animal (ruminants) body. Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels. Microbial succession in decomposition of plant organic matter.

## **Unit 2: Microbial Interactions**

Microbe interactions: Mutualism, synergism, commensalism, competition, amensalism, parasitism, predation. Microbe-Plant interaction: Symbiotic and non symbiotic interactions  
Microbe-animal interaction: Microbes in ruminants, nematophagus fungi and symbiotic luminescent bacteria.

## **Unit 3: Biogeochemical Cycling**

Carbon cycle: Microbial degradation of cellulose, hemicelluloses, lignin and chitin. Nitrogen cycle: Nitrogen fixation, ammonification, nitrification, denitrification and nitrate reduction. Phosphorus cycle: Phosphate immobilization and solubilisation. Sulphur cycle: Microbes involved in sulphur cycle.

## **Unit 4: Waste Management**

Solid Waste management: Sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill). Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment.

## Unit 5: Water Potability

Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique and (c) Presence/absence tests.

### References:

1. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4<sup>th</sup> edition. Benjamin/Cummings Science Publishing, USA.
2. Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14<sup>th</sup> edition. Pearson/ Benjamin Cummings.
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2<sup>nd</sup> edition, Academic Press.
4. Okafor, N (2011). Environmental Microbiology of Aquatic & Waste systems. 1<sup>st</sup> edition, Springer, New York.
5. Singh A, Kuhad, RC & Ward OP (2009). Advances in Applied Bioremediation. Volume 17, Springer-Verlag, Berlin Hedeilberg.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## **SEMESTER III**

### **GLOBAL ECOLOGY**

**Course Code: CMBE-203a**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of Environmental science

#### **Course Outcome:**

- Students will be able to understand the importance of environment.
- Be able to explain the development of ecosystem, concept of biodiversity and energy and nutrient pathway.
- Students will be able to understand ecological sustainability, ecological efficiencies, homeostasis and limiting factors.
- Students will gain new insights about different remediation procedures.
- Students will be able to use critical thinking skills related to hazardous wastes, pesticides, metals, radiations etc. and its impact on health.
- Students will be able to apply the knowledge of scientific methods to solve environmental problems.

#### **Details of the course:-**

##### **UNIT-I:**

Our Environment: Geological consideration of Atmosphere, Hydrosphere, Lithosphere. Basic concepts of Ecology: Development of Ecosystem, major divisions of ecology, Auto ecology of species, population structure and dynamics.

##### **UNIT II:**

Structure and function of ecosystem. Strata of an ecosystem. Energy transfer in an Ecosystem. Food chain, food web, Energy budget, Production & decomposition in a system. Ecological efficiencies.

##### **UNIT III:**

Trophic structure & ecological pyramids, Bio-geochemical cycles (N, C, and P cycles). Cybernetics & Homeostasis, Environmental monitoring and impact assessment.

##### **UNIT-IV:**

Radiation and chemical toxicology: Radiation ecology, chemical toxicants, ecotoxicology. Detection of Environmental pollutant. Indicators & detection systems.

##### **UNIT-V:**

Environmental biotechnologies, Biotechnologies in protection and preservation of environment- case studies. Bioremediation, Waste disposal.

### **Suggested Books:**

1. P.D. Sharma. (2011). Ecology and Environment. 11th edition. Rastogi Publication.
2. Chapman, J.L., Reiss, M.J. 1999. Ecology: Principles and applications (2<sup>nd</sup> edition) Cambridge, University Press.
3. Divan Rosencraz, Environmental laws and policies in India, Oxford Publication.
4. Ghosh, S.K., Singh, R. 2003. Social forestry and forest management. Global Vision Publishing House.
5. Joseph, B., Environmental studies, Tata Mc Graw Hill.

### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

# MEDICAL MICROBIOLOGY

**Course Code: CMBE-205**

**Credit Unit: 04**

## **Course Outcome**

1. **Microbial Classification:** Understand the classification, structure, and physiology of medically important microorganisms.
2. **Pathogenesis:** Explain mechanisms of microbial infections, host-pathogen interactions, and immune responses.
3. **Diagnosis:** Demonstrate knowledge of laboratory techniques for identifying pathogens and diagnosing infectious diseases.
4. **Antimicrobial Strategies:** Analyze the principles of antimicrobial agents, resistance mechanisms, and their clinical applications.
5. **Public Health Impact:** Apply knowledge of epidemiology and infection control to prevent and manage infectious diseases.

### **Unit 1: Normal microflora of the human body and host pathogen interaction**

Normal microflora of the human body: Importance of normal microflora, normal microflora of skin, throat, gastrointestinal tract, urogenital tract. Host pathogen interaction: Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial infections.

### **Unit 2 Sample collection, transport and diagnosis**

Collection, transport and culturing of clinical samples, principles of different diagnostic tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation, PCR, DNA probes).

### **Unit 3: Bacterial diseases**

List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control. Respiratory Diseases: Streptococcus pyogenes, Haemophilus influenzae, Mycobacterium tuberculosis. Gastrointestinal Diseases: Escherichia coli, Salmonella typhi, Vibrio cholerae, Helicobacter pylori. Others: Staphylococcus aureus, Bacillus anthracis, Clostridium tetani.

### **Unit 4: Viral diseases**

List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control. Polio, Herpes, Hepatitis, Rabies, Dengue, AIDS, Influenza with brief description of swine flu, Ebola, Chikungunya,

Japanese Encephalitis.

### **Unit 5: Protozoan diseases**

List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control. Malaria, Kala-azar.

### **Unit 6: Fungal disease**

Brief description of each of the following types of mycoses and one representative disease to be studied with respect to transmission, symptoms and prevention. Cutaneous mycoses: Tinea pedis (Athlete's foot), Systemic mycoses: Histoplasmosis, Opportunistic mycoses: Candidiasis.

### **References:**

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8<sup>th</sup> edition, University Press Publication.
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26<sup>th</sup> edition. McGraw Hill Publication.
3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4<sup>th</sup> edition. Elsevier.
4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9<sup>th</sup> edition. McGraw Hill Higher Education.
5. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14<sup>th</sup> edition. Pearson International Edition.

### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## SEMESTER III99

### PUBLIC HEALTH & PANDEMICS

Course Code: CMBE-205a

Credit Units: 04

**Pre-requisite:** Basic information of Animal kingdom system

#### Course Outcome:

- Students will be able to *define* and explain the fundamental principles of digestion.
- Students will be able to *understand* comparative circulation system, nervous system, endocrine system and excretory system.
- Students will *acquire* knowledge about the function of different types of organs in different animal kingdom.

#### Details of the Course:-

##### UNIT – I: Digestion and Respiration:

Comparative aspects of Digestion in invertebrate and vertebrate (general account), Human: Mechanism of digestion and absorption of carbohydrates, Proteins, Lipids and Nucleic acids. Composition of bile, saliva, pancreatic, gastric and intestinal juice.

Comparative aspects of Respiration in invertebrate and vertebrate (general account), Human: Exchange of gases, Transport of O<sub>2</sub> and CO<sub>2</sub>, Oxygen dissociation curve, Chloride shift.

##### UNIT – II: Circulation:

Comparative aspects of Circulation in invertebrate and vertebrate (general account), Human: Composition of blood, Plasma proteins & their role, blood cells, Haematopoiesis, Mechanism of coagulation of blood.

Mechanism of working of heart: Cardiac output, cardiac cycle, Origin & conduction of heartbeat.

##### UNIT – III: Muscle physiology and osmoregulation:

Structure of cardiac, smooth & skeletal muscle, threshold stimulus, All or None rule, single muscle twitch, muscle tone, isotonic and isometric contraction, Physical, chemical & electrical events of mechanism of muscle contraction.

Excretion: modes of excretion, Ornithine cycle, Mechanism of urine formation.

#### **UNIT – IV: Nervous System:**

Mechanism of generation & propagation of nerve impulse, structure of synapse, synaptic conduction, salutatory conduction, Neurotransmitters.

#### **UNIT – V: Endocrine System:**

Mechanism of action of hormones (insulin and steroids). Different endocrine glands – Hypothalamus, pituitary, pineal, thymus, thyroid, parathyroid and adrenals, hypo & hyper-secretions.

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company.	2006
	<b>Reference Books</b>	
1.	Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition. John wiley & sons, Inc.	2006

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

## Virology Lab

Course Code: CMBE-251

Credit Units: 01

**Pre-requisite:** Basic knowledge of Microbiology and Virology

**Course Outcome:**

After completion of the course, the students will be able to:

1. Learn and apply good laboratory practices in virology.
2. Understand the principles and working of virology laboratory instruments and equipment, adhering
3. to current safety protocols.
4. Isolate and identify viruses using different virological techniques.
5. Gain hands-on experience with virus cultivation and characterization methods.
6. Understand the use of immunological assays for virus detection and diagnosis.

**Details of the Laboratory Course:**

**Note:** A college must offer 70% of the below-listed experiments. The remaining 30% experiments may be modified by the college according to available facilities.

S. No.	Contents	Contact Hours
1	<b>Preparation of media for virus culture:</b> Preparing media for growing animal and plant viruses.	2
2	<b>Virus Cultivation:</b> Isolation and cultivation of viruses using cell cultures and eggs.	3
3	<b>Virus Titration:</b> Determination of virus titer using plaque assay method.	3
4	<b>Simple Staining and Negative Staining:</b> Visualizing viruses using electron microscopy and light microscopy.	3
5	<b>Identification of viral morphology:</b> Using microscopy techniques to observe viral structures.	2
6	<b>Immunological Assays for Virus Detection:</b> Performing ELISA and immunofluorescence for virus identification.	3
7	<b>Plaque Assay:</b> Quantification of infectious virus particles using the plaque method.	2
8	<b>One-step Growth Curve:</b> Plotting a growth curve of a virus in culture to analyze replication kinetics.	2
9	<b>Viral Inactivation Test:</b> Testing the effectiveness of disinfectants or treatments on virus inactivation.	2
10	<b>PCR-based Viral Detection:</b> Amplification of viral genomes using Polymerase Chain Reaction (PCR).	3

## Suggested Books:

### Text Books

1. **Virology: Principles and Applications** – John S. Oxford, Wiley-Blackwell, 2010.
2. **Medical Virology** – M.K. Bhan, New Age International, 2016.
3. **Fundamentals of Molecular Virology** – Nicholas H. Acheson, Wiley-Blackwell, 2011.

### References

1. **Virology: A Laboratory Manual** – Gary W. Carter and John D. Lister, Elsevier, 2017.
2. **Laboratory Manual of General Virology** – Edward K. Wagner, 4th Edition, Wiley-Blackwell, 2010.
3. **Viral Pathogenesis: Basic Science and Clinical Applications** – Richard K. Schenkel, McGraw-Hill, 2013.
4. **Principles of Virology: Molecular Biology, Pathogenesis, and Control** – Shapiro, R.E., 4th Edition, American Society of Microbiology, 2012.

### Examination Scheme:

<b>Components</b>	<b>Internal Assessment</b>	<b>External Evaluation</b>
<b>Attendance</b>	10%	
<b>Viva-Voce</b>	20%	
<b>Practical Record</b>	10%	
<b>Weightage</b>		60%

This syllabus outlines the core practical experiments and learning outcomes for a Virology Laboratory course, focusing on virus isolation, cultivation, detection, and characterization, along with related molecular techniques.



## Environmental Microbiology Lab

Course Code: CMBE-253

Credit Units: 01

**Pre-requisite:** Basic knowledge of Microbiology and Environmental Science

### Course Outcome:

After completion of the course, the students will be able to:

1. Learn good laboratory practices in the context of environmental microbiology.
2. Understand and operate various microbiological instruments used in environmental monitoring.
3. Identify and analyze microbial populations in different environmental samples.
4. Gain hands-on experience with techniques for assessing environmental pollution and its effects on microbial communities.
5. Understand the role of microorganisms in environmental processes like bioremediation, nutrient cycling, and waste management.

### Details of the Laboratory Course:

**Note:** A college must offer 70% of the below-listed experiments. The remaining 30% experiments may be modified by the college according to available facilities.

S. No.	Contents	Contact Hours
1	<b>Preparation of different media for environmental samples:</b> Nutrient agar, Sabouraud's agar, MacConkey agar.	2
2	<b>Isolation of bacteria from soil, water, and air samples:</b> Using serial dilution and plating methods.	3
3	<b>Determination of Total Viable Count (TVC):</b> Estimation of bacterial population in environmental samples.	3
4	<b>Detection of Waterborne Pathogens:</b> Isolation and identification of coliforms from water samples.	2
5	<b>Biochemical Oxygen Demand (BOD) Test:</b> Determining BOD to assess organic pollution in water.	2
6	<b>Fecal Coliform Test:</b> Perform a presumptive, confirmed, and completed test for fecal coliforms in water.	2
7	<b>Microbial Indicators of Pollution:</b> Detection of microbial indicators such as E. coli, Enterococcus in water.	2
8	<b>Bioremediation Techniques:</b> Isolating and identifying microorganisms capable of degrading pollutants.	3
9	<b>Nutrient Cycling:</b> Estimation of nitrogen-fixing bacteria in soil samples.	2
10	<b>Air Quality Monitoring:</b> Isolation of airborne bacteria using sedimentation or filtration methods.	2

### Suggested Books:

## Text Books

1. **Environmental Microbiology** – Maier, R.M., Pepper, I.L., and Gerba, C.P., 4th Edition, Academic Press, 2015.
2. **Microbiology of the Environment** – B.R. Binks and J.D. Salter, Wiley-Blackwell, 2004.
3. **Environmental Microbiology: From Soil to Wastewater** – S. S. M. R. Husain, CRC Press, 2009.

## References

1. **Environmental Microbiology Laboratory Manual** – Jay A. Repp, Pearson Education, 2016.
2. **Manual of Environmental Microbiology** – C. J. Hurst et al., 3rd Edition, ASM Press, 2007.
3. **Applied Environmental Microbiology** – Charles M. A. P. Eppley, Elsevier, 2008.
4. **Microbial Ecology in Growing Systems** – G. P. Stent, Springer, 2012.

## Examination Scheme:

Components	Internal Assessment	External Evaluation
Attendance	10%	
Viva-Voce	20%	
Practical Record	10%	
Weightage		60%

This syllabus outlines core practical experiments and learning outcomes for an **Environmental Microbiology** Laboratory course, focusing on the identification, isolation, and characterization of microorganisms from various environmental samples, as well as assessing environmental pollution and remediation processes.

## Medical Microbiology Lab

**Course Code: CMBE-255  
02**

**Credit Units:**

**Pre-requisite:** Basic information of Medical Microbiology Lab

### **Course Outcome:**

Upon successful completion of this course the student will be able to:

6. This course provides learning opportunities in the basic principles of medical microbiology and infectious disease.
7. It covers mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
8. The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
9. It also provides opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases.
10. To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.
11. Helps to understand the use of lab animals in medical field.
12. Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
13. Explain the methods of microorganisms control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

### **Details of the Course:-**

<b>Sl. No.</b>	<b>Contents</b>	<b>Contact Hours</b>
1	Study of composition and use of important differential media for identification of bacteria: EMBAgar, McConkey agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS	3
2	Study of bacterial flora of skin by swab method	3
3	Perform antibacterial sensitivity by Kirby-Bauer method	3
4	Identification of human blood groups.	3
5	To perform Total Leukocyte Count of the given blood sample.	3
6	To perform Differential Leukocyte Count of the given blood sample.	3

**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Ananthanarayan R. and Paniker C.K.J. Textbook of Microbiology. 8th edition, University Press Publication	2009
2.	Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication	2013
3.	Goering R., Dockrell H., Zuckerman M. and Wakelin D. Mims' Medical Microbiology. 4 <sup>th</sup> edition. Elsevier	2007
4.	Willey JM, Sherwood LM, and Woolverton CJ. Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education	2013

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60

# MICROBIAL METABOLISM

**Course Code: GMBE-203**

**Credit Unit: 04**

## **Course Outcome**

1. **Metabolic Diversity:** Understand the metabolic processes unique to microorganisms, including autotrophy, heterotrophy, and chemolithotrophy.
2. **Catabolic Pathways:** Explain energy production through microbial catabolic pathways like glycolysis, fermentation, and respiration.
3. **Anabolic Pathways:** Analyze microbial biosynthesis of macromolecules such as nucleotides, amino acids, and lipids.
4. **Regulation of Metabolism:** Understand the regulation of microbial metabolic pathways in response to environmental changes.
5. **Biotechnological Applications:** Apply microbial metabolism knowledge to industrial, environmental, and medical biotechnology.

## **Unit 1: Microbial Growth and Effect of Environment on Microbial Growth**

Definitions of growth, Batch culture, Continuous culture, generation time and specific growth rate, Temperature and temperature ranges of growth pH and pH ranges of growth, Effect of solute and water activity on growth, Effect of oxygen concentration on growth, Nutritional categories of microorganisms.

## **Unit 2: Nutrient uptake and Transport**

Passive and facilitated diffusion, Primary and secondary active transport, concept of uniport, symport and antiport, Group translocation, Iron uptake.

## **Unit 3: Chemoheterotrophic Metabolism - Aerobic Respiration**

Concept of aerobic respiration, anaerobic respiration and fermentation, Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, TCA cycle, Electron transport chain: components of respiratory chain, comparison of mitochondrial and bacterial, ETC, electron transport phosphorylation, uncouplers and inhibitors.

## **Unit 4: Chemoheterotrophic Metabolism- Anaerobic respiration and fermentation**

Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction) Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways.

## Unit 5: Chemolithotrophic and Phototrophic Metabolism

Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction), Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria and cyanobacteria.

### References:

1. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14<sup>th</sup> edition. Prentice Hall International Inc.
2. Moat AG and Foster JW. (2002). Microbial Physiology. 4<sup>th</sup> edition. John Wiley & Sons.
3. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India.
4. Gottschalk G. (1986). Bacterial Metabolism. 2<sup>nd</sup> edition. Springer Verlag.
5. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5<sup>th</sup> edition, McMillan Press.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## Seminar

Course Code: SMBE- 201

Credit Units: 01

**Pre-requisite:** Basic understanding of microbiology and scientific communication.

### Course Outcome:

After completion of the course, students will be able to:

1. Develop skills in literature review and research analysis.
2. Enhance scientific communication and presentation skills.
3. Critically analyze recent advancements in microbiology and related fields.
4. Demonstrate the ability to prepare and deliver structured oral presentations.
5. Engage in discussions and respond to scientific queries effectively.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Scientific Seminars:</b> Objectives, structure, and evaluation criteria.	2
2	<b>Literature Review Skills:</b> Identifying, evaluating, and summarizing relevant scientific literature.	4
3	<b>Topic Selection:</b> Choosing and justifying a seminar topic based on recent trends in microbiology.	2
4	<b>Scientific Writing:</b> Preparing seminar abstracts, outlines, and handouts.	4
5	<b>Presentation Techniques:</b> Creating slides, using visuals, and effective verbal communication.	4
6	<b>Seminar Delivery:</b> Individual presentation on selected topics followed by Q&A sessions.	6
7	<b>Peer Review and Feedback:</b> Evaluating peer presentations and providing constructive feedback.	3
8	<b>Report Submission:</b> Preparing and submitting a detailed report of the seminar topic.	2

### Suggested Books:

#### Text Books

1. **Scientific Presentation: A Guide for the Scientists and Engineer** – Jean-Luc Lebrun, World Scientific Publishing, 2nd Edition, 2011.
2. **How to Write and Illustrate a Scientific Paper** – Bjorn Gustavii, Cambridge University Press, 3rd Edition, 2017.

#### References

1. **Presenting Science: A Practical Guide to Giving a Good Talk** – Cigdem Issever and Ken Peach, Oxford University Press, 2016.
2. **Effective Scientific Communication** – Christina M. Griego and Yumi Wilcox, Springer, 2020.

**Examination Scheme:**

<b>Components</b>	<b>Abstract and Topic Justification</b>	<b>Presentation Delivery</b>	<b>Q&amp;A Performance</b>	<b>Report Submission</b>	<b>Peer Review Participation</b>
<b>Weightage (%)</b>	10%	40%	20%	20%	10%



## IV SEMESTER

## IMMUNOLOGY

**Course Code: CMBE-202**

**Credit Unit: 04**

### **Course Outcome**

1. **Metabolic Diversity:** Understand the metabolic processes unique to microorganisms, including autotrophy, heterotrophy, and chemolithotrophy.
2. **Catabolic Pathways:** Explain energy production through microbial catabolic pathways like glycolysis, fermentation, and respiration.
3. **Anabolic Pathways:** Analyze microbial biosynthesis of macromolecules such as nucleotides, amino acids, and lipids.
4. **Regulation of Metabolism:** Understand the regulation of microbial metabolic pathways in response to environmental changes.
5. **Biotechnological Applications:** Apply microbial metabolism knowledge to industrial, environmental, and medical biotechnology.

### **Unit 1: Introduction**

Concept of Innate and Adaptive immunity; Contributions of following scientists to the development of field of immunology - Edward Jenner, Karl Landsteiner, Robert Koch, Paul Ehrlich, Elie Metchnikoff, Peter Medawar, MacFarlane Burnet, Neils K Jerne, Rodney Porter and Susumu Tonegawa

### **Unit 2: Immune Cells and Organs**

Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen.

### **Unit 3: Antigens**

Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes); T-dependent and T-independent antigens; Adjuvants

### **Unit 4: Antibodies**

Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic), Organization of MHC locus (Mice & Human); Structure and Functions of MHC I & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways), Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response (Self MHC restriction, T cell activation, Co-stimulatory signals); Killing Mechanisms by CTL and NK cells.

### **Unit 5: Immunological Disorders and Tumor Immunity**

Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies - Animal models (Nude and SCID mice), SCID, Principles of Precipitation, Agglutination, Immunodiffusion, Immunoelectrophoresis, ELISA, Western blotting, Immunofluorescence, Flow cytometry, Immunoelectron microscopy.

## References:

1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6<sup>th</sup> edition Saunders Publication, Philadelphia.
2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11<sup>th</sup> edition WileyBlackwell Scientific Publication, Oxford.
3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6<sup>th</sup> edition W.H. Freeman and Company, New York.
4. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7<sup>th</sup> edition Garland Science Publishers, New York.
5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2<sup>nd</sup> edition Churchill Livingstone Publishers, Edinburgh.
6. Richard C and Geiffrey S. (2009). Immunology. 6<sup>th</sup> edition. Wiley Blackwell Publication.

## Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

**Course Code: CMBE-202a**

**Credit Units: 04**

**Pre-requisite:** Basic knowledge of immunology and molecular biology

**Course Outcome:**

- Students will gain new insights about different diagnostic procedures.
- Students will be able to use critical thinking skills to trouble shoot problems as they occur and determined possible causes
- Students will be able to apply the knowledge of molecular testing to the most commonly performed applications in the clinical laboratory.

**Details of the Course:-**

**UNIT I: Enzyme Immunoassays:**

Solid phases, Comparison of enzymes, conjugation of enzymes, Use of polyclonal or monoclonal antibodies, Immunoblotting, Radioimmunoassay.

**UNIT II: Molecular methods in diagnostics:**

Applications of PCR, RFLP, Nuclear hybridization methods LAMP method in transgenics.

**UNIT III: Prenatal diagnosis:**

Invasive techniques - Amniocentesis, Fetoscopy, Chorionic Villi Sampling (CVS), Non-invasive techniques - Ultrasonography, X-ray, TIFFA.

**UNIT IV: Biochemical diagnostics:**

Inborn errors of metabolism, haemoglobinopathies, mucopolysaccharidoses, lipidoses, and glycogen storage disorders.

**UNIT V: Automation in microbial diagnosis:**

Rapid diagnostic approach including technical purification and standardization of antigen and specific antibodies.

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Buckingham, L., Flaws, M.L., Molecular Diagnostics: Fundamentals, Methods, & Clinical Applications, F A DavisCo., Philadelphia.	2007
2.	Grody, W.W., Nakamura, R.M., Kiechle, F.K. & Strom, C., Molecular Diagnostics: Techniques and Applications for the Clinical Laboratory, Academic Press	2009
<b>Reference Books</b>		
1.	Ananthanarayan, R. & Paniker, C.K.J., Textbook of Microbiology. 7th edition, University Press Publication.	2005
2	Kindt, T J, Goldsby, R.A., Osborne, B.A. & Kuby, J., Immunology, 6th Edition, W.H. Freeman, New York	2007

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## IV SEMESTER

## GENDER STUDIES

**Course Code: CMBE-202b**

**Credit Units: 04**

Objectives of the course

- To familiarize the students with the terminologies related to Gender studies.
- To elaborate the concept of patriarchy and its impact on women
- To introduce students to the discipline of Women's Studies and Gender Studies and its perspectives.
- To trace the evolution of Gender Studies from Women's Studies. Learning outcomes
- Familiarity with fundamental concepts related to field of women and gender studies.
- Understanding of multidisciplinary nature of the discipline.

### **Syllabus Unit I**

Introduction: Gender Studies - Origin and growth; need for Gender Studies – objectives, nature and scope of Gender Studies. Establishment of Centre for Women's Studies under UGC guidelines 14H

### **Unit II**

Basic Concepts: Meaning and definition: gender, sex, difference between gender and sex, gender equality, gender empowerment, gender roles, gender gap. Patriarchy and Matriarchy: Meaning and definition. Gender discrimination- meaning, forms and areas, Need for Gender Sensitization. Bio-social perspective of gender, gender socialization, gender stereotyping, gender bias 16H Page 5 of 34

### **Unit III**

Multidisciplinary Nature of Gender Studies Multi-disciplinarity of gender studies, relationship with mainstream social sciences (Economics, Sociology, History, Literature, Anthropology, Psychology and Political Science) 14 H

### **Unit IV**

Women's Studies and Gender Studies A paradigm shift: from Women's Studies to Gender Studies. Relevance of women/gender studies in Indian context 6 H

### **Unit V**

Future of Gender Studies Gender studies as a profession- employment opportunities, constraints, emerging needs Role of UGC in promoting the women's and gender studies, future of gender studies

### **Recommended Readings**

1. Maithreyi Krishnaraj (2006), Is 'Gender' Easy to Study? Some Reflections, Economic and Political Weekly, October 21
2. 2. Menon, Nivedita (1999), Gender and Politics In India, OUP, New Delhi.
3. 3. Neera Desai and Maithreyi Krishnaraj (1986), Women's Studies in India – Some Perspectives, Popular Prakashan Private Ltd, Mumbai.
4. 4. Vina Mazumdar (1985), Emergence of Women's Question and Role of Women's Studies, Occasional Paper, Centre for Women's Development Studies, New Delhi
5. 5. Mary E. John (2008), Women's Studies in India – A Reader, Penguin Books, New Delhi
6. 6. Neera Desai and Maithreyi Krishnaraj (1987), Women and Society in India, Ajantha Publications, New Delhi
7. 7. Burton, A. (1994) Burdens of History: British Feminists, Indian Women and Imperial Culture. University of North Carolina Press

## INTERNATIONAL BUSINESS IN DAIRY SCIENCE

### SEMESTER IV

Course Code: CMBE-202c

Credit Units: 04

**Pre-requisite:** Basic knowledge of dairy microbiology.

#### Course Outcome:

- Students will be able to know about the microorganisms important in food microbiology.
- Students would know about the factors influencing microbial growth in food.
- Students will understand various food borne diseases.
- Students will also have knowledge of microbiology of milk.
- Students will understand microorganisms as source of food.

#### Details of the Course:

Sl. No.	Contents	Contact Hours
1.	<b>UNIT-1</b> Microorganisms important in food microbiology: molds, yeast and bacteria – general characteristics, classification and importance. Principles of food preservation, preservation by use of high temperature, low temperature, drying and dessication. Chemical preservatives and additives. Preservation by radiation.	4
2.	<b>UNIT-2</b> Factors influencing microbial growth in food: Extrinsic and intrinsic factors. Microbial spoilage of food. Chemical changes caused by the microorganisms during spoilage. Spoilage of fish, meat, poultry, eggs, fruits and vegetables. Detection of spoilage and characterization.	10
3.	<b>UNIT-3</b> Classification of food borne diseases. Food borne infections: Brucella, Bacillus cereus, Clostridium perfringens, Yersinia enterocolitica and Escherichia, Salmonella spp. Food intoxication: Staphylococcal intoxication, Clostridial poisoning (Clostridium Botulinum). Food adulteration and prevailing food standards in India.	9
4.	<b>UNIT-4</b> Microbiology of Milk: Sources of microorganisms in milk and types of microorganisms in milk. Microbiological examination of milk (standard plate count, direct microscopic count, reductase, and phosphatase test). Dehydration and pasteurization of milk. Dairy products from microorganisms: Butter, yoghurt and cheese.	12

5.	<b>UNIT-5</b> Microorganisms as source of food: Single Cell Protein (SCP). Mushrooms and food value of mushrooms. Food conversions: Lactic acid conversions, soyabean conversions and Bakery. Microbiological estimation of food: Sample collection, preparation and analysis techniques.	6
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**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Food science By Norman N. Potler, Joseph H. Hotchkiss. Fourth edition, CBS Publishers and Distributors, New Delhi	2006
2.	Food Microbiology , by William C. Frazier and Dennis C. Westhoff, Fourth edition, Tata McGrawHill Publishing Company Limited, New Delhi	1997-1979
3.	Modern Food Microbiology by James M. Jay, Fourth Edition, CBS Publishers and Distributors, New Delhi.	1959
4.	Bains W. Biotechnology from A to Z. Oxford Univ. Press.	1993
<b>Reference Books</b>		
1.	Introduction to Food Biotechnology. Author; Perry Johnson.	2002

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
<b>Weightage (%)</b>	10	20	10	60

# MOLECULAR BIOLOGY

**Course Code: CMBE-204**

**Credit Unit: 04**

## **Course Outcome**

1. **DNA and RNA Biology:** Understand the structure, replication, transcription, and translation of genetic material.
2. **Gene Regulation:** Explain mechanisms of gene expression and regulation in prokaryotes and eukaryotes.
3. **Molecular Techniques:** Demonstrate proficiency in molecular biology techniques such as PCR, electrophoresis, and cloning.
4. **Genetic Mutations:** Analyze the impact of mutations and DNA repair mechanisms on genome stability.
5. **Applications in Biotechnology:** Apply molecular biology concepts to advancements in genetic engineering, genomics, and therapeutic development

## **Unit 1: Structures of DNA and RNA / Genetic Material**

DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves. DNA topology – linking number, topoisomerases; Organization of DNA Prokaryotes, Viruses, Eukaryotes. RNA Structure, Organelle DNA -- mitochondria and chloroplast DNA.

## **Unit 2: Replication of DNA (Prokaryotes and Eukaryotes)**

Bidirectional and unidirectional replication, semi- conservative, semi- discontinuous replication  
Mechanism of DNA replication: Enzymes and proteins involved in DNA replication –DNA polymerases, DNA ligase, primase, telomerase – for replication of linear ends Various models of DNA replication including rolling circle, D- loop (mitochondrial),  $\Theta$  (theta) mode of replication and other accessory protein, Mismatch and excision repair.

## **Unit 3: Transcription in Prokaryotes and Eukaryotes**

Transcription: Definition, difference from replication, promoter - concept and strength of promoter RNA Polymerase and the transcription unit Transcription in Eukaryotes: RNA polymerases, general Transcription factors.

## **Unit 4: Post-Transcriptional Processing**

Split genes, concept of introns and exons, RNA splicing, spliceosome machinery, concept of alternative splicing, Polyadenylation and capping, Processing of rRNA, RNA interference: si



RNA, miRNA and its significance.

### **Unit 5: Translation (Prokaryotes and Eukaryotes)**

Translational machinery, Charging of tRNA, aminoacyl tRNA synthetases, Mechanisms of initiation, elongation and termination of polypeptides in both prokaryotes and eukaryotes, Fidelity of translation, Inhibitors of protein synthesis in prokaryotes and eukaryote.

### **Unit 6: Regulation of gene Expression in Prokaryotes and Eukaryotes**

Principles of transcriptional regulation, regulation at initiation with examples from lac and trp operons, Sporulation in Bacillus, Yeast mating type switching, Changes in Chromatin Structure - DNA methylation and Histone Acetylation mechanisms.

### **References:**

1. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6<sup>th</sup> edition, Cold Spring Harbour Lab. Press, Pearson Publication.
2. Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP (2009) The World of the Cell, 7<sup>th</sup> edition, Pearson Benjamin Cummings Publishing, San Francisco.
3. De Robertis EDP and De Robertis EMF (2006) Cell and Molecular Biology, 8<sup>th</sup> edition. Lippincott Williams and Wilkins, Philadelphia.
4. Karp G (2010) Cell and Molecular Biology: Concepts and Experiments, 6<sup>th</sup> edition, John Wiley & Sons. Inc.
5. Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4<sup>th</sup> Edition, Cold Spring Harbour Laboratory press.

### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## ANTHROPOLOGY

**Course Code: CMBE-204a**

**Credit Unit: 04**

### Course Outcomes

1. **Cultural Understanding:** Gain insight into the diversity of human cultures, traditions, and social behaviors across time and space.
2. **Biological Perspectives:** Understand human evolution, biological adaptations, and the interplay between biology and culture.
3. **Archaeological Methods:** Learn techniques for studying past civilizations through material remains and artifacts.
4. **Holistic Analysis:** Develop a comprehensive perspective on human societies by integrating cultural, biological, and linguistic aspects.
5. **Contemporary Applications:** Apply anthropological knowledge to address modern issues like globalization, health disparities, and social justice.

### UNIT-1 Social anthropology:

history and subject matter; Relationship of social and cultural anthropology with sociology, psychology, history, economics and political science.

### UNIT-2 Concepts of Society;

Pre-requisite of Human society Individual and Society; Group and its types; Community; Association and Institution Status and Role ;

### Unit -3 Social fact;

Social Action; Social Structure , Function and Social Organisation ; Structural - Functionalism ; Social System ; Social Conflict

### Unit -4 Techniques and methods:

Field work/ Ethnography and Survey Research Comparative and Historical Methods

### References:

1. Metcalf Peter (2005) Anthropology: the basics. Abingdon (England), Routledge.
2. Ingold Tim (1994) Companion encyclopedia of anthropology. London, Routledge reference.
3. R.M MacIver & Charles H. Page (1950) Society : An Introductory Analysis. London, Macmillan
4. Ralph Linton (1936) The Study of Man. New York, Appelton Century Croft.
5. M. J. Herskovits (1974) Cultural Anthropology, New Delhi, Oxford and IBH Publications.
6. Roger Keesing (1984) An Introduction of Cultural Anthropology. NewYork, MacMillan.
7. Kingsley Davis (1948) Human Society, New York: MacMillan.
8. John Monaghan and Peter Just (2000) Social and Cultural Anthropology: A very Short Introduction. 9. Thomas Hylland Eriksen (2010) Small Places, Large Issues: An Introduction to Social and Cultural Anthropology.
10. Nigel Rapport and Joanna Overing (2006) Social and Cultural Anthropology: The Key Concepts .

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

# NEUROBIOLOGY

**Course Code: CMBE-204b**

**Credit Unit: 04**

1. **Neural Structure:** Understand the anatomy and physiology of the nervous system at cellular and systemic levels.
2. **Signal Transmission:** Explain the mechanisms of neuronal communication, including action potentials and synaptic transmission.
3. **Sensory and Motor Systems:** Analyze the neural basis of sensory processing and motor control.
4. **Neuroplasticity:** Explore the principles of neural development, plasticity, and regeneration.
5. **Neurological Disorders:** Apply knowledge of neurobiology to understand the basis of neurological and psychiatric diseases.

## UNIT I Neural induction

- Overview of early embryology +details of hydra, C. elegans (indentation), Drosophila (delamination), frog, zebrafish, chick and humans (invagination).
- ‘Organiser ‘of differentiation- Spemann and Mangold experiments, Keller sandwich.
- Molecular nature of neural inducer- Noggin, chordin, follistatin, activin, BMP4-WNT signalling- important for formation of neural plate.
- Neuroblast induction-acheate scute, lateral inhibition and details – notch delta signalling pathway- important for formation of neuroblasts.

## UNIT II Polarity and Segmentation

- Overview of polarity and brain architecture, rhombomeres
- AP-Axis in Drosophila-Bicoid and nanos, homeobox genes, ANT-C and BX-C in flies, effect of homeobox genes on hindbrain development in mammals.
- Upstream control of hox genes, transformers-RA, WNT-b-catenin, FGF
- Mesencephalon/metencephalon boundary organiser-WNT1, ENGRAILED1, FGF8.
- Forebrain development in mammals-pax genes
- DV-axis polarity-sonic hedgehog(shh) induces the ventralisation (floorplate).
- Dorsal neural tube development- again WNT/BMP and shh signalling
- Patterning the cerebral cortex-pax6, emx2, fgf8 and fgf18

## UNIT III Genesis and Migration

- Methods to visualise lineage and timing of a neurons birth-thymidine, BrdU, retroviral GFP, thymidine dating
- Molecular control of neuron number-intrinsic proteins and also

mitogens like FGF, IGF

- What separates neurons from glia
- Cerebral and cerebellar cortex formation
- Molecular control of migration of neurons, adult neurogenesis

#### **UNIT IV Determination and differentiation**

- Determination-various transcription factors involved (intracellular factors)
- Asymmetric cell division – eg NB, GMC, neuron – (numb and prospero) and drosophila eye
- Local environmental factors- eg Drosophila eye imaginal disc (MF) and chick-quail transplant studies
- Histogenesis-loss of competence Eg layers of the cortex by transplantation studies and retina by heterochronic experiments
- Neuronal differentiation form neural stem cell, embryonic stem cell and induced pluripotent cell-basic principle and methodology

#### **UNIT V Axon growth and guidance**

- Overview of growth cone and axonal pathfinding. Initial study
- Guidance cues for growth cone – Netrin, Semaphorin and Ephrins
- Substrates for growth of developing axon – Role of cell adhesion molecule in growth cone guidance
- Mechanism of axon guidance-guidance cues and the control of cytoskelata dynamic, localized translational of growth cone guidance, changing response to guidance cues
- Axon regeneration

#### **Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	University Chemistry, B.H.Mahan	1987
2.	Chemistry, Principles and Application, M.J. Sienko and R.A. Plane	1980
	<b>Reference Books</b>	
1.	Physical Chemistry, P.W. Atkins <sub>12</sub>	2009

2.	Organic Chemistry, I.L.Final (Vol-1, Vol-2)	2002
3.	Fundamentals of Molecular Spectroscopy, C.N. Banwell	1994

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

# NANOTECHNOLOGY

**Course Code: CMBE-204c**

**Credit Unit: 04**

## Course Outcomes

6. **Neural Structure:** Understand the anatomy and physiology of the nervous system at cellular and systemic levels.
7. **Signal Transmission:** Explain the mechanisms of neuronal communication, including action potentials and synaptic transmission.
8. **Sensory and Motor Systems:** Analyze the neural basis of sensory processing and motor control.
9. **Neuroplasticity:** Explore the principles of neural development, plasticity, and regeneration.
10. **Neurological Disorders:** Apply knowledge of neurobiology to understand the basis of neurological and psychiatric diseases.

## Unit I

**Background to Nanoscience:** Definition of Nano, Scientific revolution-Atomic Structure and atomic size, emergence and challenges of nanoscience and nanotechnology, carbon age-new form of carbon (CNT to Graphene), influence of nano over micro/macro, size effects and crystals, large surface to volume ration, surface effects on the properties.

## Unit II

**Types of nanostructure and properties of nanomaterials:** One dimensional, Two dimensional and Three dimensional nanostructured materials, Quantum Dots shell structures, metal oxides, semiconductors, composites, mechanical-physical-chemical properties.

## Unit III

**Application of Nanomaterial:** Ferroelectric materials, coating, molecular electronics and nanoelectronics, biological and environmental, membrane based application, polymer based application.

## Unit IV

**Surface Nanoscience:** Introduction to surface active agents. Theory and applications. Types of surfactants. Classification, synthesis of surfactant - Shape, size and structure of surfactants. Micelle, Emulsions, Microemulsions & Gels. Kraft temperature, surfactant geometry and packing.

## Unit V

**Colloidal Nanoscience:** Introduction to colloidal material, surface properties, origin of colloidal particles, preparation & characterization of colloidal particles. Applications of super hydrophilic hydrophobic surfaces, self-cleaning surfaces. Surface viscosity.

## References:

1. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et.al.
2. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.
3. Instrument E L Principe, P Gnauck and P Hoffrogge, Microscopy and Microanalysis (2005), 11: 830- 831, Cambridge University Press.
4. Processing & properties of structural naonmaterials - Leon L. Shaw, Nanochemistry: A Chemical Approach to Nanomaterials, Royal Society of Chemistry, Cambridge UK 2005.

## Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test <sup>12</sup>	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## Aerobiology

Course Code: CMBE-204d

Credit Units: 04

**Pre-requisite:** Basic knowledge of microbiology, plant pathology, and environmental science.

### Course Outcome:

After completion of the course, students will be able to:

1. Understand the fundamental concepts of aerobiology and its applications.
2. Analyze the diversity and dynamics of airborne microorganisms and allergens.
3. Investigate the role of airborne particles in human health, agriculture, and environment.
4. Learn techniques for sampling and identification of bioaerosols.
5. Apply aerobiological knowledge in disease forecasting, air quality assessment, and biotechnology.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Aerobiology:</b> Definition, scope, and importance in health, agriculture, and environment.	6
2	<b>Sources of Bioaerosols:</b> Natural and anthropogenic sources, transport mechanisms, and deposition processes.	6
3	<b>Sampling and Analysis Techniques:</b> Methods of air sampling, culture-dependent and independent approaches, particle counting.	8
4	<b>Microbial Composition of Air:</b> Types of microorganisms (bacteria, fungi, viruses) in the air and their seasonal variations.	6
5	<b>Aerobiology and Human Health:</b> Allergens, respiratory infections, and immune responses caused by airborne particles.	6
6	<b>Agricultural Aerobiology:</b> Impact of airborne pathogens on crop diseases, spore dispersal, and prediction models.	6
7	<b>Environmental Applications:</b> Role of aerobiology in air quality monitoring, pollution studies, and climate change impact.	6
8	<b>Industrial and Forensic Applications:</b> Applications in biotechnological processes and forensic investigations.	4

### Suggested Books:

#### Text Books

1. **Aerobiology** – Roger L. Edmonds, Springer, 1979.
2. **Introduction to Aerobiology** – Maureen E. Lacey and Jonathan S. West, Springer, 2006.

#### References

1. **Bioaerosols: Assessment and Control** – Harriet Burge, ACGIH, 2006.
2. **Fungal Spores and Disease in Plants and Animals** – Donald G. Cooley, Springer, 2013.
3. **Aerobiology in Climate Change and Environmental Monitoring** – Edited by Usha Kiran and Subodh Kumar, Springer, 2020.

### Examination Scheme:

Components	Attendance	Assignments	Midterm Exam	Final Exam
Weightage (%)	10%	20%	30%	40%

# RECOMBINANT DNA TECHNOLOGY

**Course Code: CMBE-206**

**Credit Units: 04**

## **Course Outcomes**

1. **Molecular Tools:** Understand the principles and tools used in gene cloning and genetic engineering.
2. **Vector Design:** Learn the construction and application of cloning and expression vectors.
3. **Gene Manipulation:** Demonstrate proficiency in techniques like PCR, restriction digestion, and ligation.
4. **Applications:** Explore the use of recombinant DNA in medicine, agriculture, and industry.
5. **Ethics and Safety:** Analyze the ethical, legal, and biosafety considerations of genetic engineering.

## **Unit 1: Gene Recombination and Gene transfer**

Bacterial Conjugation, Transformation, Transduction, Episomes, Plasmids, Microinjection, Electroporation, Microprojectile, Shot Gun method, Ultrasonication, Liposome fusion, Microlaser.

## **Unit 2: Changing genes**

Site-directed mutagenesis and Protein engineering: Primer extension is a simple method for site directed mutation, PCR based site directed mutagenesis, Random mutagenesis, Use of Phage display techniques to facilitate the selection of mutant peptides, Gene shuffling, production of chimeric proteins.

## **Unit 3: Genetic engineering in animals**

Production of transgenic mice, ES cells can be used for gene targeting in mice, Applications of gene targeting, Using Yeast to study Eukaryotic gene function, Therapeutic products produced by genetic engineering-blood proteins, human hormones, immune modulators and vaccines, Transgenic animals, Production of proteins of Pharmaceutical value.

## **Unit 4: Genetic engineering in plants**

Use of *Agrobacterium tumefaciens* and *Arhizogenes*, Ti plasmids, Strategies for gene transfer to plant cells, Direct DNA transfer to plants, Gene targeting in plants, Use of plant viruses as episomal expression vectors.

## **References:**



1. Gene Cloning and DNA Analysis: An introduction 6<sup>th</sup> Edition; TA Brown, John Wiley & Sons.
2. Recombinant DNA Technology, Keya Chaudhuri, Teri Press - New Delhi, ISBN: 9788179933206, 8179933202.

# MICROBIAL PHYSIOLOGY & METABOLISM

Course Code: CMBE-206a

Credit Units: 04

**Pre-requisite:** Basic information of biology and microbiology.

## Course Outcome:

At the end of the course, the students will be familiar with microbial technology. This would help students to launch themselves in industrial biotechnology which is the fastest growing industry in the developing country.

## Details of the Course:-

S. No.	Contents	Contact Hours
1	<b>Introduction of microbes, taxonomy and classification</b> 11. Introduction to bacteria, fungi, and viruses, structural and cellular organelles differences among different types and classes ; biochemical/microscopic/molecular methods to differentiate archaea, eubacteria and eukaryotes; microbial evolution, systematics and taxonomy- new approaches to bacterial taxonomy, classification including ribotyping, characteristics of primary domains, taxonomy, nomenclature and Bergey's manual, ribosomal RNA sequencing.  <b>12. Microbiology Techniques</b> Important milestones in microbiology, methods in microbiology- principles of microbial nutrition, culture media, theory and practice of sterilization, pure culture techniques, minimal and enrichment culture techniques.	6
2	<b>Growth and nutrition:</b> Prokaryotic growth patterns and functions - microbial nutrition and growth - arithmetic and geometric growth expression, growth kinetics, growth curve, measurement of growth and growth yields, synchronous growth, continuous culture, diauxic growth, culture collection and maintenance of cultures.	7
3	<b>Microbial Genetics:</b> Microbial regulation of gene expression (attenuation and negative regulation with e.g. <i>trp</i> and <i>lac</i> operon), transfer of genetic material: plasmids, transposons, transduction, transformation and conjugation. Mutations and their chemical basis; mutagens and their use in biotechnology; modes of recombination; comparative prokaryotic genomics.	7 5
4	<b>Host-microbe interaction:</b> Normal micro flora of skin, oral cavity, gastrointestinal tract; entry of pathogens into the host, types of toxins (exo, endo, entro) and their mode of actions, plant -microbe interactions, microbial pathogenesis -disease reservoirs; epidemiological terminologies; infectious disease transmission <sub>1,3</sub>	9
5	<b>Microbes based therapies:</b> Antimicrobial agents, sulfa drugs, antibiotics -penicillin and	8

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Pelczar Jr., M.J., Chan, E.C.S. and Krieg, Noel R., Microbiology, McGraw Hill (2003) 5th ed.	2003
2.	Stanier, R.Y., Ingraham, J.L. and Wheelis, M.L., General Microbiology, MacMillan (2007) 5th ed.	2007
<b>References</b>		
1.	Microbiology 10 <sup>th</sup> Edition. Prescott, L.M.; Harley, J.P. and Klein, D.A. (2003) McGraw Hill, USA.	2016
2.	Foundations in Microbiology 10 <sup>th</sup> edition, Kathleen Park Talaro and Barry Chess.	2017
3.	Microbiology- An Introduction. Tortora, G.J., Funke, B.R., and Case, C.L., , Pearson Education (2015)12 <sup>th</sup> ed.	2015
4.	Principles of Virology, Vol I and Vol II, 4 <sup>th</sup> Edition, Jane Flint, Vincent Racaniello, Glenn Rall, Anna Marie Skalka, (2015), American Society of Microbiology	2015
5.	Comparative Plant Virology, Roger Hull, 2 <sup>nd</sup> ed. Elsevier, Academic Press. (2009)	2009
6.	Plant Viruses, Diseases and Their Management, Kajal Kumar Biswas, IK. International Publishing House Pvt Ltd, 2016.	2016
7.	Animal cell culture and Virology, S. Nandi, New India Publishing agency, 1 <sup>st</sup> ed. (2009)	2009
8.	Textbook of Medical Virology, Mishra B, CBS Publishing, 1 <sup>st</sup> edition, 2018	2018

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

# ENTOMOLOGY

Course Code: CMBE-206b

Credit Units: 04

## Course Outcomes

1. Insect Biology: Understand the anatomy, physiology, and classification of insects.
2. Ecological Roles: Analyze the ecological importance of insects in ecosystems and their interactions with other organisms.
3. Insect Behavior: Explore the behavioral patterns and adaptations of insects.
4. Pest Management: Learn techniques for identifying and managing insect pests in agriculture and public health.
5. Applied Entomology: Apply knowledge of entomology in fields like pollination, biocontrol, and forensic science.

### UNIT I Principles, utility and relevance:

insect body wall structure, cuticular outgrowths, colouration and special integumentary structures in insects, body tagmata, sclerites and segmentation.

### UNIT II Head-

Origin, structure and modification; types of mouthparts and antennae, tentorium and neck sclerites.

### UNIT III Thorax-

Areas and sutures of tergum, sternum and pleuron, pterothorax; Wings: structure and modifications, venation, wing coupling apparatus and mechanism of flight; Legs: structure and modifications.

**UNIT IV Abdomen-** Segmentation and appendages; Genitalia and their modifications; Embryonic and post-embryonic development; Types of metamorphosis. Insect sense organs (mechano-, photo- and chemoreceptors).

**UNIT V insect** segmentation, various tagmata and their appendages; preparation of permanent mounts of different body parts and their appendages of taxonomic importance including male and female genitalia. Sense organs.

### REFERENCES

Chapman RF. 1998. The Insects: Structure and Function. Cambridge Univ. Press, Cambridge. David BV & Ananthkrishnan TN. 2004. General and Applied Entomology. Tata-McGraw Hill, New Delhi. Duntson PA. 2004. The Insects: Structure, Function and Biodiversity. Kalyani Publ., New Delhi. Evans JW. 2004. Outlines of Agricultural Entomology. Asiatic Publ., New Delhi. Richards OW & Davies RG. 1977. Imm's General Text Book of Entomology. 10th Ed. Chapman & Hall, London. Saxena RC & Srivastava RC. 2007. Entomology: At a Glance. Agrotech Publ. Academy, Jodhpur. Snodgrass RE. 1993. Principles of Insect Morphology. Cornell Univ. Press, Ithaca.

## Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	13 10	60

## Agrostology

**Course Code: CMBE-206c  
04**

**Credit Units:**

**Pre-requisite:** Basic understanding of botany, plant taxonomy, and ecology.

### Course Outcome:

After completion of the course, students will be able to:

1. Understand the taxonomy, anatomy, and physiology of grasses.
2. Identify and classify grass species based on their morphological and ecological characteristics.
3. Explore the ecological and economic importance of grasses in natural and managed ecosystems.
4. Analyze the role of grasses in agriculture, environmental management, and climate change mitigation.
5. Learn techni

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Agrostology:</b> Definition, scope, and importance in ecology, agriculture, and industry.	6
2	<b>Taxonomy and Systematics of Grasses:</b> Morphological features, classification, and identification of grass families (Poaceae).	8
3	<b>Anatomy and Physiology of Grasses:</b> Structure of grass leaves, stems, and roots; photosynthesis (C3 and C4 pathways) in grasses.	6
4	<b>Ecological Role of Grasses:</b> Grassland ecosystems, biodiversity, and the role of grasses in soil conservation and carbon sequestration.	6
5	<b>Economic Importance of Grasses:</b> Food crops (rice, wheat, maize), fodder, turf, and industrial uses (paper, biofuels).	6
6	<b>Grasses in Agriculture:</b> Pasture management, forage quality, and their role in sustainable agriculture.	6
7	<b>Grass Propagation and Cultivation:</b> Methods of propagation, breeding techniques, and pest management in grass cultivation.	6
8	<b>Applications in Environmental Management:</b> Grasses for erosion control, phytoremediation, and landscaping.	6

### Suggested Books:

#### Text Books

1. **Agrostology: A Textbook of Grasses** – R.J. Goel, Daya Publishing House, 1st Edition, 2017.
2. **Grasses of the World** – T.R. Soderstrom et al., Smithsonian Institution Press, 1986.

#### References

1. **Poaceae: Grass Family** – Edited by W.D. Clayton, Royal Botanic Gardens, Kew, 1986.
2. **Grassland Ecophysiology and Grazing Ecology** – G.A. McNaughton and J.B. Wilson, Cambridge University Press, 1995.

3. **Forage Crop Production** – C.J. Nelson, American Society of Agronomy, 3rd Edition, 2012.

**Examination Scheme:**

<b>Components</b>	<b>Attendance</b>	<b>Assignments</b>	<b>Midterm Exam</b>	<b>Final Exam</b>
<b>Weightage (%)</b>	10%	20%	30%	40%

## Immunology Lab

**Course Code: CMBE-252**

**Credit Units: 01**

**Pre-requisite:** Basic understanding of Immunology

**Course Outcome:**

- (vii) Students will be able to understand/experience the immune system.
- (viii) Students will be able to understand related immunological techniques and apply them in medical laboratory profession.
- (ix) Students will be able to value role of immune system in different diseases.

**Details of the Course:-**

S. No.	Contents	Contact Hours
1	Differential leucocytes count	2
2	Total leucocytes count	2
3	Total RBC count	2
4	Separation of serum from blood	2
5	ELISA	2

**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	Using Antibodies: A Laboratory Manual. Harlow & Lane (1998) Cold Spring Harbor Lab Press.	1998
<b>Reference Books</b>		
1.	Immunological Techniques Made Easy. Cochet, et al (1998) Wiley Publishers, Canada	1998

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60



## Molecular Biology Lab

**Course Code: CMBE-254**

**Credit Units: 01**

**Pre-requisite:** Basic information of cell biology.

### **Course Outcome:**

After completion of the course the students should be able

6. To learn about principle and working of laboratory instruments.
7. To acquire a comprehensive knowledge on molecular biology techniques.
8. To become familiar with technical requirements, concepts and general procedures in molecular biology and implement the knowledge in research work.
9. To learn and implement different strategies to isolate genomic and plasmid DNA from cells
10. To understand the methods to check purity of isolated nucleic acid samples.
11. To analyze the methods of DNA based methods of identification of unknown samples.
12. To learn the methods of DNA amplification for future recombinant techniques.

### **Details of the Laboratory Course:-**

**Note:** A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by college according to facilities available.

<b>S. NO.</b>	<b>CONTENTS</b>	<b>CONTACT HOURS</b>
1	Isolation of genomic DNA from eukaryotic cells.	2
2	Isolation of RNA from eukaryotic cells.	2
3	Isolation of proteins from eukaryotic cells.	2
4	Isolation of genomic DNA from prokaryotic cells.	2
5	Isolation of plasmid DNA from Prokaryotic cells.	2
6	Restriction mapping of plasmid DNA: This experiment involves single and double digestion of the plasmid with restriction enzymes.	2
7	Gel electrophoretic separation of DNA and molecular wt. determination.	2
8	Gel electrophoretic separation of RNA.	2

9	Gel electrophoretic separation of proteins.	2
10	Transblot analysis of DNA.	2
11	Gel Extraction of DNA.	2
12	PCR amplification of DNA: Visualization by gel electrophoresis.	2

**Suggested Books:**

1.	Molecular Cloning – A laboratory manual: 3 <sup>rd</sup> Edition Vol. 1-3. Sambrook J and Russell D.W. (2001). Cold Spring Harbor laboratory Press, New York	2001
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**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60

## Recombinant DNA Technology Lab

Course Code: CMBE-256

Credit Units: 01

**Pre-requisite:** Basic experience of molecular biology techniques

### Course Outcome:

6. Students will be able to isolate and analyze DNA/plasmid DNA and protein.
7. Students will be able to digest and ligate the DNA molecules.
8. Students will be able to design primers and amplification of DNA by PCR.
9. Students will be able to learn the techniques of cloning gene in plasmid vectors.
10. Students will be able to screen the positive transformants with the gene cloned through reporter based assays.

### Details of the Course:-

S. No.	Contents	Contact Hours
1	Isolation of Vector/plasmid DNA	3
2	Quantification of Nucleic acid and determination of its purity	3
3	Isolation of protein	3
4	Restriction digestion of DNA and its analysis by AGE	6
5	Ligation of DNA molecules	3
6	Primer designing	3
7	Polymerase chain reaction	6
8	Preparation of competent cells	3
9	Transformation in bacteria and reporter gene assay	3

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Methods in yeast genetics: a Cold Spring Harbor Laboratory course manual. David C. Amberg, Daniel Burke, Jeffrey Strathern Cold Spring Harbor Laboratory Press, c2005 2005 ed.	2005
2.	Departmental Laboratory Manual	2018
	<b>Reference Books</b>	
1.	Molecular Cloning- A Laboratory Manual: 3 <sup>rd</sup> Edition, 2001, Vol. 1 -3 . Sambrook J and Russell D.W.(2001 ). Cold spring Harbor Laboratory Press, New York.	2001
2.	DNA cloning: A Practical Approach. Glover and Hames ( 2001) Oxford Univ. Press.	2001

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

# MICROBES IN ENVIRONMENT

**Course Code: GMBE-202**

**Credit Units: 03**

## **Course outcomes**

1. **Insect Biology:** Understand the anatomy, physiology, and classification of insects.
2. **Ecological Roles:** Analyze the ecological importance of insects in ecosystems and their interactions with other organisms.
3. **Insect Behavior:** Explore the behavioral patterns and adaptations of insects.
4. **Pest Management:** Learn techniques for identifying and managing insect pests in agriculture and public health.
5. **Applied Entomology:** Apply knowledge of entomology in fields like pollination, biocontrol, and forensic science.

## **Unit 1: Microorganisms and their Habitats**

Structure and function of ecosystems, Terrestrial Environment: Soil profile and soil microflora  
Aquatic Environment: Microflora of fresh water and marine habitats, Atmosphere: Aeromicroflora and dispersal of microbes, Animal Environment: Microbes in/on human body (Microbiomics) & animal (ruminants) body. Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels.

## **Unit 2: Microbial Interactions**

Microbe interactions: Mutualism, synergism, commensalism, competition, amensalism, parasitism, predation, Microbe-Plant interaction: Symbiotic and non symbiotic interactions, Microbe-animal interaction: Microbes in ruminants, nematophagus fungi and symbiotic luminescent bacteria.

## **Unit 3: Biogeochemical Cycling**

Carbon cycle: Microbial degradation of cellulose, hemicelluloses, lignin and chitin, Nitrogen cycle: Nitrogen fixation, ammonification, nitrification, denitrification and nitrate reduction, Phosphorus cycle: Phosphate immobilization and solubilisation, Sulphur cycle: Microbes involved in sulphur cycle, Other elemental cycles: Iron and manganese.

## **Unit 4: Waste Management**

Solid Waste management: Sources and types of solid waste, Methods of solid waste disposal

(composting and sanitary landfill), Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment.

### **Unit 5: Microbial Bioremediation**

Principles and degradation of common pesticides, hydrocarbons (oil spills).

### **Unit 6: Water Potability**

Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique and (c) Presence/absence tests.

### **References:**

1. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4<sup>th</sup> edition. Benjamin/Cummings Science Publishing, USA.
2. Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14<sup>th</sup> edition. Pearson/ Benjamin Cummings.
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2<sup>nd</sup> edition, Academic Press.
4. Okafor, N (2011). Environmental Microbiology of Aquatic & Waste systems. 1<sup>st</sup> edition, Springer, New York.
5. Singh A, Kuhad, RC & Ward OP (2009). Advances in Applied Bioremediation. Volume 17, Springer-Verlag, Berlin Hedeilberg.

### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

# MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT

**Course Code: GMBE-202a**

**Credit Units: 03**

## **Course outcomes**

1. **Insect Biology:** Understand the anatomy, physiology, and classification of insects.
2. **Ecological Roles:** Analyze the ecological importance of insects in ecosystems and their interactions with other organisms.
3. **Insect Behavior:** Explore the behavioral patterns and adaptations of insects.
4. **Pest Management:** Learn techniques for identifying and managing insect pests in agriculture and public health.
5. **Applied Entomology:** Apply knowledge of entomology in fields like pollination, biocontrol, and forensic science.

## **Unit 1: Soil Microbiology**

Soil as Microbial Habitat, Soil profile and properties, Soil formation, Diversity and distribution of microorganisms in soil.

## **Unit 2: Mineralization of Organic & Inorganic Matter in Soil**

Mineralization of cellulose, hemicelluloses, lignocelluloses, lignin and humus, phosphate, nitrate, silica, potassium.

## **Unit 3: Microbial Activity in Soil and Green House Gases**

Carbon dioxide, methane, nitrous oxide, nitric oxide – production and control

## **Unit 4: Microbial Control of Soil Borne Plant Pathogens**

Biocontrol mechanisms and ways, Microorganisms used as biocontrol agents against Microbial plant pathogens, Insects, Weeds.

## **Unit 5: Biofertilization, Phytostimulation, Bioinsecticides**

Plant growth promoting bacteria, biofertilizers – symbiotic (Bradyrhizobium, Rhizobium, Frankia), Non Symbiotic (Azospirillum, Azotobacter, Mycorrhizae, MHBs, Phosphate solubilizers, algae),

Novel combination of microbes as biofertilizers, PGPRs.

### **Unit 6: Secondary Agriculture Biotechnology**

Biotech feed, Silage, Biomanure, biogas, biofuels – advantages and processing parameters.

#### **References:**

1. Agrios GN. (2006). Plant Pathology. 5<sup>th</sup> edition. Academic press, San Diego,
2. Singh RS. (1998). Plant Diseases Management. 7<sup>th</sup> edition. Oxford & IBH, New Delhi.
3. Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press,
4. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4<sup>th</sup> edition.
5. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, AcademicPress.

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



# MANAGEMENT OF HUMAN MICROBIAL DISEASES

**Course Code: SMBE-202**

**Credit Unit: 04**

## **Course outcomes**

6. **Insect Biology:** Understand the anatomy, physiology, and classification of insects.
7. **Ecological Roles:** Analyze the ecological importance of insects in ecosystems and their interactions with other organisms.
8. **Insect Behavior:** Explore the behavioral patterns and adaptations of insects.
9. **Pest Management:** Learn techniques for identifying and managing insect pests in agriculture and public health.
10. **Applied Entomology:** Apply knowledge of entomology in fields like pollination, biocontrol, and forensic science.

## **Unit 1: Importance of Diagnosis of Diseases**

Bacterial, Viral, Fungal and Protozoan Diseases of various human body systems, Disease associated clinical samples for diagnosis.

## **Unit 2: Collection of Clinical Samples**

How to collect clinical samples (oral cavity, throat, skin, Blood, CSF, urine and faeces) and precautions required. Method of transport of clinical samples to laboratory and storage.

## **Unit 3: Direct Microscopic Examination and Culture**

Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa stained thin blood film for malaria, Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens.

## **Unit 4: Serological and Molecular Methods**

Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes.

## **Unit 5: Kits for Rapid Detection of Pathogens**

Typhoid, Dengue and HIV, Swine flu.

### **Unit 6: Testing for Antibiotic Sensitivity in Bacteria.**

Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method.

#### **References:**

1. Ananthanarayan R and Paniker CKJ (2009). Textbook of Microbiology, 8<sup>th</sup> edition, Universities Press Private Ltd.
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26<sup>th</sup> edition. McGraw Hill Publication.
3. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2<sup>nd</sup> edition, Elsevier India Pvt Ltd.
4. Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13<sup>th</sup> edition, Mosby.
5. Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and McCartney Practical Medical Microbiology, 14<sup>th</sup> edition, Elsevier.

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

# BIOINFORMATICS

**Course Code: CMBE-301**

**Credit Unit: 04**

## Course Outcomes

1. **Data Analysis:** Understand the principles of analyzing biological data using computational tools.
2. **Genomics and Proteomics:** Explore techniques for studying genomes, transcriptomes, and proteomes.
3. **Algorithm Development:** Apply algorithms for sequence alignment, phylogenetics, and molecular modeling.
4. **Database Management:** Learn to access, manage, and interpret biological databases.
5. **Applications:** Utilize bioinformatics in drug discovery, personalized medicine, and evolutionary studies.

### Unit 1: Introduction to computational biology

What is computational biology and bioinformatics, internet and bioinformatics, chemoinformatics. Introduction to linux and common terminal commands.

### Unit 2: Biological databases and genome browsers

Introduction to various databases and their classification (primary and secondary databases) e.g. NCBI, DDBJ, EMBL, ENSEMBL, UCSC and their use in laboratories: literature, sequence, structure, medical, enzymes and metabolic pathways databases.

### Unit 3: Sequence alignment and visualization

Local and global sequence alignments (Needleman-Wunsch and Smith-Waterman algorithms), pair-wise (BLAST and FASTA algorithms) and multiple sequence alignment (Clustal W) and its importance. Theory behind BLAST- how Hidden Markov Model (HMM) can be used to model a family of unaligned sequences or a common motif within a set of unaligned sequences and further be used for discrimination and multiple alignment, BLAST score, amino acid substitution matrices, s-value and e-value, calculating the alignment score and significance of e and p value.

### Unit 4: Phylogenetic analysis

Basics and tools for phylogenetic analysis, cladistics, tree-building methods (character and distance

based methods), construction of phylogenetic trees (PHYLIP) and identifying homologs.

### **Unit 5: Microarray analysis**

Introduction and use of DNA microarray to assay gene expression, designing of the experiment, analysis and biological interpretation, principle and applications of protein microarray.

#### **References:**

1. Bioinformatics: Sequence and Genome analysis, 2<sup>nd</sup> edition (2004), David W. Mount, Cold Spring Harbour Laboratory Press. ISBN-13: 978-0879697129.
2. Bioinformatics: A practical guide to the analysis of genes and proteins, 3<sup>rd</sup> edition (2004), Andreas D. Baxevanis and B.F. Francis Ouellette, John Wiley and Sons. ISBN-13: 978-0471478782.

#### **Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

# MICROBIOLOGICAL ANALYSIS OF AIR AND WATER

**Course Code: CMBE-301a**

**Credit Unit: 04**

## **Course outcomes:**

- Explain the importance of aseptic techniques in microbiological sampling.
- Describe various methods for sampling air and water.
- Identify the factors affecting microbial growth in air and water.
- Calculate microbial load in air and water samples.

## **Unit 1: Aeromicrobiology**

Bioaerosols, Air borne microorganisms (bacteria, Viruses, fungi) and their impact on human health and environment, significance in food and pharma industries and operation theatres,allergens.

## **Unit 2: Air Sample Collection and Analysis**

Bioaerosol sampling, air samplers, methods of analysis, CFU, culture media for bacteria and fungi, Identification characteristics.

## **Unit 3: Control Measures**

Fate of bioaerosols, inactivation mechanisms – UV light, HEPA filters, desiccation, Incineration.

## **Unit 4: Water Microbiology**

Water borne pathogens, water borne diseases.

## **Unit 5 Microbiological Analysis of Water**

Sample Collection, Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive/MPN tests confirmed and completed tests for faecal coliforms (b) Membrane filter technique and (c) Presence/absence tests.

**References:**

1. da Silva N, Taniwaki MH, Junqueira VC, Silveira N, Nascimento MS, Gomes RAR (2012) Microbiological Examination Methods of Food and Water A Laboratory Manual, CRC Press.
2. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4<sup>th</sup> edition. Benjamin/Cummings Science Publishing, USA.
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2<sup>nd</sup> edition, Academic Press.
4. Hurst CJ, Crawford RL, Garland JL, Lipson DA (2007) Manual of Environmental Microbiology, 3<sup>rd</sup> edition, ASM press.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## HOSPITAL MANAGEMENT

**Course Code: CMBE-301b**

**Credit Unit: 04**

### **Course outcomes:**

- to provide conceptual understanding of Management Concepts
- to familiarize the students with the contemporary issues in Management
- to understand and appreciate the human behaviour in organisations

### **UNIT - I Nature of Management -**

Social Responsibilities of Business - Manager and Environment Levels in Management - Managerial Skills - Planning - Steps in Planning Process - Scope and Limitations - Short Range and Long Range Planning - Flexibility in Planning Characteristics of a sound Plan - Management by Objectives (MBO) - Policies and Strategies - Scope and Formulation - Decision Making - Techniques and Processes

### **UNIT – II An Overview of Staffing, Directing and Controlling**

Functions - Organising - Organisation Structure and Design - Authority and Responsibility Relationships - Delegation of Authority and Decentralisation - Interdepartmental Coordination - Emerging Trends in Corporate Structure, Strategy and Culture - Impact of Technology on Organisational design - Mechanistic Vs Adoptive Structures - Formal and Informal Organisation

### **UNIT – III Perception and Learning -**

Personality and Individual Differences - Motivation and Job Performance - Values, Attitudes and Beliefs - Stress Management - Communication Types Process - Barriers - Making Communication Effective

### **UNIT – IV Group Dynamics -**

Leadership - Styles - Approaches - Power and Politics - Organisational Structure - Organisational Climate and Culture - Organisational Change and Development.

### **UNIT – V Comparative Management Styles and approaches -**

Japanese Management Practices Organisational Creativity and Innovation - Management of Innovation - Entrepreneurial Management - Benchmarking - Best Management Practices across the world - Select cases of Domestic & International Corporations - Management of Diversity.

**Suggested Books:**

- Koontz, Weirich & Aryasri, PRINCIPLES OF MANAGEMENT, Tata McGraw-Hill, NewDelhi,2004
- Tripathi & Reddy, PRINCIPLES OF MANAGEMENT, Tata McGraw-Hill, New Delhi,2008
- Laurie Mullins, MANAGEMENT AND ORGANISATIONAL BEHAVIOUR, Pearson, NewDelhi,2007
- Meenakshi Gupta, PRINCIPLES OF MANAGEMENT, PHI Learning, NewDelhi, 2009
- Fred Luthans, ORGANISATIONAL BEHAVIOUR, TataMcGraw-Hill, NewDelhi
- Stephen Robbins, ORGANISATIONAL BEHAVIOUR, Pearson, New Delhi
- Ricky Griffin, MANAGEMENT: PRINCIPLES & APPLICATIONS, Cengage, NewDelhi,2008

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## SOIL & WATER MICROBIOLOGY

**Course Code: CMBE-301c**

**Credit Unit: 04**

### **Course outcomes:**

- To enrich students' knowledge and train them in epidemiology and Immunology.
- To present to the students the concept of epidemiology, chemotherapy, drug resistance and immune system.
- To inculcate sense of Scientific Responsibilities & Social Awareness.
- To familiarize students with epidemiology and Immunology .
- To introduce the basic concepts of epidemiology and Immunology.

### **Course detail:**

#### **Unit 1: Epidemiology**

Aims and approaches of epidemiological studies. Basic measurements in Epidemiology. Measurement tools in epidemiology. Outline classification of epidemiological studies..Case control and cohort studies – Study design and application.

#### **Unit II: Clinical trials of drugs and vaccines**

Randomized control trials Concurrent parallel and cross-over trials and their applications. .Epidemiology of infectious diseases i. Sources and Reservoirs of Infection. Modes of Transmission of Infections. Disease Prevention and Control Measures.

#### **Unit III: Introduction to Chemotherapy**

.Classes of antibiotics.Selective toxicity, Bioavailability, MIC, MBC, LD50 .Antagonism and synergism in drugs.Concept of antibiotic sensitivity and drug resistance: (MDR,XDR,PDR).

#### **Unit IV : Immunology**

Immunity: Definition, Types innate and acquired, active and passive, humoral and cell mediated). Formation of blood cells (hematopoiesis): Myeloid and lymphoid lineages and differentiation process. Antigens and antibodies: definition and concept.

#### **Unit V: Immunoematology**

ABO and Rh blood group systems.Bombay blood group.Biochemistry of blood group substances.Inheritance of ABH antigens.Medico- legal applications of blood groups Active and Passive Immunization.Active Immunization -Whole organism vaccines i. Attenuated vaccines ii. Inactivated Vaccines iii. Recombinant vaccines iv. Conjugate vaccines v. Subunit vaccine vi.Toxoids.Passive Immunization Transfer of preformed antibodies.Latest Immunization schedule in India

SEMESTER V

Suggested Books :

Year	Book Title	Author(s)
2017	Ananthanarayan and Paniker's Textbook of Microbiology	Reba Kanungo
2004	Collins and Lyne's Microbiological Methods	C. H. Collins, P. M. Lyne, J. M. Grange, J. O. III Falkingham
2010	Antibiotic and Chemotherapy	R. Finch, D. Greenwood, R. Whitley, S. R. Norrby
2019	Park's Preventive and Social medicine	K. Park
2013	Medical Bacteriology Including Medical Mycology and AIDS	N. C. Dey, T. K. Dey, D. Sinha

## INSTRUMENTATION AND BIOTECHNIQUES

**Course Code: CMBE-303**

**Credit Unit: 04**

### **Course Outcomes**

1. **Laboratory Techniques:** Master essential laboratory techniques in molecular biology and biotechnology.
2. **Instrumentation Skills:** Understand the principles and applications of instruments like spectrophotometers, chromatography, and PCR machines.
3. **Data Interpretation:** Analyze and interpret experimental data obtained through various biotechnological instruments.
4. **Biotech Applications:** Apply biotechnology techniques in fields like diagnostics, agriculture, and pharmaceuticals.
5. **Quality Control:** Learn the importance of quality control and standardization in biotechnology experiments.

### **Unit 1: Microscopy**

Brightfield and darkfield microscopy, Fluorescence Microscopy, Phase contrast Microscopy, Confocal Microscopy, Electron Microscopy (Scanning and Transmission Electron Microscopy) and Micrometry.

### **Unit 2: Chromatography**

Principles and applications of paper chromatography (including Descending and 2-D), Thin layer chromatography. Column packing and fraction collection. Gel filtration chromatography, ionexchange chromatography and affinity chromatography, GLC, HPLC.

### **Unit 3: Electrophoresis**

Principle and applications of native polyacrylamide gel electrophoresis, SDS- polyacrylamide gel electrophoresis, 2D gel electrophoresis, Isoelectric focusing, Zymogram preparation and Agarose gel electrophoresis.

### **Unit 4: Spectrophotometry**

Principle and use of study of absorption spectra of biomolecules. Analysis of biomolecules using UV and visible range. Colorimetry and turbidometry.

### **Unit 5: Centrifugation**

Preparative and analytical centrifugation, fixed angle and swinging bucket rotors. RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and ultracentrifugation.

### References:

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7<sup>th</sup> Ed., Cambridge University Press.
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5<sup>th</sup> Ed., W.H. Freeman and Company.
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 9<sup>th</sup> Ed., McGraw Hill.
4. Karp G. (2010) Cell and Molecular Biology: Concepts and Experiments. 6<sup>th</sup> edition. John Wiley & Sons. Inc.
5. De Robertis EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8<sup>th</sup> edition. Lipincott Williams and Wilkins, Philadelphia.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## MARINE MICROBIOLOGY

**Course Code: CMBE-303a**

**Credit Unit: 04**

### **Course outcomes:**

- Describe the major groups of marine microorganisms (bacteria, archaea, fungi, viruses, and protists).
- Explain the ecological roles of marine microorganisms in nutrient cycling, primary production, and biogeochemical processes.
- Discuss the factors influencing microbial diversity and distribution in marine environments.
- Explain the processes of microbial decomposition and mineralization of organic matter.
  - Describe the role of marine microorganisms in biogeochemical cycles (carbon, nitrogen, sulfur, and phosphorus).
- Discuss the significance of microbial interactions with other organisms in marine food webs.

### **Unit 1: Marine Environment**

World's oceans & Seas, Physio – Chemical properties of marine water, marine microbial habitat: water column, sediments, coastal ecosystems, mangroves salt marshes. Bio-films & Microbial mats. Microbial life at surface of living & nonliving systems and microbial interactions. Quorum sensing in marine microbes and significance. Metabolic diversity and importance of microbial communities, Photo trophy & primary productivity.

### **Unit 2: Methods in Marine Microbiology**

Sampling methods of different habitat of oceans and screening by CLSM & FCM. Importance of Culturable & non-Cultural microorganisms. Molecular tools to study marine diversity. Limitations of analysis of nucleic acid directly from marine environment.

### **Unit 3: Role of Microbes in ocean processes**

Bioenergetics, Carbon & Nitrogen cycling in ocean, Photosynthesis and Primary productivity. Eutrophication of coastal areas. Microbial loop in ocean food web. Microbial processes and climate change. Bio – fouling & bio – deterioration, indicator organisms and pollution control. Symbiosis of microalgae with animals: Chemoautotrophic prokaryotes with animals. Symbionts of sponges, mixotrophy in protists. Metabolic consortia and mutualism between prokaryotes.

### **Unit 4: Marine Microbes**

Bacterial and viral disease of fresh water, seawater, aqua culture: fish, bivalve mollusks, Crustaceans, corals. Diagnosis methods. Control of diseases. Biodegradation and Bioremediation of marine pollutants (oil, Organic comp. etc.).

### **Unit 5: Recent trends in Marine Microbiology**

Recently identified microorganisms of marine ecosystem, there applications in present and future industries

#### **Suggested books:**

1. Munn, C. 2011. Marine Microbiology: Ecology and Applications. GS Publications. PP- 648.
2. Sekwon Kim. 2013. Marine Microbiology: Bioactive compounds and Biotechnological applications. Wiley VCH.
3. Paul, J. 2001. Marine Microbiology. Academic Press. PP-666.

#### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## VETERINARY SCIENCE

**Course Code: CMBE-303b**

**Credit Unit: 04**

### **Course Outcomes:**

- Understand the anatomical structure of domestic animals.
- Explain the physiological functions of various organ systems.
- Apply anatomical and physiological knowledge to diagnose and treat animal diseases.
  
- Understand the nutritional requirements of different animal species.
- Formulate balanced diets for various livestock and poultry.
- Evaluate the quality of feedstuffs.
- Apply principles of nutrition to improve animal health and productivity.

### **Unit 1: Animal Anatomy and Physiology**

Gross Anatomy of Domestic Animals ,Histology of Animal Tissues, Physiology of Various Organ Systems (Digestive, Respiratory, Circulatory, Nervous, Endocrine, Reproductive)

### **Unit 2: Animal Nutrition and Feed Science**

Nutrients and Their Functions, Feedstuffs: Classification and Composition, Feed Formulation and Ration Balancing, Ruminant Nutrition, Non-Ruminant Nutrition

### **Unit 3: Animal Reproduction and Genetics**

Reproductive Physiology of Male and Female Animals, Artificial Insemination, Embryo Transfer Technology, Genetics and Breeding, Genetic Disorders in Animals

### **Unit 4: Animal Diseases**

Infectious Diseases (Bacterial, Viral, Fungal, Parasitic), Non-Infectious Diseases (Nutritional, Metabolic, Toxic), Clinical Examination and Diagnosis, Disease Prevention and Control, Zoonotic Diseases

### **Unit 5: Animal Health and Welfare**

Animal Welfare Principles, Humane Slaughter and Handling, Veterinary Public Health, Zoonotic Disease Control, Animal Ethics and Legislation.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
<b>Text Books</b>		
1.	Textbook of Veterinary Anatomy <i>by Sisson and Grossman</i>	1979
2.	Veterinary Physiology <i>by Cunningham and Klein</i>	2009
3.	Livestock Feeds and Feeding <i>by Morrison</i>	2009
4.	Animal Nutrition <i>by Church and Pond</i>	2002

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60



## FOOD AND DAIRY MICROBIOLOGY

**Course Code: DMBE-301**

**Credit Unit: 04**

### **Course Outcomes**

1. **Microbial Contamination:** Understand the types and sources of microbial contamination in food and dairy products.
2. **Fermentation Processes:** Learn the role of microorganisms in food fermentation and dairy production.
3. **Food Preservation:** Analyze microbial control methods for food preservation, including pasteurization and refrigeration.
4. **Foodborne Pathogens:** Identify pathogenic microorganisms and their role in foodborne illnesses.
5. **Quality Control:** Apply microbiological techniques for assessing food safety and quality in food and dairy industries.

### **Unit 1: Foods as a substrate for microorganisms**

Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general.

### **Unit 2: Microbial spoilage of various foods**

Principles, Spoilage of vegetables, fruits, meat, eggs, milk and butter, bread, canned Foods.

### **Unit 3: Principles and methods of food preservation**

Principles, physical methods of food preservation: temperature (low, high, canning, drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO<sub>2</sub>, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins.

### **Unit 4: Fermented foods**

Dairy starter cultures fermented dairy products: yogurt, acidophilus milk, kumiss, kefir, dahi and cheese, other fermented foods: dosa, sauerkraut, soy sauce and tampeh, Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market.

### **Unit 5: Food borne diseases**

Food intoxications: Staphylococcus aureus, Clostridium botulinum and mycotoxins; Food infections: Bacillus cereus, Vibrio parahaemolyticus, Escherichia coli, Salmonellosis, Shigellosis, Yersinia enterocolitica, Listeria monocytogenes and Campylobacter jejuni.

**References:**

1. Adams MR and Moss MO. (1995). Food Microbiology. 4<sup>th</sup> edition, New Age International (P) Limited Publishers, New Delhi, India.
2. Banwart JM. (1987). Basic Food Microbiology. 1<sup>st</sup> edition. CBS Publishers and Distributors, Delhi, India.
3. Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.
4. Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.
5. Frazier WC and Westhoff DC. (1992). Food Microbiology. 3<sup>rd</sup> edition. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## DEVELOPMENTAL BIOLOGY AND EMBRYOLOGY

**Course Code: DMBE-301a**

**Credit Unit: 04**

### Course outcomes:

- Define key terms in developmental biology, such as differentiation, morphogenesis, and pattern formation.
- Explain the central dogma of molecular biology and its relevance to development.
- Describe the different stages of embryonic development, from fertilization to organogenesis.
- Understand the concept of cell fate determination and potency.
- Describe the process of fertilization, including sperm-egg recognition and fusion.
- Explain the early cleavage divisions and the formation of the blastula.
- Understand the process of gastrulation and the formation of germ layers.
- Describe the mechanisms of cell fate specification and differentiation.

### Unit 1: Introduction to Developmental Biology

Basic concepts of development, central dogma of molecular biology, model organisms, techniques in developmental biology.

### Unit 2: Fertilization and Early Embryonic Development

Gametogenesis, fertilization, cleavage, gastrulation, formation of germ layers.

### Unit 3: Organogenesis and Morphogenesis

Neurulation, organogenesis, cell signaling pathways, morphogenesis.

### Unit 4: Stem Cells and Regeneration

Stem cells, properties of stem cells, applications of stem cell research, regeneration.

### Unit 5: Evolutionary Developmental Biology (Evo-Devo)

Evolutionary developmental biology, homology and analogy, genetic toolkit, heterochrony and heterotopy, evolution of novel structures and body plans

### Suggested books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1.	Principles of Developmental Genetics	2014

2.	Developmental Biology	2018
3.	Signaling Pathways in Development	2000
4.	Molecular Biology of the Cell	2015
5.	Stem Cell Biology	2011

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## POPULATION BIOLOGY

**CourseCode:DMBE-303b**

**Credit Unit: 04**

### **Course Outcomes:**

- Understand the fundamental concepts of population ecology, including population size, density, distribution, and growth rates.
- Apply mathematical models (exponential and logistic growth) to analyze population dynamics.
- Evaluate the impact of density-dependent and density-independent factors on population regulation.
- Explain the Hardy-Weinberg equilibrium principle and its assumptions.
- Analyze the effects of genetic drift, gene flow, and natural selection on population genetic structure.
- Apply quantitative genetics concepts to understand phenotypic variation and heritability.

### **Unit 1: Introduction to Population Ecology**

Definition, scope, population characteristics, dynamics, growth models, life history strategies, population regulation.

### **Unit 2: Population Genetics**

Hardy-Weinberg equilibrium, genetic drift, gene flow, natural selection, quantitative genetics, molecular evolution, conservation genetics.

### **Unit 3: Population Interactions**

Interspecific interactions, intraspecific interactions, ecological niches, Lotka-Volterra models, community ecology, ecological succession.

### **Unit 4: Population Demography**

Life tables, survivorship curves, reproductive rates, population projections, demographic transition, human population dynamics.

### **Unit 5: Conservation Biology**

Biodiversity loss, conservation strategies, habitat fragmentation, population viability analysis, wildlife management, ecosystem services.

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1.	Principles of EcologyE.P. Odum	1983
2.	Fundamentals of EcologyEugene P. Odum	1971
3.	Ecology: Individuals, Populations, and CommunitiesM. Begon, J.L. Harper, C.R. Townsend	1996
4.	Population Ecology: A TreatiseBrian Dennis2014Population Ecology: A Unified ApproachAlan Berryman	2002
5.	Population Dynamics: A Theoretical and Empirical ApproachRobert M. May	1976

## Bioinformatics Lab

**Course Code: CMBE-351**

**Credit Units: 01**

**Pre-requisite:** Basic knowledge of computer application

**Course Outcome:**

11. Students will be able to understand basics of internet and computers along with information on various databases.
12. Students will be able to understand application of bioinformatics in biotechnology.
13. Students will be able to understand sequence alignment and various algorithms for it.
14. Students will be able to understand and interpret sequence annotation and its retrieval.
15. The information about various biologically important databases will be made available to students.

**Details of the Course:-**

**Note:** A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by college according to facilities available.

S. NO.	CONTENTS	CONTACT HOURS
1	Introduction to various databases of proteins, nucleic acids. Primary, secondary and composite databases.	3
2	BLAST, FASTA, DOT PLOT	3
3	MSA using various free tools.	3
4	Phylogenetic predictions.	3
5	Prediction of structure of proteins and nucleic acids	3
6	ORF prediction and its validation	3
7	Primer designing	3
8	Restriction mapping	3
9	Epitope prediction using various online tools	3
10	Data mining tool and its practical applications in a case study	3

**Suggested Books:**

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text/Reference Books</b>		
1.	Bioinformatics: Principles and Applications. Ghosh Z. and Bibekanand M., Oxford University Press, 2008.	2015
2.	Genome analysis and bioinformatics: a practical approach. T.R. Sharma, I.K. International Publishing House Pvt. Ltd., 2009.	2009
3.	Bioinformatics and Functional Genomics, Pevsner J. II Edition, Wiley-Blackwell, (2009).	2015
4.	Discovering Genomics, Proteomics and Bioinformatics, Campbell A. M., Heyer L. J., II Edition. Benjamin Cummings, 2006.	2006
5.	Bioinformatics: A practical guide to analysis of genes and proteins, Andreas D. Baxevanis, Wiley Student edition,	2006
6.	Bioinformatics, Sequence and genome analysis by David W. Mount, Second Edition, CSHL Press, 2004	2004

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60



## Instrumentation and Biotechniques Laboratory

**Course Code: CMBE-353**

**Credit Units: 01**

**Pre-requisite:** Basic knowledge of Biochemistry and Molecular Biology

**Course Outcome:**

After completion of the course, the students will be able to:

1. Understand the principles and applications of key bioinstrumentation tools.
2. Operate and troubleshoot laboratory instruments used in modern biological research.
3. Perform techniques such as spectrophotometry, chromatography, and electrophoresis.
4. Analyze biological samples using advanced laboratory techniques.
5. Integrate bioinstrumentation and biotechniques in molecular, biochemical, and cellular studies.

**Details of the Laboratory Course:**

**Note:** A college must offer 70% of the below-listed experiments. The remaining 30% experiments may be modified by the college according to available facilities.

S. No.	Contents	Contact Hours
1	<b>Principles and Operation of Spectrophotometer:</b> Measurement of absorption spectra and concentration using Beer-Lambert's law.	3
2	<b>Chromatographic Techniques:</b> Separation of biomolecules using thin-layer chromatography (TLC) and column chromatography.	3
3	<b>Electrophoresis:</b> Separation of proteins or nucleic acids using SDS-PAGE and agarose gel electrophoresis.	3
4	<b>Centrifugation Techniques:</b> Separation of cell components and biomolecules using differential and density gradient centrifugation.	3
5	<b>pH Meter Calibration and Use:</b> Measurement of pH for various biological samples and buffers.	2
6	<b>Fluorometry:</b> Use of fluorescence spectrophotometry for protein and DNA quantification.	2
7	<b>ELISA:</b> Perform Enzyme-Linked Immunosorbent Assay for antigen or antibody detection.	3
8	<b>Microscopy Techniques:</b> Observation of biological specimens using phase-contrast and fluorescence microscopy.	2
9	<b>Protein Estimation:</b> Estimation of proteins using Bradford or Lowry method.	3
10	<b>Molecular Techniques:</b> DNA extraction and its quantification using NanoDrop or spectrophotometer.	2

**Suggested Books:****Text Books**

1. **Principles and Techniques of Biochemistry and Molecular Biology** – Wilson, K., and Walker, J., Cambridge University Press, 2018.
2. **Practical Biochemistry** – David Plummer, McGraw Hill Education, 2009.
3. **Biophysical Chemistry: Principles and Techniques** – Upadhyay, Upadhyay, and Nath, Himalaya Publishing House, 2016.

**References**

1. **Bioinstrumentation** – Webster J.G., Wiley-Interscience, 2004.
2. **Techniques in Molecular Biology** – Vinay Sharma, Academic Press, 2017.
3. **Fundamentals of Bioanalytical Techniques and Instrumentation** – Sabari Ghoshal, PHI Learning, 2010.
4. **Analytical Biochemistry** – Holme and Peck, Pearson Education, 2014.

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>	<b>External Evaluation</b>
<b>Attendance</b>	10%	
<b>Viva-Voce</b>	20%	
<b>Practical Record</b>	10%	
<b>Weightage</b>		60%

## Minor Project

**Course Code: DMBE-351**

**Credit Units: 01**

**Pre-requisite:** Basic understanding of microbiological techniques and concepts.

### Course Outcome:

After completion of the course, students will be able to:

1. Design and execute a research-based microbiological project.
2. Develop technical skills in handling microbiological tools and techniques.
3. Analyze experimental results and interpret findings scientifically.
4. Prepare scientific reports and presentations effectively.
5. Apply theoretical microbiological knowledge to practical and real-world problems.

### Details of the Course:

- **Project Description:**  
The minor project will involve identifying a microbiological problem or question, formulating a hypothesis, conducting experiments, and reporting the findings. Students will work in small groups or individually under the guidance of a faculty member.
- **Suggested Topics (examples):**
  1. Isolation and characterization of bacteria from soil, water, or food samples.
  2. Antimicrobial activity of plant extracts or synthesized nanoparticles.
  3. Study of the role of probiotics in gut microbiota.
  4. Bioremediation potential of soil microorganisms.
  5. Microbial diversity analysis in a specific environment using culture and non-culture methods.
  6. Testing the efficiency of household disinfectants on microbial populations.
  7. Investigation of fungal species in a particular habitat (e.g., air, soil).
  8. Study of biofilm formation and its inhibition using natural or synthetic agents.
- **Project Workflow:**
  1. Identification of research topic and literature review (Week 1).
  2. Experimental design and resource allocation (Week 2).
  3. Conducting experiments and data collection (Weeks 3–6).
  4. Analysis of results and compilation of data (Week 7).
  5. Preparation of project report and presentation (Week 8).
- **Report Submission:**  
A comprehensive project report must be submitted, including an introduction, materials and methods, results, discussion, conclusion, and references.
- **Evaluation Scheme:**
- **Evaluation Scheme:**

Components	Project Proposal	Execution of the Work	Practical Skills	Final Report	Oral Presentation
Weightage (%)	10%	30%	20%	20%	20%

**Suggested References:**

1. **Research Methods in Microbiology** – Elsevier, 2014.
2. **Practical Microbiology** – R.C. Dubey and D.K. Maheshwari, S. Chand Publishing, 2021.
3. **Experiments in Microbiology, Plant Pathology, and Biotechnology** – K.R. Aneja, New Age International, 2017.
4. Relevant research articles and journal publications depending on the chosen topic.

## Industrial Biotechnology Laboratory

**Course Code: SMBE-551**
**Credit Units: 01**
**Pre-requisite:** Basic understanding of microbiology, molecular biology, and biochemistry.

**Course Outcome:**

After completion of the course, students will be able to:

1. Learn fermentation techniques and operate industrial bioprocess equipment.
2. Develop skills in the production and analysis of biotechnological products.
3. Understand the principles of enzyme kinetics and immobilization.
4. Explore microbial processes for the production of biofuels, antibiotics, and other bio-products.
5. Perform downstream processing techniques for product purification.

**Details of the Laboratory Course:**

**Note:** A college must offer 70% of the below-listed experiments. The remaining 30% experiments may be modified by the college according to available facilities.

S. No.	Contents	Contact Hours
1	<b>Screening of Industrially Important Microorganisms:</b> Isolation and characterization from soil or water.	3
2	<b>Submerged and Solid-State Fermentation:</b> Production of enzymes or bioactive compounds.	3
3	<b>Enzyme Kinetics Study:</b> Determination of $K_m$ and $V_{max}$ using a model enzyme (e.g., amylase, lipase).	3
4	<b>Immobilization Techniques:</b> Entrapment and activity assay of immobilized enzymes.	3
5	<b>Production of Alcohol/Biofuels:</b> Fermentation of sugars by <i>Saccharomyces cerevisiae</i> or other microbes.	3
6	<b>Antibiotic Production and Assay:</b> Penicillin production and antibacterial activity testing.	3
7	<b>Batch Fermentation:</b> Monitoring parameters like pH, temperature, and dissolved oxygen during a batch culture.	3
8	<b>Downstream Processing:</b> Product recovery using centrifugation, filtration, and solvent extraction.	3
9	<b>Bioassay Techniques:</b> Determining the biological activity of a product (e.g., vitamins, antibiotics).	2
10	<b>Bioplastic Production:</b> Synthesis and analysis of polyhydroxyalkanoates (PHA) from microbial cultures.	3

**Suggested Books:****Text Books**

1. **Industrial Microbiology** – Prescott and Dunn, CBS Publishers, 5th Edition, 2007.
2. **Principles of Fermentation Technology** – P. F. Stanbury, A. Whitaker, and S. J. Hall, Butterworth-Heinemann, 3rd Edition, 2016.
3. **Biochemical Engineering Fundamentals** – James E. Bailey and David F. Ollis, McGraw-Hill, 1986.

**References**

1. **Comprehensive Biotechnology** – Moo-Young, M., Pergamon Press, 2nd Edition, 2011.
2. **Biotechnology: A Laboratory Course** – Becker, J., and Caldwell, G., Academic Press, 1996.
3. **Manual of Industrial Microbiology and Biotechnology** – Demain and Solomon, ASM Press, 3rd Edition, 2010.
4. **Biotechnology: Concepts and Applications** – H. D. Kumar, East-West Press, 2007.

**Examination Scheme:**

<b>Components</b>	<b>Project Proposal</b>	<b>Execution of the Work</b>	<b>Practical Skills</b>	<b>Final Report</b>	<b>Oral Presentation</b>
<b>Weightage (%)</b>	10%	30%	20%	20%	20%

This syllabus emphasizes key practical aspects of Industrial Biotechnology, including fermentation, enzyme technology, product recovery, and bioprocess analysis, to prepare students for industrial and research roles in biotechnology.

## GENETIC ENGINEERING AND BIOTECHNOLOGY

**Course Code: GMBE-201**

**Credit Unit:**

**03**

1. Molecular Tools: Understand the principles and tools used in gene cloning and genetic engineering.
2. Vector Design: Learn the construction and application of cloning and expression vectors.
3. Gene Manipulation: Demonstrate proficiency in techniques like PCR, restriction digestion, and ligation.
4. Applications: Explore the use of recombinant DNA in medicine, agriculture, and industry.
5. Ethics and Safety: Analyze the ethical, legal, and biosafety considerations of genetic engineering.

### **Unit 1: Introduction to genetic engineering**

Milestones in genetic engineering and biotechnology, Restriction modification systems: Mode of action, applications of Type II restriction enzymes in genetic engineering, DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases, Cloning: Use of linkers and adaptors Transformation of DNA: Chemical method, Electroporation Methods of DNA, RNA and Protein analysis: Agarose gel electrophoresis, Southern - and Northern - blotting techniques, dot blot, DNA microarray analysis, SDS-PAGE and Western blotting.

### **Unit 2: Vectors**

Cloning Vectors: Definition and Properties, Plasmid vectors: pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs, Expression vectors: E.coli lac and T7 promoter-based vectors, yeast YIp, YE<sub>p</sub> and YC<sub>p</sub> vectors, Baculovirus based vectors, mammalian SV40-based expression vectors.

### **Unit 3: DNA Amplification and DNA sequencing**

PCR: Basics of PCR, RT-PCR, Real-Time PCR, Genomic and cDNA libraries: Preparation and uses, Genome sequencing, Sanger's method of DNA Sequencing: traditional and automated sequencing.

#### **Unit 4 Application of Genetic Engineering and Biotechnology**

Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral mediated delivery, Agrobacterium - mediated delivery, Products of recombinant DNA technology: Products of human therapeutic interest - insulin, hGH, antisense molecules. Bt transgenic - cotton, brinjal, flavo savo tomato, Gene therapy, recombinant vaccine, protein engineering.

#### **Unit 5 Intellectual Property Rights**

Patents, Copyrights, Trademarks.

#### **References:**

1. Brown TA. (2010). Gene Cloning and DNA Analysis. 6<sup>th</sup> edition. Blackwell Publishing, Oxford, U.K.
2. Clark DP and Pasternik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA.
3. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7<sup>th</sup> edition. Blackwell Publishing, Oxford, U.K.
4. Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3<sup>rd</sup> edition. ColdSpring Harbor Laboratory Press.
5. Wiley JM, Sherwood LM and Woolverton CJ. (2013). Prescott, Harley and Klein's Microbiology. 8<sup>th</sup> edition, McGraw Hill Higher Education.

#### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## GENOME ORGANISATION AND FUNCTION

**Course Code: GMBE-503**

**Credit Unit: 03**

### Course outcomes:

- Explain the structure and organization of DNA, including the concept of the double helix.
- Describe the different levels of DNA packaging, from nucleosomes to chromosomes.
- Discuss the concept of genome size and its relationship to organismal complexity.
- Explain the semi-conservative mechanism of DNA replication.
- Describe the role of DNA polymerases and other enzymes in DNA replication.
- Discuss the various types of DNA repair mechanisms, including base excision repair, nucleotide excision repair, and mismatch repair.

**Unit 1: Introduction to Genomics** Genome structure, genome size and complexity, the human genome project, functional genomics, structural genomics, comparative genomics.

**Unit 2: DNA Replication and Repair** DNA replication mechanisms, DNA repair mechanisms, DNA damage and mutagenesis.

**Unit 3: Transcription and RNA Processing** Transcription initiation, elongation, and termination, RNA polymerase, RNA processing (capping, splicing, polyadenylation), RNA stability and degradation.

**Unit 4: Translation and Protein Synthesis** Genetic code, ribosome structure and function, translation initiation, elongation, and termination, protein folding and post-translational modifications.

**Unit 5: Gene Regulation** Gene regulation in prokaryotes and eukaryotes, transcriptional regulation, post-transcriptional regulation, translational regulation, epigenetic regulation.

### Suggested books:

S. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text/Reference Books</b>		
1.	Molecular Biology of the Cell Alberts, Johnson, Lewis, Raff, Roberts, Walter	Various Editions
2.	Genetics: A Conceptual Approach Benjamin A. Pierce.	Various Editions
3.	Principles of Genetics D. Peter Snustad and Michael J. Simmons	Various Editions

4.	Molecular Biology of the Gene James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick	Various Editions
5.	Biology T.A. Brown	Various Editions

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20	10	60

**INDUSTRIAL BIOTECHNOLOGY****Course Code:SMBE-501****Credit Unit: 03****Course outcomes:****Pre-requisite:** Basic knowledge of biotechnology**Course Outcome:**

- Students will be able to understand the technologies for microbial cell maintenance.
- Students will learn about bioprocess technology.
- Students will be able to understand fermenters.

**Details of the Course:****UNIT -1**

Technology of Microbial Cell Maintenance Principles of Microbial growth, Methods to increase yield of microbes, Batch, fed- batch and continuous cultures (definition and kinetics). Strain preservation, maintenance and strain improvement by mutation of gene transfer processes. Microbial culture selection with high yield potential. Commercial Production of Microorganisms.

**UNIT -2**

Production of Primary Metabolites A brief outline of processes for the production of some commercially important organic acids (e.g. citric acid, lactic acid, acetic acid etc.); amino acids (glutamic acid, phenylalanine, aspartic acid etc.) and alcohols (ethanol, butanol etc.)

**UNIT -3**

Production of Secondary Metabolites Study of production processes for various classes of secondary metabolites: antibiotics: betalactams (penicillin, cephalosporin etc.), aminoglycosides (streptomycin etc.), macrolides (erythromycin), vitamins and steroids.

**UNIT -4**

Design and construction of a Fermentors: Body construction; construction material; Aeration and agitation systems; Stirrer glands and bearings; Baffles; Valves and steam traps; Pressure-control valves; computer applications in fermentation technology; specialized bioreactors; membrane bioreactors; tower bioreactors; fluidized bed bioreactors; Immobilized system and packed bed reactors and Photobioreactors.

**UNIT -5**

Production Modern Biotechnology Products Production of recombinant proteins having therapeutic and diagnostic applications, production of vaccines. Production of monoclonal antibodies. Products of plant and animal cell culture.

**Suggested Books:**

S.No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
<b>Text Books</b>		
1.	W. Crueger and A. Crueger. Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.	2000
2.	P.F. Stanbury and A. Whitaker-Principle of Fermentation Technology; Pergamon Press	1988
3	A.H. Patel. Industrial Microbiology. 1st edition, Macmillan India Limited.	1996
<b>Reference Books</b>		
1.	L.E. Casida. Industrial Microbiology. 1st edition. Wiley Eastern Limited.	1991
2	M. L. Shuler and F. Kargi-Bioprocess Engineering: Basic Concepts” by, 2nd Edition, Pearson Education	2001

**Examination Scheme:**

## SEMESTER V

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

**INDUSTRIAL BIOTECHNOLOGY LAB****Course Code:SMBE-551****Credit Unit: 01****Pre-requisite:** Basic knowledge of cell biology, biotechnology.**Course Outcome:**

After completion of the course the students will be able to

- To acquire a comprehensive knowledge on animal biotechnology and applications.
- To become familiar with technical requirements, concepts and general procedures in animal cell culture and implement the knowledge in research work.
- To learn and implement different strategies to grow store cell lines.
- To understand the methods to test cell viability.
- To visualize cell lines using different microscopic methods.

**Details of the Course:-**

Note: A college must offer 70% of the below listed experiments. The remaining 30% experiments may be modified by college according to facilities available.

<b>S. NO.</b>	<b>CONTENTS</b>	<b>CONTACT HOURS</b>
1	Preparation of animal cell culture medium.	3
2	Revival of cell line	3
3	Cell line counting	3
4	Cell line Viability testing (Trypan blue, MTT method)	3
5	Trypsinization (Cell passaging)	3
6	Storage of cell line	3
7	Isolation of Primary cell culture from Organs (Liver)	3
8	Imaging of cell line (Phase contrast microscopy, Fluorescence microscopy)	3
9	Sterilization of animal cell culture, serum and medium.	3

**Suggested Books:**

<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>	<b>Year of Publication/Reprint</b>
	<b>Text Books</b>	
1	Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications, R. Ian Freshney. 6 <sup>th</sup> edition	2011

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Viva-Voce</b>	<b>Practical Record</b>	
<b>Weightage (%)</b>	10	20	10	60

## FOOD FERMENTATION TECHNIQUES

**Course Code: DMBE-305**

**Credit Unit: 04**

1. Fermentation Basics: Understand the principles and processes of fermentation in food production.
2. Microorganism Roles: Learn the roles of yeast, bacteria, and molds in food fermentation.
3. Fermented Products: Explore the production and characteristics of various fermented foods like bread, yogurt, and beverages.
4. Fermentation Control: Analyze methods to control fermentation parameters for desired product outcomes.
5. Health Benefits: Examine the nutritional, sensory, and probiotic benefits of fermented foods.

### **Unit 1: Fermented Foods**

Definition, types, advantages and health benefits

### **Unit 2: Milk Based Fermented Foods**

Dahi, Yogurt, Buttermilk (Chach) and cheese: Preparation of inoculums, types of microorganisms and production process

### **Unit 3: Grain Based Fermented Foods**

Soy sauce, Bread, Idli and Dosa: Microorganisms and production process

### **Unit 4: Vegetable Based Fermented Foods**

Pickels, Saeurkraut: Microorganisms and production process

### **Unit 5: Fermented Meat and Fish**

Types, microorganisms involved, fermentation process

### **Unit 6: Probiotic Foods**

Definition, types, microorganisms and health benefits

### References:

1. Hui YH, Meunier-Goddik L, Josephsen J, Nip WK, Stanfield PS (2004) Handbook of food and fermentation technology, CRC Press.
2. Holzapfel W (2014) Advances in Fermented Foods and Beverages, Woodhead Publishing.
3. Yadav JS, Grover, S and Batish VK (1993) A comprehensive dairy microbiology, Metropolitan.
4. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7<sup>th</sup> edition. Springer.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## FOOD FERMENTATION TECHNIQUES LAB

**Course Code: DMBE-355**

**Credit Unit: 01**

### Course outcomes:

- Understand the fundamental principles of microbial fermentation.
- Identify various microorganisms involved in food fermentation.
- Explain the role of environmental factors (temperature, pH, oxygen, etc.) in fermentation
- Differentiate between various fermentation techniques (lactic acid, alcoholic, acetic acid,
- Understand the importance of starter cultures in fermentation.

#### 1. Lactic Acid Fermentation:

- **Foods:** Yogurt, sauerkraut, kimchi, pickles
- **Microorganisms:** Lactic acid bacteria (LAB)
- **Process:** Anaerobic fermentation of sugars into lactic acid, resulting in acidic products.

#### 2. Alcoholic Fermentation:

- **Foods:** Wine, beer, cider, sake
- **Microorganisms:** Yeast
- **Process:** Anaerobic conversion of sugars into alcohol and carbon dioxide.

#### 3. Acetic Acid Fermentation:

- **Foods:** Vinegar
- **Microorganisms:** Acetic acid bacteria
- **Process:** Aerobic oxidation of ethanol into acetic acid.

#### 4. Soy Sauce Fermentation:

- **Foods:** Soy sauce
- **Microorganisms:** Aspergillus oryzae, yeast, bacteria
- **Process:** A complex fermentation process involving koji mold, yeast, and bacteria, resulting in a salty, umami-rich sauce.

#### 5. Miso Fermentation:

- **Foods:** Miso paste
- **Microorganisms:** Aspergillus oryzae, yeast, bacteria
- **Process:** A fermentation process similar to soy sauce, but with different ratios of ingredients and longer fermentation times.

#### 6. Tempeh Fermentation:

- **Foods:** Tempeh
- **Microorganisms:** Rhizopus oligosporus
- **Process:** Fungal fermentation of soybeans, resulting in a protein-rich, fermented food.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Viva-Voce	Practical Record	
Weightage (%)	10	20 18	10	60



## PLANT PATHOLOGY

**Course Code: CMBE-302**

**Credit Unit: 04**

### **Course outcomes**

1. Disease Identification: Identify and classify plant diseases caused by fungi, bacteria, viruses, and other pathogens.
2. Pathogen-Host Interaction: Understand the mechanisms of plant-pathogen interactions and how diseases affect plant health.
3. Disease Management: Learn strategies for managing and controlling plant diseases, including chemical, biological, and cultural methods.
4. Plant Immune Response: Explore plant defense mechanisms and the molecular basis of plant immunity.
5. Impact on Agriculture: Assess the economic and ecological impact of plant diseases on agriculture and food security.

### **Unit 1: Introduction and History of plant pathology**

Concept of plant disease- definitions of disease, disease cycle & pathogenicity, symptoms associated with microbial plant diseases, types of plant pathogens, economic losses and social impact of plant diseases. Significant landmarks in the field of plant pathology- Contributions of Anton DeBary, Millardet, Burrill, E. Smith, Adolph Mayer, Ivanowski, Diener, Stakman, H.H. Flor, Van Der Plank, molecular Koch's postulates. Contributions of eminent Indian plant pathologists.

### **Unit 2 Stages in development of a disease**

Infection, invasion, colonization, dissemination of pathogens and perennation.

### **Unit 3 Plant disease epidemiology**

Concepts of monocyclic, polycyclic and polyetic diseases, disease triangle & disease pyramid, Forecasting of plant diseases and its relevance in Indian context.

### **Unit 4 Host Pathogen Interaction**

A. Microbial Pathogenicity

Virulence factors of pathogens: enzymes, toxins (host specific and non specific) growth regulators, virulence factors in viruses (replicase, coat protein, silencing suppressors) in disease development.

Effects of pathogens on host physiological processes (photosynthesis, respiration, cell membrane

permeability, translocation of water and nutrients, plant growth and reproduction).

**B. Genetics of Plant Diseases**

Concept of resistance (R) gene and avirulence (avr) gene; gene for gene hypothesis, types of plant resistance: true resistance– horizontal & vertical, apparent resistance.

**C. Defense Mechanisms in Plants**

Concepts of constitutive defense mechanisms in plants, inducible structural defenses (histological cork layer, abscission layer, tyloses, gums), inducible biochemical defenses

[hypersensitive response (HR), systemic acquired resistance (SAR), phytoalexins, pathogenesis related (PR) proteins, plantibodies, phenolics, quinones, oxidative bursts].

### **Unit 5 Control of Plant Diseases**

Principles & practices involved in the management of plant diseases by different methods, viz. regulatory - quarantine, crop certification, avoidance of pathogen, use of pathogen free propagative material, cultural - host eradication, crop rotation, sanitation, polyethylene traps and mulches, chemical - protectants and systemic fungicides, antibiotics, resistance of pathogens to chemicals. Biological - suppressive soils, antagonistic microbes-bacteria and fungi, trap plants genetic engineering of disease resistant plants- with plant derived genes and pathogen derived genes.

### **Unit 6 Specific Plant diseases**

Study of some important plant diseases giving emphasis on its etiological agent, symptoms, Epidemiology and control.

A. Important diseases caused by fungi, White rust of crucifers - *Albugo candida*, Downy mildew of onion - *Peronospora destructor* Late blight of potato - *Phytophthora infestans*, Powderymildew of wheat - *Erysiphe graminis*, Ergot of rye - *Claviceps purpurea*, Black stem rust of wheat - *Puccinia graminis tritici*, Loose smut of wheat - *Ustilago nuda*, Wilt of tomato - *Fusarium oxysporum* f.sp. *lycopersici*, Red rot of sugarcane - *Colletotrichum falcatum*, Early blight of potato - *Alternaria solani*.

B. Important diseases caused by phytopathogenic bacteria: Angular leaf spot of cotton, bacterial leaf blight of rice, crown galls, and bacterial cankers of citrus.

C. Important diseases caused by phytoplasmas: Aster yellow, citrus stubborn.

D. Important diseases caused by viruses: Papaya ring spot, tomato yellow leaf curl, banana bunchy top, rice tungro.

E. Important diseases caused by viroids: Potato spindle tuber, coconut cadang cadang.

**References:**

1. Agrios GN. (2006). Plant Pathology. 5<sup>th</sup> edition. Academic press, San Diego.
2. Lucas JA. (1998). Plant Pathology and Plant Pathogens. 3<sup>rd</sup> edition. Blackwell Science, Oxford.
3. Mehrotra RS. (1994). Plant Pathology. Tata McGraw-Hill Limited.
4. Rangaswami G. (2005). Diseases of Crop Plants in India. 4<sup>th</sup> edition. Prentice Hall of India Pvt. Ltd., New Delhi.
5. Singh RS. (1998). Plant Diseases Management. 7<sup>th</sup> edition. Oxford & IBH, New Delhi.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## Medicinal Microbiology

**Course Code:** CMBE-302a

**Credit Units:** 03

**Pre-requisite:** Basic understanding of microbiology, bacteriology, and immunology.

### Course Outcome:

After completion of this course, students will be able to:

1. Understand the relationship between microorganisms and human diseases.
2. Identify the major pathogens responsible for infectious diseases.
3. Learn the principles of microbial pathogenesis, diagnosis, and treatment.
4. Analyze the role of the immune system in defense against infections.
5. Develop skills for laboratory diagnosis and interpretation of microbial infections.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Medical Microbiology:</b> Role of microbiology in medicine, history, and scope of medical microbiology.	4
2	<b>Microbial Classification and Identification:</b> Bacteria, viruses, fungi, and parasites. Methods of identification and classification.	6
3	<b>Pathogenesis and Disease Mechanisms:</b> Virulence factors, microbial adhesion, invasion, immune evasion.	8
4	<b>Bacterial Infections:</b> Common bacterial pathogens, diseases caused by bacteria, diagnostic techniques, and antimicrobial therapy.	8
5	<b>Viral Infections:</b> Classification, structure, replication, and diseases caused by viruses (e.g., HIV, influenza, hepatitis).	8
6	<b>Fungal and Parasitic Infections:</b> Diseases caused by fungi (e.g., candidiasis, aspergillosis) and parasites (e.g., malaria, giardiasis).	6
7	<b>Microbial Diagnosis:</b> Laboratory techniques for diagnosing infections (e.g., Gram staining, PCR, ELISA, culture methods).	6
8	<b>Antimicrobial Resistance:</b> Mechanisms of resistance, multidrug-resistant organisms (MDRO), and strategies to combat resistance.	4
9	<b>Immunology in Medical Microbiology:</b> Role of the immune system in infection control, immunization, and diagnostic immunology.	6
10	<b>Hospital-Acquired Infections (HAIs):</b> Epidemiology, control, and prevention of hospital-acquired infections.	4

### Suggested Books:

#### Text Books

1. **Medical Microbiology** – Patrick R. Murray, Ken S. Rosenthal, and Michael A. Pfaller, Elsevier, 8th Edition, 2015.
2. **Sherris Medical Microbiology** – Kenneth J. Ryan<sup>19</sup>, C. George Ray, McGraw-Hill, 6th Edition, 2018.

## References

1. **Medical Microbiology: A Guide to Microbial Infections** – P.M. Johnson, Elsevier, 7th Edition, 2015.
2. **Medical Microbiology and Infection at a Glance** – Stephen Gillespie and Kathleen Bamford, Wiley-Blackwell, 2nd Edition, 2015.
3. **Clinical Microbiology Made Ridiculously Simple** – Mark Gladwin and William Trattler, MedMaster, 7th Edition, 2015.

## Examination Scheme:

<b>Components</b>	<b>Attendance</b>	<b>Assignments</b>	<b>Midterm Exam</b>	<b>Final Exam</b>
<b>Weightage (%)</b>	10%	20%	30%	40%



## MARINE MICROBIOLOGY

**Course Code: CMBE-304**

**Credit Unit: 04**

### **Course Outcomes**

- Marine Microbial Diversity: Understand the diversity and ecological roles of microorganisms in marine environments.
- Microbial Ecosystems: Analyze the structure and function of marine microbial communities in various habitats.
- Biogeochemical Cycles: Explore the role of marine microorganisms in nutrient cycling and energy flow in marine ecosystems.
- Marine Pathogens: Identify marine microorganisms that contribute to disease in marine organisms and humans.
- Biotechnology Applications: Apply knowledge of marine microbes to biotechnological innovations in areas like bioremediation and biofuels.

### **Unit 1: Marine Environment**

World's oceans & Seas, Physio – Chemical properties of marine water, marine microbial habitat: water column, sediments, coastal ecosystems, mangroves salt marshes. Bio-films & Microbial mats. Microbial life at surface of living & nonliving systems and microbial interactions. Quorum sensing in marine microbes and significance. Metabolic diversity and importance of microbial communities, Photo trophy & primary productivity.

### **Unit 2: Methods in Marine Microbiology**

Sampling methods of different habitat of oceans and screening by CLSM & FCM. Importance of Culturable & non-Cultural microorganisms. Molecular tools to study marine diversity. Limitations of analysis of nucleic acid directly from marine environment.

### **Unit 3: Role of Microbes in ocean processes**

Bioenergetics, Carbon & Nitrogen cycling in ocean, Photosynthesis and Primary productivity. Eutrophication of coastal areas. Microbial loop in ocean food web. Microbial processes and climate change. Bio – fouling & bio – deterioration, indicator organisms and pollution control. Symbiosis of microalgae with animals: Chemo<sup>19</sup>autotrophic prokaryotes with animals. Symbionts

of sponges, mixotrophy in protists. Metabolic consortia and mutualism between prokaryotes.

#### **Unit 4: Marine Microbes**

Bacterial and viral disease of fresh water, seawater, aqua culture: fish, bivalve mollusks, Crustaceans, corals. Diagnosis methods. Control of diseases. Biodegradation and Bioremediation of marine pollutants (oil, Organic comp. etc.).

#### **Unit 5: Recent trends in Marine Microbiology**

Recently identified microorganisms of marine ecosystem, there applications in present and future industries.

#### **References:**

1. Munn, C. 2011. Marine Microbiology: Ecology and Applications. GS Publications. PP- 648.
2. Sekwon Kim. 2013. Marine Microbiology: Bioactive compounds and Biotechnological applications. Wiley VCH.
3. Paul, J. 2001. Marine Microbiology. Academic Press. PP-666.

#### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## Soil and Water Analysis of Microbes

**Course Code: CMBE-304a**

**Credit Units: 03**

**Pre-requisite:** Basic understanding of microbiology, environmental science, and ecology.

### Course Outcome:

After completion of this course, students will be able to:

1. Understand the microbial communities in soil and water ecosystems.
2. Learn the methods for isolation, identification, and quantification of soil and water microorganisms.
3. Explore the impact of soil and water microbes on environmental health and pollution control.
4. Develop skills in laboratory techniques for microbial analysis of environmental samples.
5. Gain practical experience in interpreting microbial data and its significance in environmental microbiology.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Soil and Water Microbiology:</b> Overview of microbial communities in soil and water, their ecological roles.	6
2	<b>Soil Microbes and Their Role:</b> Types of soil microorganisms (bacteria, fungi, actinomycetes), their functions in nutrient cycling, and soil fertility.	6
3	<b>Water Microbes and Their Role:</b> Types of microorganisms found in water (bacteria, algae, protozoa), and their role in aquatic ecosystems.	6
4	<b>Microbial Contamination of Soil and Water:</b> Pathogens in soil and water, waterborne diseases, and the impact of pollution.	6
5	<b>Techniques for Microbial Analysis in Soil:</b> Soil sampling, serial dilution, spread plate method, most probable number (MPN) method, and isolation of microbes.	6
6	<b>Techniques for Microbial Analysis in Water:</b> Water sampling, membrane filtration, MPN technique, and enumeration of coliforms.	6
7	<b>Biological Indicators of Soil and Water Quality:</b> Use of microbial indicators for assessing the health of soil and water ecosystems.	6
8	<b>Environmental Impact of Soil and Water Microbes:</b> Role of microbes in bioremediation, biodegradation, and nutrient cycling in polluted ecosystems.	6
9	<b>Microbial Ecology of Water Bodies:</b> Characterization of microbial communities in freshwater, marine, and wastewater environments.	6
10	<b>Microbial Water Treatment:</b> Biological methods for treating contaminated water and wastewater, such as activated sludge, biofilms, and bioreactors.	6

### Suggested Books:

#### Text Books

1. **Soil Microbiology, Ecology, and Biochemistry** – Eldor A. Paul, Academic Press, 4th Edition, 2014.
2. **Water Microbiology: Methods and Protocols** – R. P. K. Nair, Springer, 2nd Edition, 2017.

#### References

SEMESTER V

1. **Environmental Microbiology: From the Environment to Human Health** – Ian L. Pepper and Charles P. Gerba, Academic Press, 3rd Edition, 2015.
2. **Microbiology of Waterborne Diseases** – D. M. Kay, Elsevier, 2nd Edition, 2019.
3. **Methods in Environmental Microbiology** – William G. Characklis and K. C. Marshall, Wiley-Interscience, 2003.

**Examination Scheme:**

<b>Components</b>	<b>Attendance</b>	<b>Assignments</b>	<b>Midterm Exam</b>	<b>Final Exam</b>
<b>Weightage (%)</b>	10%	20%	30%	40%

## Paleontology

**Course Code:** CMBE-304b

**Credit Units:** 03

**Pre-requisite:** Basic knowledge of biology, geology, and evolutionary concepts.

### Course Outcome:

After completion of this course, students will be able to:

1. Understand the principles of paleontology and its importance in studying the history of life.
2. Learn about fossil types, fossilization processes, and fossil record.
3. Develop skills in identifying and classifying fossils.
4. Understand the concept of evolution through the study of ancient organisms.
5. Apply paleontological methods to interpret past climates, ecosystems, and evolutionary patterns.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Paleontology:</b> Definition, scope, importance of paleontology in understanding the history of life.	6
2	<b>Fossils and Fossilization:</b> Types of fossils (body fossils, trace fossils), fossilization processes (mineralization, impressions).	6
3	<b>The Fossil Record:</b> Stratigraphy, methods of dating fossils (relative dating, radiometric dating), principles of fossil distribution.	6
4	<b>Classification of Fossils:</b> Major groups of fossils (plants, animals, microorganisms), taxonomic classification of fossil organisms.	6
5	<b>Microfossils:</b> Study of microfossils (foraminifera, diatoms, pollen grains), their significance in paleoclimatology and paleoecology.	6
6	<b>Paleobiology and Evolution:</b> Evolutionary trends in fossil records, studying extinct organisms, theories of extinction.	6
7	<b>Paleoecology:</b> Reconstructing past environments using fossil evidence, interpreting ancient ecosystems, climate change through time.	6
8	<b>Paleontological Methods:</b> Fieldwork methods (excavation, collection), laboratory techniques (preparation, identification, analysis of fossils).	6
9	<b>Fossils and the Geologic Time Scale:</b> Understanding the geologic time scale, major periods of earth history, and significant fossil discoveries.	6
10	<b>Applications of Paleontology:</b> Paleontology in resource exploration (oil, coal), paleontology in understanding evolution and conservation.	6

### Suggested Books:

#### Text Books

1. **Principles of Paleontology** – David M. Raup and Steven M. Stanley, W. H. Freeman, 3rd Edition, 2002.
2. **Invertebrate Paleontology and Evolution** – Richard A. Fortey, CRC Press, 4th Edition, 2014.

## References

1. **Paleontology: A Brief History of Life** – Ian J. Thorpe, Wiley-Blackwell, 1st Edition, 2008.
2. **Field Guide to Fossils** – Jennifer A. Clack, University of Chicago Press, 2002.
3. **The Fossil Book: A Record of Prehistoric Life** – Gregory S. Paul, Sterling Publishing, 2008.

## Examination Scheme:

<b>Components</b>	<b>Attendance</b>	<b>Assignments</b>	<b>Midterm Exam</b>	<b>Final Exam</b>
<b>Weightage (%)</b>	10%	20%	30%	40%

## MICROBIAL TECHNOLOGY

**Course Code: CMBE-602**

**Credit Unit: 04**

### Course Outcomes

1. **Microbial Applications:** Understand the role of microorganisms in the production of bioproducts, including antibiotics, enzymes, and biofuels.
2. **Genetic Engineering:** Apply genetic modification techniques to enhance microbial production capabilities.
3. **Fermentation Technology:** Learn fermentation processes for large-scale microbial production in industrial biotechnology.
4. **Bioremediation:** Analyze the use of microbes in the cleanup of environmental pollutants and waste management.
5. **Microbial Processes:** Explore the role of microorganisms in food, pharmaceutical, and agricultural biotechnology.

### Course Outcomes

#### Unit 1: Microbial Biotechnology and its Applications

Microbial biotechnology: Scope and its applications in human therapeutics, agriculture (Biofertilizers, PGPR, and Mycorrhizae), environmental, and food technology, Use of prokaryotic and eukaryotic microorganisms in biotechnological applications, genetically engineered microbes for industrial application: Bacteria and yeast.

#### Unit 2: Therapeutic and Industrial Biotechnology

Recombinant microbial production processes in pharmaceutical industries - Streptokinase, Recombinant vaccines (Hepatitis B vaccine), Microbial polysaccharides and polyesters, Microbial production of bio-pesticides, bioplastics, Microbial biosensors.

#### Unit 3: Applications of Microbes in Biotransformation

Microbial based transformation of steroids and sterols, Bio-catalytic processes and their industrial applications: Production of high fructose syrup and production of cocoa butter substitute.

#### Unit 4 Microbial Products and their Recovery

Microbial product purification: filtration, ion exchange & affinity chromatography techniques,

Immobilization methods and their application: Whole cell immobilization.

### **Unit 5 Microbes for Bio-energy and Environment**

Bio-ethanol and bio-diesel production: commercial production from lignocellulosic waste and algal biomass, Biogas production: Methane and hydrogen production using microbial culture.

Microorganisms in bioremediation: Degradation of xenobiotics, mineral recovery, removal of heavy metals from aqueous effluents.

#### **References:**

1. Ratledge, C and Kristiansen, B. (2001). Basic Biotechnology, 2<sup>nd</sup> Edition, Cambridge University Press.
2. Demain, A. L and Davies, J. E. (1999). Manual of Industrial Microbiology and Biotechnology, 2<sup>nd</sup> Edition, ASM Press.
3. Swartz, J. R. (2001). Advances in Escherichia coli production of therapeutic proteins. Current Opinion in Biotechnology, 12, 195–201.
4. Prescott, Harley and Klein's Microbiology by Willey JM, Sherwood LM, Woolverton CJ (2014), 9<sup>th</sup> edition, Mc Graw Hill Publishers.
5. Gupta PK (2009) Elements of Biotechnology 2<sup>nd</sup> edition, Rastogi Publications.

#### **Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## Bioanalytical Tools

**Course Code:** CMBE-602a

**Credit Units:** 04

**Pre-requisite:** Basic knowledge of biochemistry, molecular biology, and microbiology.

### Course Outcome:

After completion of this course, students will be able to:

1. Understand the principles and applications of various bioanalytical techniques in biological research.
2. Learn about the different tools used for the analysis and characterization of biomolecules (proteins, nucleic acids, lipids, etc.).
3. Develop practical skills in using bioanalytical instruments for experimental analysis.
4. Apply bioanalytical methods for quality control, diagnostics, and research in biotechnology and medicine.
5. Analyze experimental data and interpret results obtained from bioanalytical techniques.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Bioanalytical Tools:</b> Overview of bioanalytical techniques, their importance in biological research.	4
2	<b>Spectrophotometry:</b> Principles of UV-Vis spectroscopy, applications in protein and nucleic acid quantification.	6
3	<b>Chromatography Techniques:</b> Basics of chromatography (paper, thin layer, gas, liquid chromatography), principles, applications, and types.	8
4	<b>Electrophoresis:</b> Gel electrophoresis (agarose, polyacrylamide), protein and nucleic acid separation, Western blotting, and applications.	8
5	<b>Mass Spectrometry:</b> Principles of mass spectrometry, types (MALDI, ESI), applications in proteomics and genomics.	6
6	<b>Fluorescence Spectroscopy:</b> Theory and applications of fluorescence, fluorophores, and their use in molecular biology.	6
7	<b>Nuclear Magnetic Resonance (NMR):</b> Principles of NMR spectroscopy, application in structure elucidation of biomolecules.	6
8	<b>Enzyme-Linked Immunosorbent Assay (ELISA):</b> Principles of ELISA, types (sandwich, competitive), applications in diagnostics and research.	6
9	<b>PCR and RT-PCR:</b> Polymerase chain reaction (PCR) principles, applications in gene amplification and diagnostics, RT-PCR for RNA analysis.	6
10	<b>Bioinformatics and Data Analysis:</b> Analysis and interpretation of data from bioanalytical techniques using software tools.	6

### Suggested Books:

#### Text Books

## SEMESTER V

1. **Bioanalytical Chemistry** – Suzanne E. Walker, John Wiley & Sons, 2nd Edition, 2009.
2. **Principles and Techniques of Biochemistry and Molecular Biology** – Keith Wilson and John Walker, Cambridge University Press, 7th Edition, 2018.

## References

1. **Modern Techniques of Biochemistry** – David A. L. Davies and John W. Phillips, Oxford University Press, 3rd Edition, 2016.
2. **Bioanalytical Chemistry: Techniques and Applications** – Gary S. Glick and Edwin W. Lee, CRC Press, 2013.
3. **Fundamentals of Biochemistry: Life at the Molecular Level** – Donald Voet, Judith G. Voet, Wiley, 5th Edition, 2016.

## Examination Scheme:

<b>Components</b>	<b>Attendance</b>	<b>Assignments</b>	<b>Midterm Exam</b>	<b>Final Exam</b>
<b>Weightage (%)</b>	10%	20%	30%	40%

## Entrepreneurship Development

**Course Code:** GMBE-602

**Credit Units:** 03

**Pre-requisite:** Basic knowledge of business management, economics, and marketing.

### Course Outcome:

After completion of this course, students will be able to:

1. Understand the key principles and practices of entrepreneurship and innovation.
2. Learn the process of identifying, developing, and launching new business ventures.
3. Develop skills for business planning, financial management, and marketing for start-ups.
4. Understand the challenges faced by entrepreneurs and the strategies for overcoming them.
5. Gain knowledge of government schemes, funding options, and support systems for entrepreneurs.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Entrepreneurship:</b> Definition, types of entrepreneurs, qualities of an entrepreneur, role of entrepreneurship in economic development.	6
2	<b>Idea Generation and Opportunity Recognition:</b> Techniques for generating business ideas, evaluating market opportunities, identifying customer needs.	6
3	<b>Business Planning and Feasibility Study:</b> Importance of a business plan, components of a business plan, conducting a feasibility study, SWOT analysis.	8
4	<b>Sources of Capital and Financial Management:</b> Identifying funding sources (bank loans, venture capital, angel investors), budgeting, financial projections, managing cash flow.	6
5	<b>Marketing and Sales Strategies:</b> Marketing strategies for new ventures, product pricing, promotion, and distribution, customer relationship management.	8
6	<b>Legal Framework for Entrepreneurship:</b> Business structures (sole proprietorship, partnerships, corporations), intellectual property, licenses, and regulations.	6
7	<b>Entrepreneurial Ecosystem and Government Support:</b> Government policies, schemes, and incentives for entrepreneurship, support from incubators, accelerators, and industry networks.	6
8	<b>Business Growth and Scaling:</b> Strategies for scaling a business, managing growth, risk management, building a brand.	6
9	<b>Challenges Faced by Entrepreneurs:</b> Common pitfalls and obstacles (financial, operational, market competition), risk-taking, decision-making, and coping strategies.	6
10	<b>Case Studies and Success Stories:</b> Analysis of successful entrepreneurs, their challenges and strategies for overcoming them, real-world examples from various industries.	6

### Suggested Books:

#### Text Books

1. **Entrepreneurship: Theory, Process, Practice** – Donald F. Kuratko, Cengage Learning, 10th Edition, 2017.
2. **The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses** – Eric Ries, Crown Business, 2011.

#### References

1. **The Entrepreneur's Guide to Building a Successful Business** – Jonathan S. Haskel, Wiley-Blackwell, 2006.
2. **Entrepreneurship and Small Business Management** – David A. L. Davies, Pearson Education, 8th Edition, 2014.
3. **Business Model Generation** – Alexander Osterwalder & Yves Pigneur, Wiley, 2010.

**Examination Scheme:**

<b>Components</b>	<b>Attendance</b>	<b>Assignments</b>	<b>Midterm Exam</b>	<b>Final Exam</b>
<b>Weightage (%)</b>	10%	20%	30%	40%

## Microbiological Quality Control in Food and Pharmaceutical Industries

**Course Code:** DMBE-304

**Credit Units:** 03

**Pre-requisite:** Basic knowledge of microbiology, food science, and pharmaceutical practices.

### Course Outcome:

After completion of this course, students will be able to:

1. Understand the principles of microbiological quality control in the food and pharmaceutical industries.
2. Learn about the role of microbiological testing in ensuring product safety and quality.
3. Gain knowledge of the methods for detecting, identifying, and quantifying microorganisms in food and pharmaceutical products.
4. Apply microbiological techniques for contamination control, shelf-life studies, and validation of hygiene practices.
5. Understand regulatory standards and guidelines for microbiological quality control in these industries.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Microbiological Quality Control:</b> Definition, importance in food and pharmaceutical industries, regulatory standards.	6
2	<b>Microbial Contamination in Food and Pharmaceuticals:</b> Types of microorganisms in food and drugs (bacteria, yeasts, molds, viruses), sources of contamination.	6
3	<b>Microbiological Testing Methods:</b> Culture-based methods (agar plating, enrichment cultures), rapid diagnostic methods (PCR, ELISA, biosensors).	8
4	<b>Quality Control Techniques:</b> Sterility testing, microbiological limit tests, endotoxin testing, total viable count, and specific pathogen testing.	8
5	<b>Food Microbiology:</b> Role of microbiological control in food safety, spoilage microorganisms, pathogenic organisms in food, HACCP (Hazard Analysis and Critical Control Points).	6
6	<b>Pharmaceutical Microbiology:</b> Role of microbiological quality control in ensuring the safety and efficacy of drugs, validation of sterility, and antimicrobial efficacy.	6
7	<b>Environmental Monitoring and Control:</b> Cleanroom microbiology, monitoring air, surfaces, and equipment in manufacturing areas.	6
8	<b>Microbiological Validation and Documentation:</b> Procedures for validating microbiological tests, regulatory documentation, and compliance with GMP (Good Manufacturing Practices).	6
9	<b>Shelf-Life Studies and Stability Testing:</b> Techniques for evaluating microbial stability, shelf-life of products, packaging, and storage conditions.	6
10	<b>Emerging Trends in Microbiological Quality Control:</b> Advances in rapid detection technologies, automation, and microbiological safety in emerging food products and pharmaceuticals.	6

### Suggested Books:

#### Text Books

1. **Microbiological Analysis of Food and Water** – Arun K. Chavan, Wiley-Blackwell, 2nd Edition, 2014.
2. **Pharmaceutical Microbiology** – Peter S. Hersey and Peter E. Dunne, Wiley, 5th Edition, 2008.

**References**

1. **Microbial Quality Assurance in the Food Industry** – John S. H. (Jr.), Springer, 2005.
2. **Food Microbiology: Fundamentals and Frontiers** – M. P. Doyle and L. R. Beuchat, ASM Press, 4th Edition, 2019.
3. **Microbiological Control in the Pharmaceutical Industry** – S. M. Bloomfield and J. M. Knapp, Academic Press, 2010.
4. **Manual of Food Quality Control** – FAO/WHO, 2009.

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**Examination Scheme:**

<b>Components</b>	<b>Attendance</b>	<b>Assignments</b>	<b>Midterm Exam</b>	<b>Final Exam</b>
<b>Weightage (%)</b>	10%	20%	30%	40%

## Microbiological Analysis of Air and Water

**Course Code:** DMBE-302

**Credit Units:** 03

**Pre-requisite:** Basic knowledge of microbiology, environmental science, and analytical techniques.

### Course Outcome:

After completion of this course, students will be able to:

1. Understand the importance of microbiological analysis of air and water in environmental monitoring and public health.
2. Learn the techniques for the isolation, identification, and quantification of microorganisms from air and water samples.
3. Apply principles of microbial water quality testing and air sampling to real-world scenarios.
4. Interpret microbial contamination levels and their implications on health and safety standards.
5. Understand the regulatory standards for microbial levels in water and air and their role in environmental protection.

### Details of the Course:

S. No.	Contents	Contact Hours
1	<b>Introduction to Microbiological Analysis:</b> Importance of microbiological analysis in environmental monitoring, microbial contamination in water and air, overview of standard methods.	6
2	<b>Airborne Microorganisms:</b> Types of microorganisms found in the air, sampling methods (settle plates, impactors, impingers), factors affecting airborne microbial distribution.	6
3	<b>Microbiological Sampling Techniques for Air:</b> Techniques for air sampling, analysis of air samples, use of impingers and air samplers.	6
4	<b>Waterborne Microorganisms:</b> Types of microorganisms found in water (bacteria, viruses, protozoa), sources of contamination, and public health risks.	6
5	<b>Sampling and Preservation of Water Samples:</b> Techniques for sampling water from different sources (groundwater, surface water, treated water), preservation of samples during transport.	6
6	<b>Microbiological Methods for Water Analysis:</b> Standard methods for microbial analysis (coliform testing, heterotrophic plate count, membrane filtration), detection of pathogenic microorganisms.	6
7	<b>Quantification of Microorganisms in Water:</b> Methods to estimate microbial load (most probable number, direct plate count), interpreting results.	6
8	<b>Regulatory Standards for Air and Water Quality:</b> WHO, EPA, and other regulatory guidelines for acceptable levels of microbial contaminants in water and air.	6
9	<b>Impact of Microbial Contamination on Human Health:</b> Waterborne diseases, air pollution, and associated health risks, case studies.	6
10	<b>Emerging Technologies in Microbial Monitoring:</b> Advances in rapid detection methods (PCR, biosensors, real-time monitoring systems), environmental health implications.	6

### Suggested Books:

#### Text Books

1. **Standard Methods for the Examination of Water and Wastewater** – American Public Health Association (APHA), 23rd Edition, 2017.

2. **Environmental Microbiology: From the Environment to Human Health** – Ian L. Pepper, Charles P. Gerba, and Terry J. Gentry, Academic Press, 2017.

## References

1. **Water Microbiology: Laboratory Manual** – M.J. Hocking, Springer, 2012.
2. **Manual of Environmental Microbiology** – C.J. Hurst, Elsevier Academic Press, 2007.
3. **Microbial Ecology of the Oceans** – D.L. Kirchman, Wiley-Blackwell, 2012.
4. **Microbial Contamination and Control in Water Systems** – D. W. Smith, Springer, 2009.

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### Examination Scheme:

Components	Attendance	Assignments	Midterm Exam	Final Exam
Weightage (%)	10%	20%	30%	40%



## MAJOR PROJECT

**Course Code: CMBE-310**

**Credit Units: 6**

### **Course Contents:**

- Forty five days of Sixth Semester of the B.Sc. Curriculum is devoted to major project/field work.
- Students, with the help of their mentor and faculty colleagues will identify a lab in India & abroad for the research work.
- The student should stay for a minimum prescribed Semester period at the place of work.
- Students not staying for the prescribed period will be marked absent as per the University Rules.
- At the end of their project the students shall submit the dissertation as per the Guidelines prescribed below.

### **The Aims of the Project**

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award a B.Sc. Degree.

### **Objectives**

- To provide the students an opportunity to demonstrate the ability to devise, select and use a range of methodologies appropriate to the chosen topic of research.
- To allow students to show the application of skills of data collection, critical analysis and concept synthesis necessary for formation of defensible conclusions and/or recommendations.
- To allow students the opportunity to demonstrate ability to draw appropriate conclusions argued from the evidence presented. [Should the research produce negative or inconclusive results, the conclusions should be critically examined to ascertain the reasons].
- To provide a forum to demonstrate the skills of structuring and present a balanced informed, complete, clear and concise written argument.

### **Dissertation Guidelines The Dissertation Topic**

It is important to distinguish here between ‘dissertation topic’ and ‘dissertation title’. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation

has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally the topic is expected to be:

- Relevant to Biotechnology;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to the knowledge of students;
- Value and interest to the students and their personal and professional development.

### **Dissertation format**

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, name of the student, name of degree and the date of submission.
- Second page should contain the certificate received from the organization/University from where the student has completed his/her project work.
- The next page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of graphs, figures and tables giving legends and page numbers.
- Next to follow should be following in the sequence given below:
  - Abbreviations used (if any)
  - Introduction
  - State-of-Art
  - Material & Methods
  - Results
  - Discussion
  - Summary (approximately 500 words)
  - Conclusion
  - Future Prospects
- References: After this concluding chapter, students should give a list of all the references they have used. These should be cross - references with the text. For articles from journals, the following details are required e.g.

Schlöter M, Assmus B and Hartmann A (1995) the use of immunological methods to detect and identify bacteria in the environment. *Biotech Adv* 13: 75-90

For books, the following details are required

Bahera BK and Varma A (2003) *Green Energy from Waste Biomass*, Capital Book Company, New Delhi, India

For book chapter

Mukherji KG, Mandeep and Varma A (1998) Mycorrhizosphere microorganisms: screening and evaluation. (Ed) Varma A. In: *Mycorrhiza Manual*. Springer-Verlag, Germany, pp 85-97

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.
- List of Publications (if any) by the students should be attached in the end.

**Guidelines for the assessment of the dissertation**

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the materials & methods employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?

**Examination Scheme:**

<b>Components</b>	<b>Theme of Project</b>	<b>Quality of Project</b>
<b>Weightage (%)</b>	<b>30</b>	<b>70</b>

## ENTREPRENEURSHIP DEVELOPMENT

**Course Code: GMBE-602**

**Credit Units: 04**

### UNIT I INTRODUCTION

Meaning, Needs and Importance of Entrepreneurship, Promotion of entrepreneurship, Factors influencing entrepreneurship, Features of a successful Entrepreneurship.

### UNIT II ESTABLISHING AN ENTERPRISE)

Forms of Business Organization, Project Identification, Selection of the product, Project formulation, Assessment of project feasibility.

### UNIT III FINANCING THE ENTERPRISE

Importance of finance / loans and repayments, Characteristics of Business finance, Fixed capital management: Sources of fixed capital, working capital its sources and how to move for loans, Inventory direct and indirect raw materials and its management.

### UNIT IV MARKETING MANAGEMENT

Meaning and Importance, Marketing-mix, product management – Product line, Product mix, stages of product like cycle, marketing Research and Importance of survey, Physical Distribution and Stock Management.

### UNIT V ENTREPRENEURSHIP AND INTERNATIONAL BUSINESS

Meaning of International business, Selection of a product, Selection of a market for international business, Export financing, Institutional support for exports.

### References:

1. Holt DH. Entrepreneurship: New Venture Creation.
2. Kaplan JM Patterns of Entrepreneurship.
3. Gupta CB, Khanka SS. Entrepreneurship and Small Business Management, Sultan Chand & Sons.

### Examination Scheme:

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	21      10	60

## **MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES**

**Course Code: DMBE-304**

**Credit Unit: 04**

### **Unit 1: Microbiological Laboratory and Safe Practices**

Good laboratory practices - Good laboratory practices, Good microbiological practices, Biosafety cabinets – Working of biosafety cabinets, using protective clothing, specification for BSL- 1, BSL-2, BSL-3. Discarding biohazardous waste – Methodology of Disinfection, Autoclaving & Incineration.

### **Unit 2: Determining Microbes in Food / Pharmaceutical Samples**

Culture and microscopic methods - Standard plate count, Most probable numbers, Direct microscopic counts, Biochemical and immunological methods: Limulus lysate test for endotoxin, gel diffusion, sterility testing for pharmaceutical products, Molecular methods - Nucleic acid probes, PCR based detection, biosensors.

### **Unit 3: Pathogenic Microorganisms of Importance in Food & Water**

Enrichment culture technique, Detection of specific microorganisms - on XLD agar, Salmonella, Shigella Agar, Manitol salt agar, EMB agar, McConkey Agar, Saboraud Agar, Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centres (COB, 10 min Resazurin assay).

### **Unit 4: HACCP for Food Safety and Microbial Standards**

Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations, Microbial Standards for Different Foods and Water – BIS standards for common foods and drinking water.

**References:**

1. Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3<sup>rd</sup> ed. Academic Press
2. Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7<sup>th</sup> edition. Springer
4. Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60

## MICROBIOLOGICAL ANALYSIS OF AIR AND WATER

**Course Code: DMBE-302**

**Credit Unit: 04**

### **Course Outcomes**

1. **Microbial Applications:** Understand the role of microorganisms in the production of bioproducts, including antibiotics, enzymes, and biofuels.
2. **Genetic Engineering:** Apply genetic modification techniques to enhance microbial production capabilities.
3. **Fermentation Technology:** Learn fermentation processes for large-scale microbial production in industrial biotechnology.
4. **Bioremediation:** Analyze the use of microbes in the cleanup of environmental pollutants and waste management.
5. **Microbial Processes:** Explore the role of microorganisms in food, pharmaceutical, and agricultural biotechnology.

### **Unit 1: Aeromicrobiology**

Bioaerosols, Air borne microorganisms (bacteria, Viruses, fungi) and their impact on human health and environment, significance in food and pharma industries and operation theatres,allergens.

### **Unit 2: Air Sample Collection and Analysis**

Bioaerosol sampling, air samplers, methods of analysis, CFU, culture media for bacteria and fungi, Identification characteristics.

### **Unit 3: Control Measures**

Fate of bioaerosols, inactivation mechanisms – UV light, HEPA filters, desiccation, Incineration.

### **Unit 4: Water Microbiology**

Water borne pathogens, water borne diseases.

### **Unit 5 Microbiological Analysis of Water**

Sample Collection, Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive/MPN tests confirmed and completed tests for faecal coliforms (b) Membrane filter technique and (c) Presence/absence tests.

**References:**

1. da Silva N, Taniwaki MH, Junqueira VC, Silveira N, Nascimento MS, Gomes RAR (2012) Microbiological Examination Methods of Food and Water A Laboratory Manual, CRC Press.
2. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4<sup>th</sup> edition. Benjamin/Cummings Science Publishing, USA.
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2<sup>nd</sup> edition, Academic Press.
4. Hurst CJ, Crawford RL, Garland JL, Lipson DA (2007) Manual of Environmental Microbiology, 3<sup>rd</sup> edition, ASM press.

**Examination Scheme:**

Components	Internal Assessment			External Evaluation
	Attendance	Class Test	Assignment/ Project/Seminar/Quiz	
Weightage (%)	10	20	10	60



## ANIMAL BIOTECHNOLOGY

**Course Code: SMBE-604**

**Credit Units: 04**

### Course outcomes

1. **Genetic Manipulation:** Understand techniques for genetic modification and cloning of animals for research and production.
2. **Animal Cell Culture:** Learn the principles of animal cell culture techniques for research and bioproduct development.
3. **Reproductive Biotechnology:** Explore reproductive technologies such as artificial insemination, embryo transfer, and gene editing in animals.
4. **Transgenic Animals:** Analyze the creation and applications of transgenic animals in medicine and agriculture.
5. **Ethical and Regulatory Issues:** Understand the ethical, legal, and regulatory considerations in animal biotechnology research and applications.

### UNIT I

Gene transfer methods in Animals – Microinjection, Embryonic Stem cell, gene transfer, Retrovirus & Gene transfer.

### UNIT II

Introduction to transgenesis. Transgenic Animals – Mice, Cow, Pig, Sheep, Goat, Bird, Insect. Animal diseases need help of Biotechnology – Foot-and mouth disease, Coccidiosis, Trypanosomiasis, Theileriosis.

### UNIT III

Animal propagation – Artificial insemination, Animal Clones. Conservation Biology – Embryo transfer techniques. Introduction to Stem Cell Technology and its applications.

### UNIT IV

Genetic modification in Medicine - gene therapy, types of gene therapy, vectors in genetherapy,molecular engineering, human genetic engineering, problems & ethics.

### References:

1. Brown, T.A. (1998). Molecular biology Labfax II: Gene analysis. II Edition. Academic Press, California,USA.
2. Butler, M. (2004). Animal cell culture and technology: The basics. II Edition. Bios scientific publishers.

**Examination Scheme:**

<b>Components</b>	<b>Internal Assessment</b>			<b>External Evaluation</b>
	<b>Attendance</b>	<b>Class Test</b>	<b>Assignment/ Project/Seminar/Quiz</b>	
<b>Weightage (%)</b>	10	20	10	60

# **School of Agriculture and Environmental Sciences**



## **Shobhit University, Gangoh**

**(Established by UP Shobhit University Act No. 3, 2012)**

### **School of Agriculture And Environmental Sciences**

#### **Ordinances, Regulations & Syllabus**

**For**

**Bachelor of Science in Agriculture  
(B.Sc.Ag.) Four Year Programme Semester Pattern  
(w.e.f. session 2013-14)**

**Revised and approved in the year 2019 (13<sup>th</sup> Meeting of the  
Board of Studies )**

## Examination and Evaluation System

- Fifth Deans' Committee deliberated on the examination and evaluation system being followed by different universities. The Committee recommends Uniform Grading system to be followed with uniform OGPA requirements for award of degrees at all levels and uniform conversion formulae to be followed for declaration of I, II and III divisions, distinctions etc. Declaration of division in the degree certificate to be made compulsory by all universities:

### Examination

- External theory (50%)
- Internal Theory + Practical (50%)
- Courses with Theory and Practical: Mid-term Exam (30%) + Assignment (5%) in practical oriented courses + Practical (15%)
- Courses with only Theory: Mid-term Exam (40%) + Assignment (10%)
- Courses with only Practical: (100%) Internal
- Paper to be set by external: HOD shall ensure the coverage of syllabus. If needed moderation can be done.
- Evaluation to be done internally by the faculty other than the Course Instructor. Syllabus of the concerned course shall be sent to the external examiner, who shall prepare the question papers. For practical, it is recommended that examinations shall be conducted by course instructor(s) and one teacher nominated by HOD.

### Evaluation

Degree	Percentage of Marks Obtained	Conversion into Points
All	100	10 Points
	90 to <100	9 to <10
	80 to <90	8 to <9
	70 to <80	7 to <8
	60 to <70	6 to <7
	50 to <60	5 to <6
	<50 (Fail)	<5
	Eg. 80.76	8.076
	43.60	4.360
	72.50 (but shortage in attendance)	Fail (1 point)

OGPA	Division
5.000 – 5.999	Pass
6.000 – 6.999	II division
7.000 – 7.999	I division
8.000 and above	I division with distinction

- $GPA = \frac{\text{Total points scored}}{\text{Total credits (for 1 semester)}}$
- $CGPA = \frac{\sum \text{Total points scored}}{\text{Course credits}}$
- $OGPA = \frac{\sum \text{Total points scored (after excluding failure points)}}{\text{Course credits}}$
- $\% \text{ of Marks} = OGPA \times 100/10$

### B.Sc.(Ag.) SEMESTER-I

S. No	Subject Code	Title	CreditHours			
			Cr	L	T	P
1.	BAG-101	Fundamentals of Horticulture	2	1	0	2
2.	BAG-103	Fundamentals of Plant Biochemistry and Biotechnology	3	2	0	2
3.	BAG-105	Fundamentals of Soil Science	3	2	0	2
4.	BAG-107	Introduction to Forestry	2	1	0	2
5.	BAG-109/ BAG-109A/ BAG-109B/ BAG-109C/	Comprehension & Communication Skills in English/ English Grammar-I/ Soft Skills-I/ Life Management-I/	2	1	0	2
6.	BAG-111	Fundamentals of Agronomy	4	3	0	2
7.	BAG-113	Introductory Biology*	1	1	0	0
8.	BAG-115/ BAG-115A BAG-115B	Elementary Mathematics*/ Fundamentals of Statistics/ Statistical Thinking and Data Analysis	2	2	0	0
9.	BAG-117	Agricultural Heritage*	1	1	0	0
10.	BAG-119/ BAG-119A/ BAG-119B/ BAG-119C	Rural Sociology & Educational Psychology/ Science, Technology, and Society/ Women's and Gender Studies/ Geography of the Global Economy	2	2	0	0
11.	BAG-121/ BAG-121A/ BAG-121B/ BAG-121C/	Human Values & Ethics (non-gradual)/ Global Climate Policy and Sustainability/ Planetary Change and Human Health/ Tools for Sustainable Design	1	1	0	0
12.	BAG-123/ BAG-123A/ BAG-123B/ BAG-123C	NSS/ NCC/ Physical Education & Yoga Practices**/ Water, Sanitation and Hygiene	2	0	0	4
<b>Total</b>			<b>25</b>	<b>17</b>	<b>0</b>	<b>16</b>

**\*R: Remedial course; \*\*NC: Non-gradual courses- 18+03\*+03\*\***

**B.Sc.(Ag.) SEMESTER-II**

<b>S. No</b>	<b>Subject Code</b>	<b>Title</b>	<b>CreditHours</b>			
			<b>Cr</b>	<b>L</b>	<b>T</b>	<b>P</b>
1.	BAG-102	Fundamentals of Genetics	3	2	0	2
2.	BAG-104	Agricultural Microbiology	2	1	0	2
3.	BAG-106	Soil and Water Conservation Engineering	2	1	0	2
4.	BAG-108	Fundamentals of Crop Physiology	2	1	0	2
5.	BAG-110	Fundamentals of Agricultural Economics	2	2	0	0
6.	BAG-112	Fundamentals of Plant Pathology	4	3	0	2
7.	BAG-114	Fundamentals of Entomology	4	3	0	2
8.	BAG-116	Fundamentals of Agricultural Extension Education	3	2	0	2
9.	BAG-118/ BAG-118A/ BAG-118B/ BAG-118C	Communication Skills and Personality Development/ English Grammar-II/ Soft Skills-II/ Life Management-II/	2	1	0	2
<b>Total</b>			<b>24</b>	<b>16</b>	<b>0</b>	<b>16</b>



**B.Sc.(Ag.) SEMESTER-III**

S. No	Subject Code	Title	CreditHours			
			Cr	L	T	P
1.	BAG-201	Crop Production Technology–I(Kharif Crops)	2	1	0	2
2.	BAG-203	Fundamentals of Plant Breeding	3	2	0	2
3.	BAG-205	Agricultural Finance and Cooperation	3	2	0	2
4.	BAG-207	Agri- Informatics	2	1	0	2
5.	BAG-209	Farm Machinery and Power	2	1	0	2
6.	BAG-211	Production Technology for Vegetables and Spices	2	1	0	2
7.	BAG-213	Environmental Studies and Disaster Management	3	2	0	2
8.	BAG-215/ BAG-215A/ BAG-215B/ BAG-215C	Statistical Methods/ Introduction to Mathematical Programming/ Introduction to Modeling and Simulation/ Algebraic Techniques and Semidefinite Optimization	2	1	0	2
9.	BAG-217	Livestock and Poultry Management	4	3	0	2
	<b>Total</b>		<b>23</b>	<b>14</b>	<b>0</b>	<b>18</b>

**B.Sc.(Ag.) SEMESTER-IV**

<b>S. No</b>	<b>Subject Code</b>	<b>Title</b>	<b>CreditHours</b>			
			<b>Cr</b>	<b>L</b>	<b>T</b>	<b>P</b>
1.	BAG-202	Crop ProductionTechnology–II(Rabi Crops)	2	1	0	2
2.	BAG-204	Production TechnologyforOrnamentalCrops,MAP andLandscaping	2	1	0	2
3.	BAG-206	Renewable EnergyandGreenTechnology	2	1	0	2
4.	BAG-208	Problematic Soilsand theirManagement	2	1	0	0
5.	BAG-210	ProductionTechnologyforFruitandPlantation Crops	2	1	0	2
6.	BAG-212	PrinciplesofSeedTechnology	3	2	0	2
7.	BAG-214	FarmingSystem&Sustainable Agriculture	1	1	0	0
8.	BAG-216	AgriculturalMarketingTrade&Prices	3	2	0	2
9.	BAG-218	IntroductoryAgro-meteorology&ClimateChange	2	1	0	2
10.	BAG-220	Elective Course	3	2	0	2
	<b>Total</b>		<b>22</b>	<b>13</b>	<b>0</b>	<b>16</b>

**B.Sc.(Ag.) SEMESTER-V**

S. No	Subject Code	Title	CreditHours			
			Cr	L	T	P
1.	BAG-301	PrinciplesofIntegratedPestandDiseaseManagement	3	2	0	2
2.	BAG-303	Manures,Fertilizers andSoil FertilityManagement	3	2	0	2
3.	BAG-305	PestsofCropsandStoredGrainand their Management	3	2	0	2
4.	BAG-307	DiseasesofField and HorticulturalCrops and their Management–I	3	2	0	2
5.	BAG-319	Crop Improvement-I(KharifCrops)	2	0	0	4
6.	BAG-311/ BAG-311A/ BAG-311B/ BAG-311C	EntrepreneurshipDevelopmentandBusinessCommunica tion/ English Grammar-III/ Soft Skills-III/ Life Management-III	2	1	0	2
7.	BAG-313	Geo-informatics,Nano-technologyandPrecision Farming	2	1	0	2
8.	BAG-315	PracticalCrop Production –I(Kharif crops)	2	1	0	2
9.	BAG-317/ BAG-317A/ BAG-317B	IntellectualPropertyRights/ Research Methodology/ Publication Ethics and Emerging trends in Research	1	1	0	0
10.	BAG-319	Elective Course	3	2	0	2
	<b>Total</b>		<b>24</b>	<b>14</b>	<b>0</b>	<b>20</b>

**B.Sc.(Ag.) SEMESTER-VI**

<b>S. No</b>	<b>Subject Code</b>	<b>Title</b>	<b>CreditHours</b>			
			<b>Cr</b>	<b>L</b>	<b>T</b>	<b>P</b>
1.	BAG-302	RainfedAgriculture&WatershedManagement	2	1	0	2
2.	BAG-304	Protected Cultivation and SecondaryAgriculture	2	1	0	2
3.	BAG-306	DiseasesofField and HorticulturalCrops and their Management-II	3	2	0	2
4.	BAG-308	Post-harvestManagementandValue AdditionofFruits andVegetables	2	1	0	2
5.	BAG-310	ManagementofBeneficialInsects	2	1	0	2
6.	BAG-312	Crop Improvement-II(Rabicrops)	2	1	0	2
7.	BAG-314	PracticalCrop Production –II(Rabi crops)	2	1	0	2
8.	BAG-316	PrinciplesofOrganicFarming	2	1	0	2
9.	BAG-318	FarmManagement, Production&Resource Economics	2	1	0	2
10.	BAG-320	Principles ofFood Scienceand Nutrition	2	2	0	0
11.	BAG-321	Elective Course	3	2	0	2
	<b>Total</b>		<b>24</b>	<b>14</b>	<b>0</b>	<b>20</b>

## B.Sc.(Ag.) SEMESTER-VII

S. No	Subject Code	Rural Agricultural Work Experience and Agro-industrial Attachment(RAWE&AIA)		
		Activities	No. of weeks	Credit Hours
1.	BAG-401	General orientation&On campustrainingbydifferent faculties	1	14
2.	BAG-403	Villageattachment	8	
3.	BAG-405	UnitattachmentinUniv./College.KVK/ResearchStation Attachment	5	
4.	BAG-407	Plant clinic	2	02
5.	BAG-409	Agro-IndustrialAttachment	3	04
6.	BAG-411	Project ReportPreparation,Presentationand Evaluation	1	
<b>TotalweeksforRAWE&amp;AIA</b>			<b>20</b>	<b>20</b>

- Agro- Industrial Attachment: The students would be attached with the agro-industriesfor a period of 3 weeks to get an experience of the industrial environment andworking.
- Educational tour will be conducted in break between IV & V Semester or VI & VII Semester

### RAWE

#### Component-I:VillageAttachmentTrainingProgramme

S. No	Activity	Duration
1.	Orientation andSurveyofVillage	1 week
2.	AgronomicalInterventions	1 week
3.	PlantProtection Interventions	1 week
4.	SoilImprovement Interventions(Soil samplingand testing)	1 week
5.	FruitandVegetableproductioninterventions	1 week
6.	FoodProcessingand Storageinterventions	
7.	AnimalProductionInterventions	1 week
8.	Extension andTransferofTechnologyactivities	1 week

#### Component–II:AgroIndustrial Attachment

- Students shall be placed in Agro and Cottage industries and CommoditiesBoardsfor 03 weeks.
- IndustriesincludeSeed/Saplingproduction,Pesticides-insecticides,Postharvest-processing-valueaddition,Agri-financeinstitutions,etc.

### B.Sc.(Ag.) SEMESTER-VIII

S. No	Subject Code	Title	CreditHours			
			Cr	L	T	P
1.	BAG-402	ProductionTechnologyfor Bioagentsand Biofertilizer	1	0	0	2
2.	BAG-404	SeedProductionandTechnology	1	0	0	2
3.	BAG-406	Mushroom CultivationTechnology	1	0	0	2
4.	BAG-408	Soil, Plant, Water and SeedTesting	1	0	0	2
5.	BAG-410	CommercialBeekeeping	1	0	0	2
6.	BAG-412	PoultryProductionTechnology	1	0	0	2
7.	BAG-414	CommercialHorticulture	1	0	0	2
8.	BAG-416	Floriculture and Landscaping	1	0	0	2
9.	BAG-418	FoodProcessing	1	0	0	2
10.	BAG-420	AgricultureWaste Management	1	0	0	2
11.	BAG-422	OrganicProductionTechnology	1	0	0	2
12.	BAG-424	CommercialSericulture	1	0	0	2
<b>Total</b>			<b>12</b>	<b>0</b>	<b>0</b>	<b>24</b>

EvaluationofExperientialLearningProgramme/Hands-onTraining(HOT)

S. No	Parameters	Max.Marks
1.	Project PlanningandWriting	10
2.	Presentation	10
3.	Regularity	10
4.	MonthlyAssessment	10
5.	Output delivery	10
6.	TechnicalSkill Development	10
7.	EntrepreneurshipSkills	10
8.	Business networkingskills	10
9.	Report WritingSkills	10
10.	FinalPresentation	10
<b>Total</b>		<b>100</b>

## Elective Courses

- A student can select three elective courses out of the following and offer during 4<sup>th</sup> (BAG-220), 5<sup>th</sup> (BAG-319) and 6<sup>th</sup> (BAG-321) semesters.

<b>S. No.</b>	<b>Courses</b>	<b>Credit Hours</b>
1.	Agribusiness Management	3(2+1)
2.	Agrochemicals	3(2+1)
3.	Commercial Plant Breeding	3(1+2)
4.	Landscaping	3(2+1)
5.	Food Safety and Standards	3(2+1)
6.	Biopesticides & Biofertilizers	3(2+1)
7.	Protected Cultivation	3(2+1)
8.	Micropropagation Technologies	3(1+2)
9.	Hi-tech Horticulture	3(2+1)
10.	Weed Management	3(2+1)
11.	System Simulation and Agro-advisory	3(2+1)
12.	Agricultural Journalism	3(2+1)

## **Programme Educational Objectives (PEOs)**

**PEO1 Foundational Knowledge:** Graduates will possess a strong understanding of agricultural sciences, including plant and animal biology, soil science, and agricultural economics, enabling them to address challenges in the agricultural sector.

**PEO2 Practical Skills:** Graduates will develop practical skills in modern agricultural practices, including crop production, pest management, and sustainable farming techniques, allowing them to effectively contribute to agricultural productivity.

**PEO3 Research and Innovation:** Graduates will be equipped to engage in research and innovation, utilizing scientific methods to solve agricultural problems and contribute to advancements in the field.

**PEO 4 Sustainability and Environmental Stewardship:** Graduates will understand the principles of sustainable agriculture and environmental conservation, promoting practices that ensure food security while preserving natural resources.

**PEO 5 Communication and Leadership:** Graduates will possess effective communication and leadership skills, enabling them to work collaboratively in diverse teams and to advocate for agricultural development and policy changes.

**PEO6 Lifelong Learning:** Graduates will be prepared for lifelong learning and professional development, adapting to emerging trends and technologies in agriculture to remain relevant in their careers.



## **Programme Specific Objectives (PSO's)**

**PSO 1** To impart a strong foundation in agricultural science, including plant biology, soil science, and animal husbandry.

**PSO2** To develop practical skills through hands-on training in farming techniques, crop management, and animal care.

**PSO 3** To encourage students to engage in research and innovation to address contemporary agricultural challenges, such as food security and sustainable farming.

**PSO 4** To promote sustainable agricultural practices that protect the environment and enhance productivity.

**PSO5** To familiarize students with the latest agricultural technologies, including precision farming, biotechnology, and data analytics.

**PSO6** To provide insights into agricultural economics, marketing, and policy, enabling students to make informed decisions in the agricultural sector.

**PSO7** To develop critical thinking and problem-solving skills necessary for effective decision-making in agriculture.

## Programme Outcome Objectives (POO's)

**POO1 Knowledge Application:** Demonstrate a comprehensive understanding of agricultural sciences, including plant and animal biology, soil science, and agricultural engineering.

**POO 2 Research Skills:** Conduct research using scientific methods, including data collection, analysis, and interpretation, to solve agricultural problems.

**POO3 Sustainable Practices:** Promote sustainable agricultural practices that enhance productivity while preserving environmental health and biodiversity.

**POO4 Technical Proficiency:** Utilize modern agricultural technologies and tools for efficient farming practices, including precision agriculture and biotechnology.

**POO5 Critical Thinking:** Analyze and evaluate agricultural policies, practices, and issues critically, fostering informed decision-making.

**POO 6 Communication Skills:** Communicate effectively, both verbally and in writing, to diverse audiences, including farmers, policymakers, and the general public.

**POO7 Teamwork and Leadership:** Work collaboratively in teams, demonstrating leadership skills in agricultural projects and initiatives.

**POO8 Economic Understanding:** Understand the economic principles related to agricultural production, marketing, and management.

**POO 9 Ethics and Responsibility:** Uphold ethical standards in agricultural practices, considering social responsibilities and the impact on communities.

**POO 10 Lifelong Learning:** Foster a commitment to continuous learning and professional development in the agricultural sector.

## Course Structure

## Ordinance and Regulations

## **BAG-101: Fundamentals of Horticulture**

### **CO: COURSE OBJECTIVE**

**CO-1 Understanding Horticulture Basics:** Define horticulture and its importance in agriculture and daily life. Differentiate between horticulture and other branches of plant science.

**CO-2 Introduction to Horticultural Crops:** Familiarize with various horticultural crops, including fruits, vegetables, flowers, and ornamental plants. Learn the classification of horticultural plants based on their growth habits, lifecycle, and economic importance.

**CO-3 Environmental Factors and Plant Growth:** Understand the influence of light, temperature, water, soil, and nutrients on the growth and development of horticultural crops. Study the effects of biotic and abiotic stresses on horticultural plants.

**CO-4 Horticultural Practices:** Learn the basic principles of plant propagation, including sexual and asexual methods. Understand the basics of nursery management, pruning, training, and crop management

**CO-5 Soil and Water Management:** Explore soil preparation techniques for horticultural crops. Study the importance of irrigation, drainage, and water conservation techniques.

**CO-6 Plant Nutrition and Health:** Learn about fertilizers, manures, and their application in horticulture. Understand integrated pest and disease management practices.

**CO-7 Economic and Aesthetic Value of Horticulture:** Recognize the role of horticulture in improving economic well-being and environmental sustainability. Study the use of ornamental plants in landscaping, floriculture, and urban gardening.

**CO-8 Sustainability and Modern Techniques:** Introduce sustainable horticultural practices such as organic farming and precision horticulture. Familiarize with advancements in biotechnology, tissue culture, and protected cultivation (e.g., greenhouses, playhouses).

## **COURSE CONTENTS**

### **Unit- I:**

- Horticulture- Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops

### **Unit- II:**

- Plant propagation- methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment;

### **Unit- III:**

- Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; medicinal and aromatic plants;

### **Unit- IV:**

- Importance of plant bio-regulators in horticulture. Irrigation- methods, Fertilizer application in horticultural crops.

### **Practical:**

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of orchard. Training and pruning of fruit trees. Preparation of potting mixture. Fertilizer application in different crops. Visits to commercial nurseries/orchard.

## **BAG-103: Fundamentals of Plant Biochemistry and Biotechnology**

### **CO: COURSE OBJECTIVE**

**CO-1 Understand Plant Biochemical Processes:** Develop a foundational understanding of the biochemical processes and pathways that drive plant growth, development, and metabolism.

**CO-2 Explore Plant Metabolism:** Analyze the roles of primary and secondary metabolites in plants, including their synthesis, regulation, and functional significance.

**CO-3 Study Enzymatic Mechanisms:** Learn the principles of enzymatic reactions and their applications in regulating plant physiological and biochemical processes.

**CO-4 Integrate Biochemistry and Biotechnology:** Explore the intersection of plant biochemistry with modern biotechnological tools for crop improvement, disease resistance, and sustainable agriculture.

**CO-5 Apply Molecular Biology Tools:** Gain proficiency in molecular techniques such as gene cloning, CRISPR, and recombinant DNA technology for studying and manipulating plant systems.

**CO-6 Evaluate Plant Stress Responses:** Understand biochemical mechanisms plants use to respond and adapt to biotic and abiotic stresses, and how these can be managed through biotechnology.

**CO-7 Promote Sustainable Practices:** Apply biotechnological advances to improve agricultural productivity, reduce environmental impact, and address global challenges like food security and climate change.

## COURSE CONTENTS

### Unit- I:

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.

### Unit- II:

Proteins: Importance of proteins and classification; Structures, titration and zwitterion nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure.

### Unit- III:

Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

### Unit- IV:

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation,

### Unit- V:

Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

### Practical:

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/TLC demonstration for separation of amino acids/Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization. Demonstration of isolation of DNA. Demonstration of gel electrophoresis techniques and DNA fingerprinting.

## **BAG-105: Fundamentals of Soil Science**

### **CO: COURSE OBJECTIVE**

**CO-1 Understand Soil Formation and Properties:** Develop an understanding of the processes of soil formation, including physical, chemical, and biological factors, and identify key soil properties that influence its classification and use.

**CO-2 Analyze Soil Components:** Examine the composition of soil, including minerals, organic matter, water, and air, and explain their roles in supporting plant growth and maintaining ecological balance.

**CO-3 Explore Soil Classification Systems:** Learn to classify soils based on their physical, chemical, and biological properties using standard classification systems such as Soil Taxonomy or FAO guidelines.

**CO-4 Study Soil-Water Relationships:** Investigate the movement, retention, and availability of water in soils and its impact on plant growth and agricultural productivity.

**CO-5 Understand Soil Nutrients and Fertility:** Analyze the role of essential soil nutrients, nutrient cycles, and soil amendments in maintaining soil fertility for sustainable agricultural practices.

**CO-6 Evaluate Soil Degradation and Conservation:** Identify the causes and consequences of soil degradation, including erosion, salinization, and pollution, and propose soil conservation strategies to enhance sustainability.

**CO-7 Apply Soil Science to Environmental Issues:** Explore the role of soil in addressing global environmental challenges, such as carbon sequestration, waste management, and ecosystem restoration.

## COURSE CONTENTS

### Unit- I:

- Soil as a natural body, Pathological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil;

### Unit- II:

- Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth,

### Unit- III:

- Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids-inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and its influence on soil properties; humic substances - Nature and properties;

### Unit- IV:

- Soil organisms: macro and microorganisms, their beneficial and harmful effects; Soil pollution- behavior of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

### Practical:

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals.

Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil pH and electrical conductivity.

Determination of cation exchange capacity of soil. Study of soil map. Determination of soil colour.

Demonstration of heat transfer in soil. Estimation of organic matter content of soil



## **BAG-107: Introduction to Forestry**

### **CO: COURSE OBJECTIVE**

**CO-1 Understand the Basics of Forestry:** Explain the definition, history, and importance of forestry in ecological and economic contexts.\

**CO-2 Explore Forest Ecosystems:** Identify the components of forest ecosystems, including flora, fauna, soil, and climate interactions.

**CO-3 Comprehend Forest Management Practices:** Analyze sustainable forest management principles and practices, including conservation, afforestation, and silviculture techniques.

**CO-4 Evaluate Forest Resources and Their Uses:** Discuss the economic, recreational, and environmental significance of forest products and services.

**CO-5 Analyze the Role of Forestry in Climate Change Mitigation:** Examine how forests contribute to carbon sequestration, biodiversity conservation, and climate resilience.

**CO-6 Understand Forestry Policies and Regulations:** Assess national and international forestry policies, laws, and their impact on conservation and forest management.

**CO-7 Develop Skills in Forest Assessment and Monitoring:** Practice using tools and techniques for forest inventory, mapping, and monitoring forest health.

**CO-8 Explore Career Opportunities in Forestry:** Discuss various career paths in forestry, ranging from field-based roles to research, policy-making, and environmental advocacy

## **COURSE CONTENTS**

### **Unit- I:**

- Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers

### **Unit- II:**

- Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement

### **Unit- III:**

- Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees

### **Unit- IV:**

- Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

### **Practical:**

Identification of tree-species. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees. Height measurement of standing trees by shadow method, single pole method and hypsometer. Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

## **BAG-109: Comprehension&Communication Skillsin English**

### **CO: COURSE OBJECTIVE**

**CO-1 Develop Strong Comprehension Skills:** Improve the ability to read, understand, and analyze texts, identifying main ideas, themes, and arguments.

**CO-2 Enhance Vocabulary and Grammar:** Expand vocabulary and strengthen grammar usage to enable more effective communication.

**CO-3 Master Listening Skills:** Develop the ability to comprehend spoken English in various contexts, such as lectures, conversations, and media.

**CO-4 Improve Speaking Abilities:** Build confidence and fluency in verbal communication, including presenting ideas clearly and engaging in discussions.

**CO-5 Refine Writing Skills:** Strengthen the ability to write well-structured essays, reports, and creative pieces.

**CO-6 Increase Cultural Awareness:** Understand the nuances of language use in different cultural contexts and improve cross-cultural communication.

**CO-7 Practice Effective Argumentation:** Learn to construct and present well-reasoned arguments, supported by evidence and coherent logic.

**CO-8 Enhance Interpersonal Communication:** Improve interpersonal communication skills through role-play, debates, and group discussions to foster collaboration and teamwork.

## COURSE CONTENTS

### Unit- I:

- War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw.

### Unit- II:

- Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.

### Unit- III:

- Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.

### Unit- IV:

- The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

### Practical:

Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions.

## **BAG-109 A: English Grammar-I**

### **CO: COURSE OBJECTIVE**

**CO-1 Understand Basic Grammar Concepts:** To introduce students to fundamental concepts of English grammar, including sentence structure, parts of speech, and punctuation.

**CO-2 Enhance Sentence Formation:** To develop the ability to construct grammatically correct and varied sentences, with a focus on clarity and coherence.

**CO-3 Master Verb Tenses:** To help students understand and accurately use different verb tenses, including present, past, and future forms, in both simple and continuous aspects.

**CO-4 Improve Vocabulary and Word Usage:** To expand students' vocabulary and guide them in using words appropriately within different grammatical contexts.

**CO-5 Grasp Subject-Verb Agreement:** To teach the rules of subject-verb agreement and how to apply them in diverse sentence structures.

**CO-6 Learn Sentence Types and Functions:** To provide knowledge of different types of sentences (declarative, interrogative, imperative, and exclamatory) and their functions in communication.

**CO-8 Practice Pronouns and Their Functions:** To familiarize students with the correct usage of pronouns, including personal, possessive, and reflexive forms, and how they function in sentences.

**CO-8 Develop Punctuation Skills:** To improve students' understanding and correct usage of punctuation marks (periods, commas, semicolons, colons, quotation marks, etc.) to enhance written communication.

## **COURSE CONTENTS**

### **Unit I**

Introduction to Grammar, Overview of grammar and its importance, Parts of speech: nouns, pronouns, verbs, Types of nouns: common, proper, collective.

### **Unit II**

Pronouns: subject, object, possessive, Verb types: action, linking, auxiliary, Tenses: present, past, future, Functions of adjectives and adverbs, Comparative and superlative forms.

### **Unit III**

Basic sentence components: subject, predicate, Types of sentences: simple, compound, complex, Commas, periods, question marks, exclamation points, Quotation marks and apostrophes.

### **Unit IV**

Subject-verb agreement, Misplaced modifiers, Sentence fragments and run-ons, Comprehensive review of topics covered, Practice exercises and quizzes

## **BAG-109 B: Soft Skills-I**

### **CO: COURSE OBJECTIVE**

**CO-1 Enhance Communication Skills:** Develop verbal, non-verbal, and written communication techniques to express ideas clearly and effectively.

**CO-2 Build Teamwork and Collaboration:** Foster the ability to work collaboratively in diverse groups, understanding group dynamics and conflict resolution.

**CO-3 Improve Time Management:** Learn strategies to prioritize tasks, manage time efficiently, and meet deadlines in professional and personal contexts.

**CO-4 Develop Emotional Intelligence:** Cultivate self-awareness, empathy, and the ability to manage emotions in interpersonal relationships and challenging situations.

**CO-5 Strengthen Critical Thinking and Problem-Solving:** Encourage analytical thinking to evaluate situations and propose creative, practical solutions.

**CO-7 Boost Confidence and Public Speaking Skills:** Build self-confidence and refine public speaking skills to present ideas effectively in formal and informal settings.

**CO-8 Cultivate Professional Ethics and Workplace Etiquette:** Understand and apply ethical principles and appropriate behavior in professional environments.

## **COURSE CONTENTS**

### **Unit I**

Presentation Skills, Speaking to a small group and large audience, Barriers to communication and non- verbal communication, Language skills, Types of presentation and use of aids, Effective public speaking.

### **Unit II**

Memory Skills, Memory system, Short term and long term memory, Causes of memory problems, Methods of improving memory, preventing loss of memory.

### **Unit III**

Technical Writing Skills, Defining Technical Communication and Organizing Information, Language in Technical Communication.

### **Unit IV**

Description Vs Narration Vs Instruction, Letters, Memos, Electronic Communication, Formal and Informal Reports



## **BAG-109 C: Life Management-I**

### **CO: COURSE OBJECTIVE**

**CO-1 Self-Awareness Development:** Understand personal strengths, weaknesses, values, and goals. Develop emotional intelligence to manage self and relationships effectively.

**CO-2 Time and Priority Management:** Learn strategies for effective time management. Set realistic goals and prioritize tasks to enhance productivity.

**CO-3 Stress and Emotional Regulation:** Identify sources of stress and implement techniques to manage it. Develop coping mechanisms for emotional well-being.

**CO-4 Communication Skills:** Build effective verbal and non-verbal communication skills. Enhance active listening and interpersonal communication abilities.

**CO-5 Decision-Making and Problem-Solving:** Learn frameworks for making informed decisions. Cultivate problem-solving skills to handle life challenges.

**CO-6 Work-Life Balance:** Understand the importance of balancing personal and professional life. Implement strategies to achieve harmony and avoid burnout.

**CO-7 Personal Growth and Goal Setting:** Set and achieve short-term and long-term personal goals. Develop a growth mindset and strategies for continuous improvement.

**CO-8 Health and Well-Being:** Recognize the importance of physical and mental health. Learn basic wellness practices for a balanced lifestyle.

## **COURSE CONTENTS**

### **Unit I**

Life Style & its Basics, Purpose of life & its dimensions, Importance of Self-Evaluation; (Daily routine, Food habits, Dressing Sense, Habit formation, Company, Etiquettes), Duties & Commitment of Self, Family and Society, Adjustment with Self & Environment.

### **Unit II**

Work Efficiency, Positive way of thinking, Tools & techniques for Positive thinking, Karma & Karma PhalSidhanta, Behavioral Skill.

### **Unit III**

Personality Skills, Self-Assessment Techniques, Adjustment Skills, Art of Positive Thinking.

### **Unit IV**

Environmental Awareness, Basic Concept of Environment & Ecology, Natural Resources, Environmental Ethics.

### **Unit V**

Life and Deeds of Pt. Shriram Sharma Acharya and Mataji, GayatriPariwar and its Branches, VicharKranti, AtmdevSadhna: Atmbodh and Tatvabodh, Pranayama: Nadishodhan, Pranakarshan, Diary Writing.

## **BAG-111: Fundamentals of Agronomy**

### **CO: COURSE OBJECTIVE**

**CO-1 Understanding Crop Growth and Development:** Learn about the life cycle of crops and factors influencing their growth. Study the physiological and morphological characteristics of crops.

**CO-2 Basics of Soil Science:** Understand soil properties, classification, and its role in crop production. Learn about soil fertility, nutrient management, and amendments.

**CO-3 Crop Management Practices:** Gain knowledge about crop planting methods, spacing, and cropping systems. Understand weed control, irrigation, and pest management practices.

**CO-4 Climate and Agriculture:** Explore the impact of weather and climate on crop production. Study agro climatic zones and their significance in crop planning.

**CO-5 Sustainable Agriculture:** Learn principles of sustainable land use, conservation practices, and integrated nutrient management. Focus on resource efficiency and minimizing environmental impact.

**CO-7 Introduction to Agronomic Tools and Techniques:** Understand the role of technology and tools in modern agronomy. Familiarize with concepts like precision agriculture and remote sensing.

**CO-8 Crop Improvement:** Basics of crop breeding and genetic enhancement for better yields and resilience.

## COURSE CONTENTS

### Unit- I:

- Agronomy and its scope, seeds and sowing, tillage and tilling, crop density and geometry,

### Unit- II:

- Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation-scheduling criteria and methods, quality of irrigation water, logging.

### Unit- III:

- Weeds- importance, classification, crop weed competition, concepts of weed management- principles and methods, herbicides- classification, selectivity and resistance, allelopathy.

### Unit- IV:

- Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

### Practical:

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agro-climatic zones of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements- reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

## **BAG-113: Introductory Biology**

### **CO: COURSE OBJECTIVE**

**CO-1 Understand Core Biological Concepts:** Explore the structure and function of cells, including prokaryotic and eukaryotic cells. Examine the molecular basis of life (e.g., DNA, RNA, proteins). Understand energy transformations in biological systems (e.g., photosynthesis and cellular respiration)

**CO-2 Develop Knowledge of Organismal Biology:** Learn about the diversity of life and classification systems (taxonomy). Study how organisms grow, reproduce, and interact with their environments. Understand the principles of evolution and natural selection.

**CO-3 Explore Genetics and Heredity:** Learn the basics of Mendelian and molecular genetics. Understand patterns of inheritance and the role of genetic variation in populations.

**CO-4. Examine Ecology and Environmental Biology:** Study ecosystems, energy flow, and nutrient cycles. Explore the interdependence of organisms and their environments. Understand human impacts on ecosystems and biodiversity.

**CO-5 Develop Scientific Inquiry Skills:** Learn how to design experiments, analyze data, and interpret results. Apply the scientific method to biological questions. Enhance critical thinking and problem-solving skills.

**CO-6 Prepare for Advanced Biological Studies:** Build a foundation for specialized topics in biology, such as microbiology, genetics, and biochemistry. Develop an appreciation for the scope and relevance of biology in everyday life.

## **COURSE CONTENTS**

### **Unit- I:**

- Introduction to the living world, diversity and characteristics of life, origin of life,

### **Unit- II:**

- Evolution and Eugenics. Binomial nomenclature and classification. Cell and cell division.

### **Unit- III:**

- Morphology of flowering plants. Seed and seed germination.

### **Unit- IV:**

- Plant systematic - viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

### **Practical:**

Morphology of flowering plants – root, stem and leaf and their modifications. Inflorescence, flower and fruits. Cell, tissues & cell division. Internal structure of root, stem and leaf. Study of specimens and slides. Description of plants - Brassicaceae, Fabaceae and Poaceae.

## **BAG-115: Elementary Mathematics**

### **CO: COURSE OBJECTIVES**

**CO-1 Develop Number Sense and Operations:** To help students understand and apply basic arithmetic operations (addition, subtraction, multiplication, and division) with whole numbers, fractions, and decimals.

**CO-2 Introduce Geometric Concepts:** To enable students to identify and analyze basic geometric shapes, understand their properties, and explore concepts of symmetry, area, and perimeter.

**CO-3 Understand Measurement:** To teach students how to measure length, weight, volume, and time using both standard and non-standard units of measurement, fostering an understanding of units and conversions.

**CO-4 Explore Data and Probability:** To introduce students to data collection, organization, and representation using graphs (bar charts, pictograms, and line graphs), and basic concepts of probability.

**CO-5 Introduce Problem-Solving Strategies:** To develop students' ability to solve word problems by applying mathematical operations and logical reasoning to everyday situations.

**CO-6 Enhance Mathematical Communication:** To encourage students to articulate mathematical ideas clearly using correct terminology and notation, and explain their thinking through reasoning.

**CO-7 Promote Critical Thinking:** To strengthen students' ability to make logical connections between concepts, recognize patterns, and apply mathematical concepts to real-world contexts.

## COURSE CONTENTS

### Unit- I:

- Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.

### Unit- II:

- Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameter is line joining two points  $(x_1, y_1)$  &  $(x_2, y_2)$ , Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line  $y = mx + c$  to the given circle  $x^2 + y^2 = a^2$ .

### Unit- III:

- Differential Calculus: Definition of function, limit and continuity, Simple problem on limit, Simple problems on continuity, Differentiation of  $x^n$ ,  $e^x$ ,  $\sin x$  &  $\cos x$  from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form  $y = f(x)$  (Simple problems based on it).

### Unit- IV:

- Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).

### Unit- V:

- Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.



## **BAG-115 A: Fundamentals of Statistics**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand Key Statistical Concepts:** Explain fundamental statistical concepts, including data types, measures of central tendency, and measures of dispersion.

**CO-2 Data Collection and Organization:** Apply methods for collecting, organizing, and summarizing data using appropriate statistical tools.

**CO-3 Probability Basics:** Understand and calculate probabilities to analyze random events and understand their role in statistical analysis.

**CO-4 Inferential Statistics:** Perform hypothesis testing, confidence interval estimation, and inferential techniques to draw conclusions from data.

**CO-5 Data Visualization:** Construct and interpret graphical representations of data, such as histograms, scatterplots, and boxplots.

**CO-6 Statistical Software Utilization:** Use statistical software or tools to analyze data effectively and interpret output.

**CO-7 Real-World Application:** Apply statistical methods to solve real-world problems in diverse fields, enhancing decision-making skills.

## **COURSE CONTENTS**

### **Unit-I**

Introduction: Meaning of statistics, Nature of statistics, Importance of statistics, Relation with some allied subjects, Uses of statistics, Misuses of statistics, Types of data: Primary and Secondary data, Quantitative data and Qualitative data, Discrete data and continuous data, Time series , Spatial series data and cross-sectional data, ordinal data and nominal data, Illustration with examples.

### **Unit-II**

Collection of data: Questionnaire and its basic characteristics, Definition of Schedule and pilot survey, Designing a questionnaire and schedule, concept of outliers, Presentation of data: Textual representation, Tabular representation, Diagrammatic representation (line diagram, Multiple axes diagram and multiple line diagram), Bar diagram (Horizontal and vertical bar diagrams, multiple and divided bar diagrams), Pie diagram.

### **Unit-III**

Frequency distribution, Cumulative frequency distribution and their graphical representation (Column diagram, Step diagram, ogive, Histogram, frequency curve of different types, Stem and leaf diagram). Concept of Central Tendency (Mean, Mode and Median) and its measures with properties including  $AM \geq GM \geq HM$ .

### **Unit-IV**

Measures of Dispersion: Range, Mean deviation, Standard deviation, Quartile deviation, Coefficient of variation, Quantile and Percentile with relation between different measures, Definition of Probability: Classical and Relative frequency approach to probability with limitations. Axiomatic Definition of Probability (Statement only) Theorem of Total Probability, Bonferroni's inequality, Boole's inequality.

## **BAG-115 B: Statistical Thinking and Data Analysis**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand Fundamental Statistical Concepts:** Develop a clear understanding of basic statistical terms, principles, and methodologies, including descriptive statistics, probability, and inferential techniques.

**CO-2 Data Collection and Sampling:** Learn appropriate methods for designing experiments, conducting surveys, and collecting data, while understanding the importance of sampling techniques and potential biases.

**CO-3 Exploratory Data Analysis:** Gain proficiency in visualizing and summarizing data using graphical and numerical methods to uncover underlying patterns, trends, and insights.

**CO-4 Statistical Modeling and Inference:** Apply statistical models to make inferences about populations from sample data, focusing on hypothesis testing, confidence intervals, and regression analysis.

**CO-5 Integration of Computational Tools:** Utilize statistical software and programming languages (e.g., R, Python, or Excel) to conduct data analysis efficiently and interpret outputs effectively.

**CO-6 Decision-Making Under Uncertainty:** Develop the ability to apply statistical reasoning to solve real-world problems and support decision-making in uncertain environments.

**CO-7 Communicating Statistical Findings:** Master the art of presenting data analysis results clearly and effectively to both technical and non-technical audiences, emphasizing evidence-based conclusions.

## **COURSE CONTENTS**

### **Unit I**

Statistical Thinking, Examples of Statistical Thinking, Numerical Data, Summary Statistics, From Population to Sampled Data, Different Types of Biases, Introduction to Probability, Introduction to Statistical Inference

### **Unit II**

Association and Dependence, Association and Causation, Conditional Probability and Bayes Rule, Simpsons Paradox, Confounding, Introduction to Linear Regression, Special Regression Models

### **Unit III**

Exploratory Data Analysis and Visualization, Goals of statistical graphics and data visualization, Graphs of Data, Graphs of Fitted Models, Graphs to Check Fitted Models, What makes a good graph, Principles of graphics

### **Unit IV**

Introduction to Bayesian Modeling, Bayesian inference: combining models and data in a forecasting problem, Bayesian hierarchical modeling for studying public opinion, Bayesian modeling for Big Data

## **BAG-117: Agricultural Heritage**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand Historical Significance:** Explore the historical development of agriculture and its impact on human civilization, from ancient practices to modern advancements.

**CO-2 Recognize Traditional Knowledge:** Identify and appreciate the importance of traditional agricultural practices and indigenous knowledge systems in sustaining ecosystems and enhancing crop diversity.

**CO-3 Evaluate Cultural Contributions:** Analyze the cultural, social, and economic contributions of agriculture in shaping societies across different regions and eras.

**CO-4 Study Agricultural Evolution:** Investigate the evolution of farming systems, tools, and techniques in response to changing environmental and social needs.

**CO-5 Learn Sustainability Principles:** Examine historical agricultural practices for their relevance to contemporary issues like sustainability, climate change, and food security.

**CO-6 Preserve Biodiversity:** Highlight the role of agricultural heritage in conserving biodiversity and promoting sustainable resource management.

**CO-7 Promote Awareness and Application:** Encourage the integration of agricultural heritage principles into modern farming to create a balance between tradition and innovation.

## COURSE CONTENTS

### Unit- I:

- Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture.

### Unit- II:

- Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era.

### Unit- III:

- Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world; Agriculture scope.

### Unit- IV:

- Importance of agriculture and agricultural resources available in India; Crop significance and classifications; National agriculture setup in India.

### Unit- V:

- Current scenario of Indian agriculture; Indian agricultural concerns and future prospects. Rural Sociology & Educational Psychology.

## **BAG-119: Rural Sociology & Educational Psychology**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand Rural Society:** To explore the structure, functions, and characteristics of rural communities and their role in society.

**CO-2 Analyze Social Change:** To examine the processes and patterns of social change and development in rural areas.

**CO-3 Study Cultural Practices:** To understand the cultural norms, values, traditions, and practices of rural societies.

**CO-4 Assess Rural Problems:** To identify and analyze the challenges faced by rural communities, such as poverty, illiteracy, and unemployment.

**CO-5 Promote Rural Development:** To understand the role of education, policy-making, and technology in enhancing rural life.

**CO-6 Learn Research Techniques:** To equip students with methodologies for conducting sociological research in rural settings.

**CO-7 Foster Community Engagement:** To prepare students to work effectively with rural populations and contribute to community development initiatives.

## **COURSE CONTENTS**

### **Unit- I:**

- Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology.

### **Unit- II:**

- Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.

### **Unit- III:**

- Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation.

### **Unit- IV:**

- Theories of Motivation, Intelligence.



## **BAG-119 A: Science, Technology, and Society**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand Interconnections:** Explain the interdependent relationship between science, technology, and society, and how they shape one another.

**CO-2 Analyze Ethical Implications:** Evaluate the ethical, environmental, and social impacts of scientific discoveries and technological advancements.

**CO-3 Explore Historical Contexts:** Examine the historical evolution of science and technology and its influence on societal development.

**CO-4 Foster Critical Thinking:** Develop critical thinking skills to assess the benefits, risks, and unintended consequences of technological innovation.

**CO-5 Promote Responsible Innovation:** Understand the role of individuals, organizations, and governments in fostering responsible science and technology practices for sustainable development.

**CO-6 Recognize Global Perspectives:** Explore the global dimensions of science and technology, considering issues such as equity, accessibility, and cultural diversity.

**CO-7 Encourage Lifelong Learning:** Cultivate a mindset for continuous inquiry into the advancements of science and technology and their potential to address societal challenges.

## **COURSE CONTENTS**

### **Unit I**

Science as Culture, Methods of Science, Issues and Perspectives. Social Context of Production of Scientific Knowledge, Demarcation, Autonomy and Cognitive Authority of Science. Challenges: Cognitive, Legal, Ethical, Feminist and Ideological, Discussion and Forum.

### **Unit II**

Science as Social Institution and Ethos of Science, Inequalities in Science, Critique of the Mertonian Paradigm, Knowledge Production: Social and Cultural Contexts, Discussion and Forum.

### **Unit III**

Society and Culture, Resources and Legitimation of Knowledge, Social Legitimation, Meanings, Interests, Values and the Modern State, Discussion and Forum.

### **Unit IV**

Perspectives on Science - Technology Relationship, Hierarchical, Symbiotic and Coalescing. Science and Technology, and their Human Roots, Philosophy of Science and Technology. Technology as Knowledge, Technological Shaping of Society and Social Shaping of Technology, Discussion and Forum.

### **Unit V**

Emerging Technologies: Information and Communication Society - Implications for Work, Social Relations, Governance and Control. Biotechnology - Implications for the Meanings of Life and Life. Processes, Application in Agriculture, Healthcare and Environment Discussion and Forum.

## **BAG-119 B: Women's and Gender Studies**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand Core Concepts and Theories:** Develop an understanding of key concepts, theories, and frameworks in Women's and Gender Studies, including feminism, intersectionality, and social constructionism.

**CO-2 Analyze Gender and Power Dynamics:** Examine the ways gender, sexuality, race, class, and other social categories shape individual experiences and societal structures.

**CO-3 Critique Social Inequalities:** Critically analyze historical and contemporary systems of oppression and privilege, such as patriarchy, sexism, heteronormativity, and colonialism.

**CO-4 Engage in Interdisciplinary Approaches:** Explore how Women's and Gender Studies intersects with fields such as sociology, history, literature, political science, and cultural studies to provide a holistic view of gender-related issues.

**CO-5 Promote Social Justice and Advocacy:** Build skills in activism and advocacy by exploring strategies for promoting equity, inclusion, and social justice on both local and global scales.

**CO-6 Evaluate Representations of Gender:** Analyze how gender and sexuality are represented in media, literature, and cultural practices, and consider their implications for societal norms and behaviors.

**CO-7 Apply Knowledge to Real-World Issues:** Use the knowledge gained to critically engage with and address real-world issues related to gender, such as gender-based violence, reproductive rights, workplace inequality, and LGBTQ+ rights.

## **COURSE CONTENTS**

### **Unit I**

Emergence of Women's Studies in India Establishment of Centre for Women's Studies under UGC guidelines Women's Studies in International Settings Growth and changing perspectives of Women's Studies and Research.

### **Unit II**

Basic Concepts "Understanding Sex- Gender, Understanding Sexism and Androcentrism, Understanding Patriarchy and Theories of Patriarchy, Private - Public dichotomy Patriarchy practices in different institutions and Text Books.

### **Unit III**

Representation of Women in Culture and Media. Women and Print Media. Women and Electronic Media ' Women and Films, Advertisements. Women and Mega Serials.

### **Unit IV**

Women and Literature, Women's Writings in India, Women's Representation in Literary Texts: With special reference to Novels of Ashapura Devi: Trilogy- 'PrathamPratishruti', 'Subarnalata' and 'Bakulkatha'.

### **Unit V**

Concept and definition of Social Work, Emergence of professional Social Work in India, Scope and concerns of Social Work practice, Role and Challenges of Social Workers in working with Women with disabilities.

## **BAG-119 C: Geography of the Global Economy**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Spatial Dynamics of the Global Economy:** Analyze the geographic distribution of economic activities and their interconnectedness at local, national, and global scales.

**CO-2 Examine Global Trade Patterns:** Explore the causes and consequences of international trade, including trade agreements, tariffs, and the role of global supply chains.

**CO-3 Analyze Economic Inequality:** Investigate the spatial dimensions of wealth and poverty, focusing on disparities between and within regions.

**CO-4 Evaluate the Role of Globalization:** Assess the impact of globalization on economic development, cultural exchanges, and the environment.

**CO-5 Explore Industrial and Technological Change:** Study the geographic implications of industrialization, deindustrialization, and the rise of digital economies.

**CO-6 Investigate Environmental and Economic Interactions:** Understand how economic activities influence and are influenced by environmental factors, including climate change, resource extraction, and sustainability practices.

**CO-7 Develop Geographic Analytical Skills:** Utilize tools such as GIS (Geographic Information Systems) and spatial data analysis to interpret and visualize economic patterns and trends.

## **COURSE CONTENTS**

### **Unit I**

Basic concepts and trends, Overview: geographies of global change, The structure and organization of economies, Growth and development: concepts and measures, Mapping the world economy, Recent patterns and trends: a global perspective, Recent patterns and trends: a Canadian perspective countries trade.

### **Unit II**

Emergence of a world economy and economic development, early commercial expansion, the colonial world economy, Development theories and pathways.

### **Unit III**

Population and resources, Global population dynamics, Population and migration, Natural resources and primary commodities, Population & resources I: food and agriculture, Population & resources II: oil and minerals.

### **Unit IV**

The spatial organization of the new world economy, the diffusion of the industrial revolution, the changing organization of industry: Fordism, The changing organization of industry: post-Fordism, On externalities, transactions and firm linkages, Agglomeration and new industrial spaces.

### **Unit V**

The resource curse and Dutch disease, Global food systems, the global land rush, Tropical deforestation, Fair trade: principles and realities, Global trade institutions and agreements, Local-global geographies of the financial crisis, the economy-environment interface, Globalization and inequality

## **BAG-121: Human Values and Ethics**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding Ethical Foundations:** To provide students with a comprehensive understanding of the fundamental concepts, principles, and theories of ethics and human values.

**CO-2 Developing Critical Thinking:** To enable students to critically analyze ethical dilemmas and challenges in personal, professional, and societal contexts.

**CO-3 Fostering Moral Awareness:** To cultivate a sense of moral responsibility by identifying and reflecting on the importance of values in decision-making and behavior.

**CO-4 Promoting Integrity and Accountability:** To emphasize the role of integrity, honesty, and accountability in personal and professional life.

**CO-5 Encouraging Respect for Diversity:** To teach students to appreciate and respect diverse perspectives, cultures, and values in a globalized society.

**CO-6 Enhancing Ethical Decision-Making:** To equip students with tools and frameworks to make ethical decisions and resolve conflicts effectively.

**CO-7 Building Social Responsibility:** To inspire students to contribute positively to society by addressing social, environmental, and global ethical challenges.

## **COURSE CONTENTS**

### **Unit- I:**

- Values and Ethics- An Introduction, Goal and Mission of Life.

### **Unit- II:**

- Vision of Life, Principles and Philosophy, Self Exploration.

### **Unit- III:**

- Self Awareness, Self Satisfaction, Decision Making.

### **Unit- IV:**

- Motivation, Sensitivity, Success, Selfless Service. Case

### **Unit- V:**

- Study of Ethical Lives, Positive Spirit, Body, Mind and Soul, Attachment and Detachment, Spirituality Quotient, Examination.



## **BAG-121 A: Global Climate Policy and Sustainability**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Science of Climate Change:** Gain a comprehensive understanding of the scientific principles behind climate change, including its causes, impacts, and implications for natural and human systems.

**CO-2 Analyze Global Climate Policies:** Explore key international agreements and frameworks such as the Paris Agreement, Kyoto Protocol, and IPCC reports, and assess their role in addressing climate change.

**CO-3 Evaluate Policy Approaches:** Compare and contrast policy approaches at global, regional, and national levels, focusing on mitigation strategies, adaptation planning, and policy implementation challenges.

**CO-4 Examine Sustainable Development Goals (SDGs):** Investigate the interconnections between climate action and the SDGs, emphasizing the need for integrated strategies to achieve sustainability.

**CO-5 Assess the Role of Stakeholders:** Identify the roles of various stakeholders, including governments, businesses, non-governmental organizations, and civil society, in advancing climate policy and sustainability efforts.

**CO-6 Develop Critical Thinking on Equity and Justice:** Analyze issues of climate justice, equity, and inclusivity, focusing on how climate policies affect different communities, particularly vulnerable populations.

**CO-7 Design Practical Solutions:** Equip students with the tools and frameworks to design innovative and practical solutions for climate challenges, fostering sustainable practices in various sectors.

## **COURSE CONTENTS**

### **Unit I**

Introduction to Climate Change and Sustainable Development: Principles and Approaches, Global Climate System, Climate Change: Causes and Consequences, Sustainable Development: Scope and Emerging Trends, Climate and Sustainable Development: An Interface.

### **Unit II**

Climate Change: Challenges and Choices, Climate Change and Water, Climate Change: Forest and Biodiversity, Climate Change: Coastal Ecosystem, Climate Change: Agriculture and Food Security.

### **Unit III**

Climate Change and Sustainable Development: Policies and Programmes, Sustainable Development Goals: An overview, Climate Change and Sustainable Development: National and State Policies, Achieving Sustainable Development Goals: Role of Various Stakeholders, Building Partnership for Climate Change and Sustainable Development.

### **Unit IV**

Climate Change and Sustainable Development: Stories of Success, Cross Country Experiences, National Experiences, Regional Experiences, and Community led Experiences.

### **Unit V**

Climate Change Policy, Climate change policy of countries, Uncertainty and climate change policy, Policy implications, Cost-benefit analysis in the context of climate change.

## **BAG-121 B: Planetary Change and Human Health**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Relationship between Planetary Health and Human Health:** Explore how changes in natural systems—such as climate change, biodiversity loss, and pollution—impact human health and well-being.

**CO-2 Identify Key Drivers of Environmental Change:** Examine the social, economic, and political factors driving planetary change, including industrialization, urbanization, and resource exploitation.

**CO-3 Assess the Impacts of Climate Change on Health:** Analyze the direct and indirect effects of climate change on human health, such as heat-related illnesses, vector-borne diseases, and food and water insecurity.

**CO-4 Examine the Role of Biodiversity in Public Health:** Investigate how the loss of biodiversity affects ecosystems and the services they provide, including implications for medicine, nutrition, and disease regulation.

**CO-5 Develop an Understanding of Environmental Justice:** Recognize how planetary change disproportionately affects vulnerable populations and contributes to health inequities worldwide.

**CO-6 Evaluate Adaptation and Mitigation Strategies:** Explore strategies to mitigate the adverse effects of planetary change on human health, including policy interventions, technological innovations, and community-based approaches.

**CO-7 Promote Interdisciplinary Problem-Solving:** Foster collaboration across disciplines to address the complex interconnections between environmental change and human health, integrating insights from public health, environmental science, and social sciences.

## **COURSE CONTENTS**

### **Unit I**

Introduction to Planetary Health, Current changes in the Earth's natural systems, the paradox of improved health and natural systems deterioration. Mapping the environmental determinants of human health.

### **Unit II**

Main risks of environmental change for human health, Introduction to writing an essay on planetary health, Environmental impacts of health systems, Challenges for Planetary Health, A planetary health approach to environmental health risks.

### **Unit III**

Food systems: a planetary health approach, Food security and nutrition, Climate change and health, Climate change and urban environment, COVID-19, a disease of the Anthropocene, Atmospheric and chemical pollution.

### **Unit IV**

Governance for a sustainable society, Sustainability, Sustainable development goals, Co-creation Activity for the Planetary Health course, Extreme weather events, Influence of global change in infectious diseases transmitted by water, zoonosis, and vectors.

## **BAG-121 C: Tools for Sustainable Design**

### **CO: COURSE OBJECTIVES**

**CO-1 Introduce Sustainable Design Concepts:** Provide students with a foundational understanding of sustainability principles and how they apply to design across various disciplines (e.g., architecture, industrial design, product design, urban planning).

**CO-2 Explore Tools for Sustainable Design:** Familiarize students with a variety of design tools, software, and techniques that support sustainable design practices, including energy modeling, lifecycle assessment (LCA), material selection tools, and environmental impact calculators.

**CO-3 Promote Resource Efficiency:** Teach students how to design for resource conservation, including minimizing waste, optimizing energy use, and selecting renewable and recyclable materials.

**CO-4 Assess Environmental Impacts:** Enable students to evaluate the environmental impacts of design decisions through tools like LCA, carbon footprint analysis, and other environmental metrics.

**CO-5 Integrate Social and Ethical Considerations:** Encourage students to consider social sustainability in design, including fair labor practices, inclusivity, and the well-being of communities affected by design choices.

**CO-6 Foster Innovation and Creativity in Sustainable Design:** Develop students' ability to innovate sustainable solutions that address environmental, economic, and social challenges through design thinking and problem-solving techniques.

**CO-7 Enable Real-World Application:** Equip students with the practical skills needed to apply sustainable design tools and methods to real-world projects, from product development to building design and urban planning.

**CO-8 Encourage Critical Thinking and Reflection:** Help students critically analyze design decisions and their long-term impacts on the environment and society, fostering a mindset of continuous improvement and adaptability in sustainable design practices.

## **BAG-121 C: Tools for Sustainable Design**

### **CO: COURSE OBJECTIVES**

**CO-1 Introduce Sustainable Design Concepts:** Provide students with a foundational understanding of sustainability principles and how they apply to design across various disciplines (e.g., architecture, industrial design, product design, urban planning).

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**CO-8 Encourage Critical Thinking and Reflection:** Help students critically analyze design decisions and their long-term impacts on the environment and society, fostering a mindset of continuous improvement and adaptability in sustainable design practices.

## **COURSE CONTENTS**

### **Unit I**

Sustainable Design Sustainability and related terms, Design process and sustainable development, approaches to sustainability, sustainable design principles, application of sustainable design principles in product design, tools for sustainable design.

### **Unit II**

Developments in design methods History of design methods, Introduction to various design methods by: Alexander, Banathy, Nigel Cross, IDEO, Double Diamond by UK Design Council. Introduction to social innovation, Product Service Systems, and Lifecycle analysis.

### **Unit III**

Model of the Design Innovation Process. Seven Modes of the Design Innovation Process: (1) Sense Intent, (2) Know Context, (3) Know People, (4) Frame Insights, (5) Explore Concepts, (6) Frame Solutions, (7) Realize Offerings.

### **Unit IV**

Interaction design process and methodology for designing interactive solutions. Interaction models. Paradigms for interaction. Services and events: products to be used in groups, products used in public places, products for future use, design of tangible, gestural, multimodal, and expressive interfaces, products that enrich user experience.

### **Unit V**

Inter-disciplinary approach drawing upon human factors, cognitive sciences, human psychology, product design, visual communication, and computer science. Exploration of alternatives and pushing the envelope of what is known to improve user experience and make the design more inclusive.

## **BAG-123: NSS**

### **CO: COURSE OBJECTIVES**

**CO-1 Develop Social Responsibility:** NSS aims to build a sense of responsibility among students toward society by involving them in activities that directly impact the community's welfare.

**CO-2 Promote Volunteerism:** The course encourages students to actively participate in community service projects such as literacy campaigns, environmental protection, health programs, and rural development.

**CO-3 Foster National Integration:** NSS helps students understand the importance of national unity, integrity, and communal harmony by engaging them in projects across diverse communities and regions.

**CO-4 Enhance Personality Development:** By participating in NSS activities, students develop qualities like leadership, teamwork, discipline, and communication, which contribute to their overall personal growth.

**CO-5 Create Awareness of Social Issues:** The course aims to raise awareness about various social issues, such as poverty, health, education, and gender equality, helping students understand the challenges faced by marginalized communities.

**CO-6 Strengthen the Link between Campus and Community:** NSS provides an avenue for students to connect with the broader community beyond their academic environment, helping bridge the gap between theory and real-life issues.

**CO-7 Promote Sustainable Development:** Through service-oriented activities, NSS helps in promoting the values of sustainable development by involving students in eco-friendly and socially beneficial initiatives.

**CO-8 Encourage Civic Participation:** NSS nurtures the habit of active participation in civic responsibilities, fostering the spirit of democracy and participation in local governance.



## **COURSE CONTENTS**

### **Course Title: National Service Scheme I**

#### **Unit- I:**

- Introduction and basic components of NSS: Orientation: history, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health

#### **Unit- II:**

- NSS programmes and activities: Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary

#### **Unit- III:**

- Understanding youth: Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change

Community mobilisation: Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilisation involving youth-adult partnership

#### **Unit- IV:**

- Social harmony and national integration: Indian history and culture, role of youth in nation building, conflict resolution and peace-building

Volunteerism and shramdan: Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism

#### **Unit- V:**

- Citizenship, constitution and human rights: Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information. Family and society: Concept of family, community (PRIs and other community based organisations) and society.

## Physical Education and Yoga Practices

1. Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennis)
2. Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennis)
3. Teaching of advanced skills of Football – involvement of all the skills in game situation with teaching of rules of the game
4. Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation
6. Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game
7. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
8. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of advanced skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation
11. Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game
12. Teaching of some of Asanas – demonstration, practice, correction and practice
13. Teaching of some more of Asanas – demonstration, practice, correction and practice
14. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
15. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
16. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teaching of rule of the game
17. Teaching – Meaning, Scope and importance of Physical Education
18. Teaching – Definition, Type of Tournaments
19. Teaching – Physical Fitness and Health Education
20. Construction and laying out of the track and field (\*The girls will have Tennis and Throw Ball).

## **BAG-123 A: NCC**

### **CO: COURSE OBJECTIVES**

**CO-1 Develop Leadership Skills:** NCC aims to cultivate leadership qualities and team-building skills among cadets by involving them in various activities that require decision-making, responsibility, and management.

**CO-2 Promote Physical Fitness:** Physical training, including drills, marches, and physical fitness routines, is a central component of the NCC course, aiming to keep cadets healthy, fit, and active.

**CO-3 Foster Discipline and Punctuality:** The NCC course instills a sense of discipline, punctuality, and respect for rules and regulations among cadets. This is achieved through regular training and adherence to strict schedules.

**CO-4 Cultivate Social Responsibility:** NCC encourages cadets to become responsible citizens by promoting social service, environmental awareness, and community involvement.

**CO-5 Develop a Sense of Patriotism:** Through exposure to national defense services, cadets are encouraged to develop a sense of patriotism, pride, and respect for the country.

**CO-6 Enhance Outdoor and Adventure Skills:** The course includes various outdoor activities, such as trekking, camping, and adventure sports, that develop survival skills, teamwork, and resilience.

**CO-7 Provide Exposure to Military and Para-military Training:** The NCC offers cadets exposure to basic military training, discipline, and knowledge of armed forces activities, which can inspire interest in defense careers.

**CO-8 Promote National Integration:** NCC aims to foster unity and national integration by bringing together young people from diverse backgrounds, regions, and communities.

**CO-9 Build Confidence and Self-reliance:** Through various training modules and field exercises, cadets gain confidence in their abilities and develop problem-solving skills, helping them to become self-reliant individuals.

## **COURSE CONTENTS**

### **Unit: 1 Personality Development**

(i) Thinking- Meaning and Concept of thinking, Reasoning, Process of thinking. (ii) Critical Thinking- Meaning & concept of critical thinking, Features of critical thinking, Process of critical thinking. (iii) Creative thinking- Meaning & concept of creative thinking, Features of creative thinking, Process of creative thinking, levels of Creativity, Characteristics of creative person.

### **Unit: 2 Leadership Development**

(i) Leadership capsule. (ii) Important Leadership traits, Indicators of leadership and evaluation. (iii) Motivation- Meaning & concept, Types of motivation. Factors affecting motivation. (iv) Ethics and Honor codes.

### **Unit: 3 Social Service and Community Development**

(i) Protection of Children & Women Safety. (ii) Road/Rail Safety. (iii) New Government Initiatives. (iv) Cyber and mobile Security Awareness.

### **Unit: 4 Group Discussion**

Coping with Stress & Emotions, time Management, Social Skills, Team Work, Career Counselling, SSB Procedure & Interview Skills, Public Speaking.

### **Unit: 5 CAMP (Practical)**

Ceremonial and Weapon Training, Swachh Bharat Abhiyan.

## **BAG-123 B: Physical Education & Yoga Practices**

### **CO: COURSE OBJECTIVES**

**CO-1 Enhance Physical Fitness:** To improve students' overall physical fitness, including strength, flexibility, endurance, balance, and coordination, through a variety of physical education and yoga activities.

**CO-2 Promote Health and Well-being:** To encourage lifelong health habits by educating students on the importance of regular physical activity, proper nutrition, mental well-being, and stress management through yoga.

**CO-3 Develop Yoga Skills and Techniques:** To teach students various yoga postures (asanas), breathing techniques (pranayama), meditation practices, and relaxation techniques to enhance physical and mental well-being.

**CO-4 Foster Mind-Body Connection:** To cultivate awareness of the connection between body and mind, enabling students to understand how physical activity and yoga can influence emotional and mental health.

**CO-5 Incorporate Yoga Philosophy:** To introduce students to the fundamental philosophy behind yoga, including concepts like mindfulness, self-discipline, non-violence (ahimsa), and ethical conduct, which promote personal growth.

**CO-6 Develop Personal Fitness Goals:** To assist students in setting and achieving individualized fitness goals through both physical education and yoga practices, encouraging self-motivation and goal setting.

**CO-7 Promote Lifelong Activity:** To instill an understanding of how regular participation in physical education and yoga can lead to a healthier lifestyle, reducing the risk of chronic diseases and improving long-term health.

## **COURSE CONTENTS**

### **Unit: 1 Physical Education**

Meaning, Definition, Aim and Objective, Misconception about Physical Education, Need, Importance and Scope of Physical Education in the Modern Society, Physical Education Relationship with General Education, Physical Education in India before Independence. Physical Education in India after Independence.

### **Unit: 2 Concept of Fitness and Wellness**

Meaning, Definition and Importance of Fitness and Wellness, Components of Fitness, Factor Affecting Fitness and Wellness.

Weight Management, Meaning and Definition of Obesity, Causes of Obesity, Management of Obesity, Health problems due to Obesity.

Lifestyle: Meaning, Definition, Importance of Lifestyle, Factor affecting Lifestyle, Role of Physical activity in the maintains of Healthy Lifestyle.

### **Unit: 3 Yoga and Meditation**

Historical aspect of yoga, Definition, types scopes & importance of yoga, Yoga relation with mental health and value education, Yoga relation with Physical Education and sports, Definition of Asana, differences between asana and physical exercise, Definition and classification of pranayama, Difference between pranayama and deep breathing, Practical: Asana, Suraya-Namaskar, Bhujang Asana, Naukasana, Halasana, Vajrasan, Padmasana, Shavasana, Makrasana, Dhanurasana, Tad Asana. Pranayam: Anulom, Vilom.

### **Unit: 4 Traditional Games of India**

Meaning, Types of Traditional Games Gilli- Danda, Kanche, Stapu, Gutte, etc Importance/ Benefits of Traditional Games, How to Design Traditional Games.

Recreation in Physical Education, Meaning, Definition of Recreation, Scope and Importance of Recreation, General Principles of Recreation, Types of Recreational Activities, Aerobics and Zumba. (Fir India Movement).

## **BAG-123 C: Water, Sanitation and Hygiene**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Importance of WASH:** Explore the impact of poor WASH on disease transmission, health, and socio-economic development.

**CO-2 Study Water Management Systems:** Understand water quality standards and the treatment of water for safe consumption.

**CO-3 Examine Sanitation Systems:** Understand different sanitation systems, such as sewage treatment, waste disposal, and the management of human excreta.

**CO-4 Promote Hygiene Practices:** Learn about the significance of hygiene behaviors, including hand washing, safe food handling, and personal cleanliness.

**CO-5 Investigate Environmental and Social Impacts:** Explore the environmental effects of inadequate sanitation and water management (e.g., pollution, contamination).

**CO-6 Understand WASH Policy and Governance:** Study the roles of various stakeholders (government, NGOs, local communities) in the development and implementation of WASH projects.

**CO-7 Develop Practical Skills in WASH Implementation:** Gain hands-on experience in designing, implementing, and evaluating WASH programs.

**CO-8 Promote Sustainability:** Investigate methods for ensuring the long-term sustainability of WASH projects through community engagement and capacity building.

## **COURSE CONTENTS**

### **Unit I**

Introduction to Sanitation and Hygiene for Health, Definitions and Concepts, Global, national and regional perspective, Relation between health, hygiene & sanitation, Relevance & importance of health, hygiene in the contemporary times.

### **Unit II**

Occupational Health and Hygiene, Concept, definition and its role, Link between occupational hygiene, risk assessment & risk management. Sanitation problems of the workplace: industries, academic institutions, corporate, hospitals, Public spaces etc.

### **Unit III**

Health Hygiene Promotion & Education, Hygiene Behavior promotion & education-concept and its importance, Hygiene promotion & education in children & adolescence, Government initiatives & policies in rural & urban area.

### **Unit IV**

Health, hygiene practices in India and in North East India, Present scenario of health hygiene in India, Reproductive & sexual health of the women, Indigenous hygiene & sanitation practices, Cultural beliefs of the people of NE India in relation to health & hygiene- role & impacts.



## **BAG-102: Fundamentals of Genetics**

### **CO: COURSE OBJECTIVE**

**CO-1 Introduction to Genetic Principles:** Understand the foundational principles of inheritance, including Mendelian and non-Mendelian genetics.

**CO-2 Chromosomal Basis of Inheritance:** Explore the structure and function of chromosomes and their role in heredity.

**CO-3 Molecular Genetics:** Analyze the molecular structure of DNA and RNA and their roles in replication, transcription, and translation.

**CO-4 Gene Expression and Regulation:** Understand how genes are regulated and expressed in prokaryotic and eukaryotic systems.

**CO-5 Mutations and Genetic Variation:** Study types of mutations, their mechanisms, and their effects on organisms.

**CO-6 Population Genetics:** Learn about genetic variation within populations and the principles of Hardy-Weinberg equilibrium.

**CO-7 Genetic Tools and Technologies:** Explore modern genetic tools such as CRISPR, PCR, and gene sequencing techniques.

## Course Content

### Unit- I:

- Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes.

### Unit- II:

- Chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis. Probability and Chi-square. Dominance relationships, Epistatic interactions with example.

### Unit- III:

- Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping.

### Unit- IV:

- Structural and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics. Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance. Genetic disorders.

### Unit- V:

- Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

### Practical:

Study of microscope. Study of cell structure. Mitosis and Meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiment on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments on probability and Chi-square test. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in *Drosophila*. Study of models on DNA and RNA structures.

## **BAG-104:Agricultural Microbiology**

### **CO: COURSE OBJECTIVE**

**CO-1Soil Microbiology:** The study of microorganisms in the soil, their role in nutrient cycling, and their impact on soil health and fertility.

**CO-2Plant-Microbe Interactions:** The relationship between microorganisms and plants, including beneficial interactions (such as nitrogen-fixing bacteria) and harmful ones (such as plant pathogens).

**CO-3Microbial Ecology:** The diversity and ecology of microbes in agricultural environments, and how they interact with each other and the plants they affect.

**CO-4Biological Control of Pests and Diseases:** The use of microorganisms to control plant diseases and pests in an environmentally friendly way.

**CO-5Microbial Biotechnologies in Agriculture:** How biotechnology and genetic engineering are used to enhance beneficial microbial functions in agriculture (e.g., bio fertilizers, bio pesticides).

**CO-6Waste Management in Agriculture:** The role of microorganisms in decomposing organic waste and producing compost or bioenergy.

**CO-7Food Safety and Microbes:** The study of microorganisms involved in food production, processing, and preservation, including beneficial probiotics and harmful pathogens.

## **Course Contents**

### **Unit- I:**

- Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photoautotrophy, growth. Bacterial genetics:

### **Unit- II:**

- Genetic recombination- transformation, conjugation and transduction, plasmids, transposon.

### **Unit- III:**

- Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles.

### **Unit- IV:**

- Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.

### **Unit- V:**

- Microbes in human welfare: silage production, biofertilizers, biopesticides, bio fuel production and biodegradation of agro-waste.

### **Practical:**

Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. Nutritional media and their preparations. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures. Isolation of Rhizobium from legume root nodule. Isolation of Azotobacter from soil. Isolation of Azospirillum from roots. Isolation of BGA. Staining and microscopic examination of microbes.

## **BAG-106:Soil and Water Conservation Engineering**

### **CO: COURSE OBJECTIVE**

**CO-1 Understand the principles of soil and water conservation:** Learn about the erosion process, types of erosion, and factors affecting soil erosion. Study the impact of erosion on agriculture, environment, and infrastructure.

**CO-2 Examine soil-water relationships:** Understand soil-water retention and its effect on soil fertility and crop production. Study infiltration, percolation, and water holding capacity of soils.

**CO-3 Learn about soil erosion control techniques:** Study various erosion control methods like contour plowing, terracing, and grass waterways. Understand vegetative, structural, and mechanical erosion control measures.

**CO-4 Explore water conservation strategies:** Understand the techniques used to conserve water in agricultural systems, such as rainwater harvesting, water storage, and irrigation efficiency. Learn about water management practices like mulching and soil moisture management.

**CO-5 Assess land and water resources:** Understand methods for evaluating soil erosion risk, water availability, and land suitability for conservation practices. Learn to design conservation measures based on site-specific conditions.

**CO-6 Introduce water harvesting techniques:** Study methods of water harvesting in dry land farming and its relevance to sustainable agriculture.

**CO-7 Foster knowledge of sustainable agricultural practices:** Understand the relationship between conservation techniques and sustainable farming systems. Learn about agroforestry, cover crops, and crop rotation as part of soil and water conservation.

**CO-8 Analyze the socio-economic aspects:** Understand the socio-economic importance of soil and water conservation in rural development. Study the policies and practices related to water conservation at regional and global levels.

## Course Content

### Unit- I:

- Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion.

### Unit- II:

- Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss.

### Unit- III:

- Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund.

### Unit- IV:

- Graded bund and bench terracing. Grassed waterways and their design. Water harvesting and its techniques.

### Unit- V:

- Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

### Practical:

General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed waterways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion.

## **BAG-108: Fundamentals of Crop Physiology**

### **CO: COURSE OBJECTIVE**

**CO-1 Photosynthesis and Respiration:** Understanding how plants convert light into energy, the process of respiration, and how these processes affect crop growth and yield.

**CO-2 Water Relations and Stress Physiology:** Exploring how water is absorbed, transported, and utilized in crops, as well as the effects of water stress on plant health and productivity.

**CO-3 Nutrient Uptake and Metabolism:** Examining how crops absorb nutrients from the soil, how these nutrients are utilized in plant growth, and the physiological effects of nutrient deficiencies.

**CO-4 Reproductive Physiology:** Studying the processes of flowering, pollination, fertilization, and seed development, which are crucial for crop production.

**CO-5 Environmental Interactions:** Investigating how factors like light, temperature, humidity, and soil conditions affect crop physiology and how plants adapt to different environments.

**CO-6 Growth Regulators and Hormones:** Analyzing the role of plant hormones in regulating growth, development, and responses to environmental stimuli.

**CO-7 Crop Yield and Improvement:** Understanding the physiological basis of crop yield, including factors that influence productivity, and how crop physiology can inform breeding and management practices to improve yields.

**CO-8 Stress Physiology:** Investigating how crops respond to abiotic and biotic stresses, including drought, salinity, pests, and diseases, and how these responses impact crop productivity.

## Course Content

### Unit- I:

- Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants:

### Unit- II:

- Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C<sub>3</sub>, C<sub>4</sub> and CAM plants;

### Unit- III:

- Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators:

### Unit- IV:

- Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops:

### Unit- V:

- Growth analysis, Role of Physiological growth parameters in crop productivity.

### Practical:

Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO<sub>2</sub> assimilation by InfraRed Gas Analyser (IRGA).



## **BAG-110: Fundamentals of Agricultural Economics**

### **CO: COURSE OBJECTIVE**

**CO-1 Understanding Economic Principles:** Introducing basic concepts in economics, such as supply and demand, market equilibrium, and price mechanisms. Understanding the role of agriculture in the broader economy and its relationship with sectors like manufacturing, services, and trade.

**CO-2 Analyzing Agricultural Markets:** Understanding how agricultural markets function, including commodity markets (e.g., grains, livestock). Exploring the factors that affect the supply and demand of agricultural products. Studying market structures like perfect competition, monopoly, and oligopoly within agriculture.

**CO-3 Evaluating Farm Production and Cost Structures:** Analyzing farm production functions, and the relationship between inputs (land, labor, capital) and outputs (crops, livestock). Understanding cost structures in farming, including fixed and variable costs, total costs, and profitability.

**CO-4 Examining Agricultural Policy and Government Intervention:** Studying government policies in agriculture such as subsidies, tariffs, and price supports. Understanding the impact of trade policies and international agricultural markets. Analyzing the role of public institutions like agricultural extension services and rural development programs.

**CO-5 Agricultural Risk and Uncertainty:** Exploring sources of risk in agriculture (e.g., climate, pest outbreaks, and market fluctuations) and how farmers manage these risks. Understanding insurance, futures markets, and diversification strategies.

**CO-6 Farm Management and Decision-Making:** Teaching techniques for optimizing resource allocation, production decisions, and financial management on farms. Understanding decision-making tools like budgeting, break-even analysis, and financial forecasting.

**CO-7 Sustainability and Agricultural Economics:** Exploring the economic aspects of sustainable farming practices and natural resource management. Studying the economics of environmental concerns like soil conservation, water use, and climate change.

## Course Content

### Unit- I:

- Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior

### Unit- II:

- Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. Demand: meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input-output relationship.

### Unit- III:

- Law of returns: Law of variable proportions and law of return to scale. Cost: concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shutdown and breakeven points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

### Unit- IV:

- National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation.

### Unit- V:

- Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning,

microv/smacrofinance,needforagriculturalfinance,publicrevenueandpublicexpenditure.Tax:meaning,directandindirecttaxes,agriculturaltaxation,VAT.Economic systems: Concepts of economy and its functions, important features ofcapitalistic,socialisticand mixed economies, elementsof economicplanning.

## **BAG-112:FundamentalsofPlantPathology**

### **CO: COURSE OBJECTIVE**

**CO-1Understanding the Principles of Plant Pathology:**Introduce the basic concepts of plant pathology, including disease causation, host-pathogen interactions, and disease development.

**CO-2Identification of Pathogens:**Study different types of plant pathogens such as fungi, bacteria, viruses, nematodes, and phytoplasmas.Learn techniques for identifying these pathogens and understanding their life cycles.

**CO-3Mechanisms of Disease Development:**Explore the process of infection, how pathogens attack plants, and the factors that influence disease progression.

**CO-4Symptoms and Diagnosis of Plant Diseases:**Learn to recognize and diagnose various symptoms of plant diseases, such as lesions, wilting, chlorosis, and necrosis.

**CO-5Epidemiology of Plant Diseases:**Study the factors that influence the spread of diseases, such as environmental conditions, crop rotation, and human activities.

**CO-6Plant Disease Management:**Examine different methods of controlling plant diseases, including chemical, biological, cultural, and genetic approaches.

**CO-7Impact of Plant Diseases:**Understand the economic and ecological impact of plant diseases on agriculture, forestry, and natural ecosystems.

**CO-8Research and Advances in Plant Pathology:**Discuss the latest developments in the field, including new technologies for pathogen detection and disease management strategies.

## Course Contents

### Unit- I:

- Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.

### Unit- II:

- Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.

### Unit- III:

- Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction. Viruses: nature, structure, replication and transmission. Study of phanerogamic plant parasites.

### Unit- IV:

- Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, Anguina, Radopholus etc.) Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants.

### Unit- V:

- Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

### Practical:

Acquaintance with various laboratory equipments and microscopy. Collection and preservation of disease specimen. Preparation of media, isolation and Koch's postulates

.General study of different structures of fungi. Study of symptoms of various plant diseases. Study of representative fungal genera. Staining and identification of plant pathogenic bacteria. Transmission of plant viruses. Study of phanerogamic plant parasites.

Study of morphological features and identification of plant parasitic nematodes. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting. Study of fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations.

## **BAG-114: Fundamentals of Entomology**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Basic Concepts of Entomology:** Gain knowledge of the fundamental principles of entomology, including the role of insects in ecosystems, human society, and the environment.

**CO-2 Identify and Classify Insect Species:** Develop the ability to identify, classify, and distinguish between major insect orders and families, including understanding their morphological and anatomical features.

**CO-3 Study Insect Physiology:** Learn about the physiological processes of insects, including digestion, respiration, excretion, reproduction, and nervous systems.

**CO-4 Understand Insect Behavior:** Investigate the behavior of insects, including communication, mating, social structures (such as in ants or bees), and response to environmental stimuli.

**CO-5 Explore Insect Ecology:** Understand the ecological roles of insects, including their impact on pollination, decomposition, pest control, and as vectors of diseases.

**CO-6 Investigate Insect Evolution and Development:** Examine the evolutionary history of insects and their development from egg to adult, including metamorphosis and adaptations to various environments.

**CO-7 Learn the Role of Insects in Agriculture and Medicine:** Understand the economic importance of insects, both beneficial (e.g., pollinators) and harmful (e.g., agricultural pests, disease vectors), and their management in pest control and medical contexts.

## Course Contents

### Unit- I:

- History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ.

### Unit- II:

- Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

### Unit- III:

- Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors – temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance.

### Unit- IV:

- Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control – importance, hazards and limitations. Recent methods of pest control, repellents, anti feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.

### Unit- V:

- Systematics: Taxonomy – importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigoniidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera:

## **BAG-116: Fundamentals of Agricultural Extension Education**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Role of Agricultural Extension:** To provide students with an understanding of the importance and role of agricultural extension in enhancing agricultural productivity, promoting sustainable practices, and improving rural livelihoods.

**CO-2 Learn Key Principles of Agricultural Extension:** To introduce students to the fundamental principles, concepts, and theories that guide agricultural extension services and their application in diverse agricultural settings.

**CO-3 Examine Extension Models and Approaches:** To analyze various extension models, approaches, and methodologies used to communicate agricultural knowledge and practices to farmers, communities, and stakeholders.

**CO-4 Develop Communication Skills for Extension Work:** To enhance students' communication and interpersonal skills, including methods for delivering information and facilitating participatory learning within rural communities.

**CO-5 Explore Extension Program Planning and Management:** To teach students how to plan, implement, monitor, and evaluate extension programs and projects that aim to address agricultural and rural development challenges.

**CO-6 Identify Key Stakeholders in Agricultural Extension:** To familiarize students with the key stakeholders in agricultural extension (farmers, government agencies, NGOs, and private sector entities) and their roles in agricultural development.

**CO-7 Promote Critical Thinking in Agricultural Innovation:** To encourage students to critically evaluate agricultural innovations and technologies, assessing their relevance, sustainability, and effectiveness in different socio-economic and environmental contexts.



## Course Content

### Unit- I:

- Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development.

### Unit- II:

- Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

### Unit- III:

- Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.- meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.

### Unit- IV:

- Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition;

### Unit- V:

- Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

### Practical:

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

## **BAG-118: Communication Skills and Personality Development**

### **CO: COURSE OBJECTIVES**

**CO-1 Enhance Verbal Communication:** To develop effective spoken communication skills, enabling students to express themselves clearly, confidently, and persuasively in various contexts, including public speaking, interviews, and presentations.

**CO-2 Improve Non-Verbal Communication:** To foster an understanding of non-verbal cues such as body language, facial expressions, posture, and eye contact, and how they impact communication.

**CO-3 Develop Listening Skills:** To strengthen active listening abilities, emphasizing the importance of listening for understanding, feedback, and engagement in both personal and professional interactions.

**CO-4 Enhance Written Communication:** To improve written communication skills, including grammar, structure, clarity, and tone, in various formats such as emails, reports, and formal correspondence.

**CO-5 Boost Confidence and Self-Presentation:** To build self-awareness and self-confidence through personal grooming, positive body language, and effective self-presentation techniques in social and professional settings.

**CO-6 Foster Emotional Intelligence:** To develop emotional intelligence skills such as empathy, emotional regulation, and social awareness, enhancing interpersonal relationships and communication effectiveness.

**CO-7 Cultivate Critical Thinking and Problem-Solving:** To encourage critical thinking in communication, allowing students to analyze situations, solve problems effectively, and make informed decisions in both professional and personal environments.

## Course Contents

### Unit- I:

- Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication;

### Unit- II:

- Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

### Unit- III:

- Reading and comprehension of general and technical articles, precis writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion.

### Unit- IV:

- Organizing seminars and conferences.

### Practical:

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precis writing, summarizing, abstracting; individual and group presentations.

## **BAG-118 A: English Grammar-II**

### **CO: COURSE OBJECTIVES**

**CO-1 Enhance Advanced Understanding of Grammar:** Develop a deeper understanding of complex English grammar structures, including advanced tenses, voice, mood, and conditionals.

**CO-2 Improve Sentence Construction:** Teach students to construct clear, concise, and grammatically correct sentences with an emphasis on variety and sophistication.

**CO-3 Master Complex Sentence Structures:** Explore and practice complex sentence types, including compound-complex sentences, subordination, and coordination.

**CO-4 Refine Use of Modifiers and Clauses:** Equip students with the skills to effectively use adjectives, adverbs, relative clauses, and other modifiers for clarity and precision in writing.

**CO-5 Analyze Punctuation and Syntax:** Develop proficiency in the correct use of punctuation marks (commas, semicolons, colons, etc.) to enhance meaning and readability.

**CO-6 Strengthen Vocabulary through Grammar:** Help students improve vocabulary usage through context and grammar, emphasizing word formation, collocations, and correct usage.

**CO-7 Foster Critical Grammar Application in Writing:** Enable students to apply grammar rules effectively in academic, professional, and creative writing to produce error-free texts.

## **Course Content**

### **Unit I**

Review of Basic Grammar, Parts of speech, sentence structure, and punctuation, Verb Tenses, Present, past, future, and perfect aspects, Modifiers, Adjectives, adverbs, and their placement,

### **Unit II**

Clauses and Sentence Types, Independent, dependent, and compound-complex sentences, Agreement, Subject-verb and pronoun-antecedent agreement, Active vs. Passive Voice, When to use each effectively, Common Grammatical Errors, Misplaced modifiers, comma splices, etc.

### **Unit III**

Punctuation, Advanced usage of commas, semicolons, colons, and dashes, Style and Tone, How grammar affects writing style and audience engagement, Editing and Proofreading Techniques,

### **Unit IV**

Application in Professional Writing, Grammar in resumes, cover letters, and reports, Strategies for self-editing and peer review, Final Review and Assessment

## **BAG-118 B: Soft Skills-II**

### **CO: COURSE OBJECTIVES**

**CO-1 Enhance Communication Skills:** Improve verbal, non-verbal, and written communication abilities to ensure clarity, effectiveness, and professionalism in various settings.

**CO-2 Develop Teamwork and Collaboration:** Foster the ability to work effectively in diverse teams, focusing on cooperation, conflict resolution, and mutual respect in a group environment.

**CO-3 Refine Time Management Techniques:** Teach practical strategies for prioritizing tasks, meeting deadlines, and maintaining productivity in both personal and professional settings.

**CO-4 Cultivate Leadership Abilities:** Develop leadership skills, including decision-making, motivating others, delegating tasks, and leading by example to inspire and guide teams.

**CO-5 Build Emotional Intelligence:** Strengthen self-awareness, empathy, and emotional regulation to better understand oneself and interact with others in a professional environment.

**CO-6 Improve Problem-Solving and Critical Thinking:** Equip students with strategies to approach problems systematically, think critically, and find innovative solutions in a variety of situations.

**CO-7 Promote Conflict Resolution Skills:** Teach effective techniques for managing and resolving conflicts, fostering positive relationships and a harmonious work environment.

## **Course Contents**

### **Unit I**

Presentation Skills, Speaking to a small group and large audience, Barriers to communication and non- verbal communication, Language skills, Types of presentation and use of aids, Effective public speaking.

### **Unit II**

Memory Skills, Memory system, Short term and long term memory, Causes of memory problems, Methods of improving memory, preventing loss of memory.

### **Unit III**

Technical Writing Skills, Defining Technical Communication and Organizing Information, Language in Technical Communication.

### **Unit IV**

Description Vs Narration Vs Instruction, Letters, Memos, Electronic Communication, Formal and Informal Reports.

## **BAG-118 C: Life Management-II**

### **CO: COURSE OBJECTIVES**

**CO-1 Enhance Time Management Skills:** To equip students with advanced techniques for managing their time effectively, prioritizing tasks, and balancing various aspects of life, including work, education, and personal commitments.

**CO-2 Develop Emotional Intelligence:** To help students understand and manage their emotions, build empathy, and improve their interpersonal relationships both personally and professionally.

**CO-3 Master Decision-Making and Problem-Solving:** To teach students methods for making informed and effective decisions, as well as strategies for solving complex life problems with confidence and clarity.

**CO-4 Financial Management and Planning:** To provide students with the knowledge and skills necessary to manage personal finances, including budgeting, investing, and planning for long-term financial goals.

**CO-5 Promote Health and Wellness:** To encourage students to develop habits for maintaining physical, mental, and emotional health through exercise, nutrition, mindfulness, and stress management techniques.

**CO-6 Cultivate Leadership and Social Responsibility:** To foster leadership qualities, enhance teamwork skills, and inspire students to take an active role in their communities through social responsibility initiatives.

**CO-7 Set and Achieve Personal and Professional Goals:** To guide students in setting realistic, measurable, and meaningful short-term and long-term goals, and to provide them with the tools and strategies to achieve them effectively.



## **Course Contents**

### **Unit I**

Basics of Life Management, Ways of Life Management, Effective Reading & Writing, Emotional development, Basics of Character Building.

### **Unit II**

Developing Tools of Life Management, Way to Creative Excellence, Effective Communication & Public Speaking, Developing Ideal Leadership Skill.

### **Unit III**

Spiritual Potential of Personality, Ideal of a successful Personality, Adjustment & Behavioral Skill.

### **Unit IV**

Workshop in campus and local areas.

## **BAG-201:Crop Production Technology–I(Kharif Crops)**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understanding of Kharif Crops:**

- To provide students with an in-depth knowledge of the different Kharif crops, their classification, and characteristics.

#### **CO-2 Soil and Climate Requirements:**

- To familiarize students with the soil types, climatic conditions, and environmental factors required for successful cultivation of Kharif crops.

#### **CO-3 Crop Improvement:**

- To explore strategies for improving crop yield, quality, and resistance to pests and diseases through breeding programs.

#### **CO-4 Nutrient Management:**

- To teach the application of appropriate fertilizers and manure for enhancing soil fertility and crop yield.

#### **CO-5 Management of Pests and Diseases:**

- To introduce students to the common pests and diseases affecting Kharif crops and their management through both organic and chemical means.

#### **CO-6 Crop Yield and Post-Harvest Technology:**

- To impart knowledge on harvesting techniques, post-harvest handling, and storage practices specific to Kharif crops.

#### **CO-7 Economics and Market Trends:**

- To make students aware of the economics of growing Kharif crops, including cost-benefit analysis, marketing strategies, and market trends for these crops.

## Course Contents

### Unit- I:

- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.

### Unit- II:

- Cereals—rice, maize, sorghum, pearl millet and finger millet, pulses—pigeon pea, mung bean and urd bean;

### Unit- III:

- Oilseeds—groundnut, and soybean; fibre crops—cotton & jute;

### Unit- IV:

- Forage crops—sorghum, cowpea, cluster bean and napier.

### Practical:

Rice nursery preparation, transplanting of rice, sowing of soybean, pigeon pea and mung bean. maize, groundnut and cotton, effect of seed size on germination and seedling vigour of kharif season crops, effect of sowing depth on germination of kharif crops, identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important agronomic experiments at experimental farm. study of forage experiments, morphological description of kharif season crops, visit to research centres of related crops.

## **BAG-203:Fundamentals of Plant Breeding**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding Genetic Principles:** To provide students with a solid foundation in the principles of genetics and heredity as they relate to plant breeding.

**CO-2 Breeding Methods:** To familiarize students with various plant breeding techniques, including traditional and modern methods such as hybridization, selection, and biotechnology.

**CO-3 Crop Improvement:** To explore strategies for improving crop yield, quality, and resistance to pests and diseases through breeding programs.

**CO-4 Evaluation of Breeding Lines:** To teach students how to evaluate and select superior breeding lines based on phenotypic and genotypic traits.

**CO-5 Plant Breeding Research:** To develop skills in designing and conducting breeding experiments, including data collection and analysis.

**CO-6 Ethical Considerations:** To instill an understanding of the ethical implications and societal impacts of plant breeding practices.

**CO-7 Application of Biotechnological Tools:** To introduce students to biotechnological tools and techniques, such as molecular markers and genetic engineering, used in modern plant breeding.

## Course Contents

### Unit- I:

- Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options. Domestication,

### Unit- II:

- Acclimatization and Introduction; Centres of origin/ diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population;

### Unit- III:

- Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties;

### Unit- IV:

- Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding- methods and uses;

### Unit- V:

- Breeding for important biotic and abiotic stresses; Biotechnological tools- DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and Farmer's Rights.

### Practical:

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiments, analysis of Randomized Block Design. To work out the mode of pollination in a given crop and extent of natural out-crossing. Prediction of performance of double cross hybrids.

## **BAG-205: Agricultural Finance and Cooperation**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understanding Agricultural Finance:**

- To introduce students to the concept and importance of agricultural finance in supporting farm operations and rural development.

#### **CO-2 Familiarization with Credit Systems:**

- To understand various sources of credit available to farmers, including institutional (banks, cooperatives) and non-institutional (moneylenders, informal sources).

#### **CO-3 Financial Management Skills:**

- To develop financial management skills necessary for effective resource allocation, budgeting, and planning in agricultural enterprises.

#### **CO-4 Cooperative Structure and Functioning:**

- To understand the formation, operation, and management of agricultural cooperatives and their impact on rural economies.

#### **CO-5 Policy and Government Support:**

- To analyze the role of government policies, subsidies, and programs in promoting agricultural finance and cooperative development.

## Course Contents

### Unit- I:

- Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC.

### Unit- II:

- Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit.

### Unit- III:

- Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.

### Unit- IV:

- Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

### Practical:

Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to acquire first hand knowledge of their management, schemes and procedures. Estimation of credit requirement of farm business – A case study. Preparation and analysis of balance sheet. A case study. Preparation and analysis of income statement – A case study. Appraisal of a loan proposal. A case study. Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Seminar on selected topics.

## **BAG-207:Agri- Informatics**

### **CO: COURSE OBJECTIVES**

**CO-1 Application of Technology in Agriculture:** Equip students with knowledge on the use of modern technologies like Geographic Information Systems (GIS), remote sensing, big data analytics, and precision farming techniques to enhance agricultural production and resource management.

**CO-2Data Management & Analysis:** Train students to handle large agricultural datasets, analyze them and extract actionable insights to improve farm management practices, crop yield predictions, pest control, and soil health.

**CO-3 Development of Agricultural Software Solutions:** Develop the capability to design and implement software tools for various agricultural sectors, such as crop modeling, irrigation scheduling, market prediction systems, and supply chain management.

**CO-4 Sustainable Agriculture Practices:** Promote understanding of sustainable farming practices by leveraging data-driven technologies to reduce waste, minimize environmental impact, and promote long-term productivity in agriculture.

**CO-5Enhancing Decision-Making in Agriculture:** Foster the ability to make informed decisions based on data, supporting farmers in improving crop management, optimizing inputs (e.g., water, fertilizers), and maximizing overall farm profitability.

**CO-6 Innovation and Research:** Encourage students to engage in research and innovation in agri-informatics, exploring new ways to use technology to address global agricultural challenges such as climate change, resource scarcity, and food security.



## Course Contents

### Unit- I:

- Introduction to Computers, Operating Systems, definition and types, Applications of MS- Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW):

### Unit- II:

- Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations. E-Agriculture, concepts and applications, Use of ICT in Agriculture.

### Unit- III:

- Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advice, market price, postharvest management etc;

### Unit- IV:

- Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop planning using IT tools.

### Practical:

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW). Introduction of programming languages. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools. Introduction of Geospatial Technology for generating valuable information for Agriculture. Hands on Decision Support System. Preparation of contingent crop planning.

## **BAG-209: Farm Machinery and Power**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding Farm Machinery:** To provide in-depth knowledge about various types of farm machinery (tractors, plows, harvesters, etc.) and their applications in modern agriculture.

**CO-2 Power Systems in Agriculture:** To study the power sources used in agriculture, including the operation and maintenance of engines, motors, and alternative energy systems (solar, bioenergy, etc.).

**CO-3 Technology Integration:** To introduce students to cutting-edge technology such as automated systems, robotics, GPS, and precision farming tools used to optimize agricultural processes.

**CO-4 Machinery Maintenance and Management:** To teach students how to manage, maintain, and repair farm machinery, ensuring optimal performance and reducing downtime in farming operations.

**CO-5 Design and Innovation:** To equip students with the knowledge to design and innovate new farming tools and machinery that can solve existing challenges in agriculture and improve efficiency.

**CO-6 Sustainable Agriculture:** To promote sustainable farming practices by focusing on energy-efficient machinery, reduced environmental impact, and the incorporation of green technologies.

**CO-7 Improving Productivity:** To enable students to use machinery effectively to increase farm productivity, reduce labor costs, and enhance overall agricultural output.

## Course Contents

### Unit- I:

- Status of Farm Power in India, Sources of Farm Power, I.C. engines, working principles of I.C. engines, comparison of two stroke and four stroke cycle engines,

### Unit- II:

- Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines:

### Unit- III:

- Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor,

### Unit- IV:

- Tractor types, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations,

### Unit- V:

- Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

### Practical:

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow. Familiarization with seed-cum-fertilizer drill, their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different intercultural equipment, Familiarization with harvesting and threshing machinery.

# **BAG-211: Production Technology for Vegetables and Spices**

## **CO: COURSE OBJECTIVES**

### **CO-1 Understanding the Basics of Vegetable and Spice Production:**

- Provide foundational knowledge of the various vegetables and spices, their classification, and importance in human nutrition and economy.

### **CO-2 Cultivation Practices and Techniques:**

- Develop skills in selecting suitable varieties of vegetables and spices for different regions.

### **CO-3 Soil and Climate Requirements:**

- Equip students with the understanding of the specific soil, temperature, and climatic conditions needed for optimum growth of vegetables and spices.

### **CO-4 Innovative Production Practices:**

- Introduce advanced and innovative production techniques, such as hydroponics, vertical farming, and protected cultivation, to improve productivity and sustainability.

### **CO-5 Integrated Pest Management (IPM) and Disease Control:**

- Educate students on integrated pest management (IPM) strategies and organic practices to minimize the use of chemical pesticides and enhance food safety.

### **CO-6 Post-Harvest Management:**

- Focus on proper harvesting, handling, packaging, and storage techniques to minimize losses and preserve the quality of vegetables and spices for both local consumption and export.

### **CO-7 Sustainable Agricultural Practices:**

- Promote environmentally sustainable practices, water conservation methods, and climate-resilient strategies in vegetable and spice production.

## Course Contents

### Unit- I:

- Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil

### Unit- II:

- Improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders,

### Unit- III:

- Important vegetable and spices such as Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol;

### Unit- IV:

- Bulb crops such as Onion, Garlic; Root crops such as Carrot, Radish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables

### Practical:

Identification of vegetables & spice crops and their seeds. Nursery raising. Direct seed sowing and transplanting. Study of morphological characters of different vegetables & spices. Fertilizer applications. Harvesting & preparation for market. Economics of vegetables and spice cultivation.

# **BAG-213:Environmental Studiesand DisasterManagement**

## **CO: COURSE OBJECTIVES**

### **CO-1Understanding the Basics of Vegetable and Spice Production:**

- Provide foundational knowledge of the various vegetables and spices, their classification, and importance in human nutrition and economy.

### **CO-2Cultivation Practices and Techniques:**

- Develop skills in selecting suitable varieties of vegetables and spices for different regions.

### **CO-3 Soil and Climate Requirements:**

- Equip students with the understanding of the specific soil, temperature, and climatic conditions needed for optimum growth of vegetables and spices.

### **CO-4 Innovative Production Practices:**

- Introduce advanced and innovative production techniques, such as hydroponics, vertical farming, and protected cultivation, to improve productivity and sustainability.

### **CO-5 Integrated Pest Management (IPM) and Disease Control:**

- Educate students on integrated pest management (IPM) strategies and organic practices to minimize the use of chemical pesticides and enhance food safety.

### **CO-6Post-Harvest Management:**

- Focus on proper harvesting, handling, packaging, and storage techniques to minimize losses and preserve the quality of vegetables and spices for both local consumption and export.

### **CO-7Sustainable Agricultural Practices:**

- Promote environmentally sustainable practices, water conservation methods, and climate-resilient strategies in vegetable and spice production.

## Course Contents

### Unit- I:

- Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

### Unit- II:

- d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.

### Unit- III:

- Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem.

### Unit- IV:

- Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

## **BAG-215:Statistical Methods**

### **CO: COURSE OBJECTIVES**

**CO-1Descriptive Statistics:** This method involves summarizing and describing the main features of a dataset. It includes measures like mean, median, mode, variance, standard deviation, and range to describe the central tendency and spread of data.

**CO-2Inferential Statistics:** This approach makes inferences or predictions about a population based on a sample of data. It involves hypothesis testing, confidence intervals, and regression analysis to draw conclusions beyond the sample data.

**CO-3Probability Theory:** The study of randomness and uncertainty. Probability distributions (such as normal, binomial, or Poisson distributions) are used to model and predict the likelihood of various outcomes.

**CO-4Regression Analysis:** A method for modeling the relationship between one dependent variable and one or more independent variables. Linear regression, logistic regression, and other types of regression are used to predict or explain the behavior of a variable.

**CO-5Analysis of Variance (ANOVA):** ANOVA is used to test for differences between two or more groups or treatments. It compares means across groups and helps determine if at least one group mean is significantly different from the others.

**CO-6Chi-Square Test:** A statistical test used to determine if there is a significant association between categorical variables. It is often used in testing hypotheses about the relationship between observed and expected frequencies.

**CO-7Time Series Analysis:** This method involves analyzing data points collected or recorded at specific time intervals. It is used for forecasting and understanding trends, seasonality, and cyclic behaviors in data.



## Course Contents

### Unit- I:

- Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion,

### Unit- II:

- Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions,

### Unit- III:

- Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in  $2 \times 2$  Contingency Table.

### Unit- IV:

- Introduction to Analysis of Variance, Analysis of One Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

### Practical:

Graphical Representation of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for  $2 \times 2$  contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sampling Simple Random Sampling.

## **BAG-215A Introduction to Mathematical Programming**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understand the Basics of Mathematical Programming:**

- Learn the fundamental concepts of mathematical programming, including optimization problems, decision variables, constraints, and objective functions.

#### **CO -2 Formulate Optimization Problems:**

- Develop the ability to translate real-world problems into mathematical programming models. This includes identifying objectives and constraints in practical situations.

#### **CO-3 Learn Different Types of Optimization Problems:**

- Explore various types of optimization problems, such as linear programming (LP), integer programming (IP), and nonlinear programming (NLP).

#### **CO-4 Understand and Apply Linear Programming Techniques:**

- Gain proficiency in solving linear programming problems using methods like the Simplex algorithm, graphical methods, and duality theory.

#### **CO -5 Explore Integer and Mixed-Integer Programming:**

- Learn how to solve problems involving integer constraints, and understand the challenges and techniques for solving mixed-integer programming (MIP) problems.

#### **CO-6 Interpret and Analyze Results:**

- Develop the skills to analyze the results of optimization problems, including sensitivity analysis, interpreting dual variables, and evaluating the quality of the solution.

#### **CO -7 Introduction to Software and Tools for Mathematical Programming:**

- Become familiar with software tools (like Excel Solver, Python, Gurobi, or CPLEX) for modeling and solving optimization problems, and understand how to apply these tools to practical problems.

## Course Contents

### Unit I

Introduction to the field of mathematical programming. Basic concepts and notation. Linear programs formulation through examples from engineering / business decision making problems; preliminary theory and geometry of linear programs, basic feasible solution.

### Unit II

simplex method, variants of simplex method, like two phase method and revised simplex method; duality and its principles, interpretation of dual variables, dual simplex method, primal-dual method; complexity of simplex method.

### Unit III

linear integer programs, their applications in real decision making problems, cutting plane and branch and bound methods, transportation problems, assignment problems, network maximum flow problems.

### Unit IV

Ellipsoid method, Karmarkar's interior point method; nonlinear programming, Lagrange multipliers, Farkas lemma, constraint qualification, KKT optimality conditions, sufficiency of KKT under convexity; quadratic programs.

### Unit V

Wolfe method, applications of quadratic programs in some domains like portfolio optimization and support vector machines, etc. Integer programming problems, the branch and bound method. Formulating the mathematical model for linear problems, primaldual relationship. Sensitivity analysis.

## **BAG-215B Introduction to Modeling and Simulation**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understanding the Basics of M&S:**

Learn the foundational concepts of modeling and simulation, including different types of models (physical, mathematical, and computational) and the role of simulation in understanding complex systems.

#### **CO-2 Differentiate between Types of Models:**

Understand the distinction between continuous and discrete models, deterministic and stochastic models, and their respective applications in real-world systems.

#### **CO-3 Identify Components of a Simulation:**

Gain insight into the key elements of a simulation, such as input data, model logic, and output analysis. Recognize the importance of each in the simulation process.

#### **CO-4 Application of M&S in Various Fields:**

Explore how modeling and simulation are used in industries such as aerospace, healthcare, economics, manufacturing, and environmental science for decision-making and problem-solving.

#### **CO-5 Learn Simulation Methodologies:**

Study various simulation methodologies, including Monte Carlo simulations, discrete event simulation, agent-based modeling, and system dynamics, along with their appropriate applications.

#### **CO-6 Model Validation and Verification:**

Understand the processes of model verification (ensuring the model is implemented correctly) and validation (ensuring the model accurately represents the real system), and their importance in achieving reliable results.

#### **CO-7 Ethical and Practical Considerations:**

Discuss the ethical implications of using models and simulations in decision-making, along with the challenges involved in modeling real-world systems accurately, such as uncertainty and computational limits.

## Course Contents

### Unit I

Introduction: System, environment, input and output variables, State variables; Static and Dynamic systems; Hierarchy of knowledge about a system and Modeling Strategy, Physical Modeling: Dimensions analysis, Dimensionless grouping of input and output variables of find empirical relations, similarity criteria and their application to physical models.

### Unit II

Modeling of System with Known Structure: Review of conservation laws and the governing equation for heat, mass and momentum transfer, Deterministic model-(a) distributed parameter models in terms of partial identification and their solutions and (b) lumped parameter models in terms of differential and difference equations, state space model, transfer functions block diagram and sub systems, stability of transfer functions, modeling for control.

### Unit III

Optimizations and Design of Systems: Summary of gradient based techniques: Nontraditional Optimizations techniques (1) genetic Algorithm (GA) - coding, GA operations elitism, Application using MATLAB :(ii) Simulated Annealing.

### Unit IV

Neural Network Modeling of Systems only with Input-output Database: Neurons, architecture of neural networks, knowledge representation, learning algorithm. Multilayer feed forward network and its back propagation learning algorithm, Application to complex engineering systems and strategy for optimum output.

### Unit V

Modeling Based on Expert Knowledge: Fuzzy sets, Membership functions, Fuzzy Inference systems, Expert Knowledge and Fuzzy Models, Design of Fuzzy Controllers, Simulation of Engineering Systems: Monte-Carlo simulation, Simulation of continuous and discrete processes with suitable examples from engineering problems.

## **BAG-215C Algebraic Techniques and Semi definite Optimization**

### **CO: COURSE OBJECTIVES**

**CO -1 Fundamentals of Algebraic Techniques:** Learn the basics of linear algebra, including matrix theory, eigenvalues, and eigenvectors, which are essential tools in optimization. Understand the concept of positive semi definite (psd) matrices and their relevance in optimization problems.

**CO-2 Introduction to Optimization:** Gain a foundational understanding of optimization theory, especially convex optimization. Learn about different types of optimization problems, including linear and nonlinear programming.

**CO-3 Semi definite Programming (SDP):** Understand what semi definite programming is and how it generalizes linear programming to matrix variables. Explore the key properties of SDPs and how they can be formulated and solved.

**CO-4 Duality Theory:** Study the duality of optimization problems, focusing on how primal and dual problems are related in semi definite programming. Learn about the duality gap and its significance in solving SDPs.

**CO-5 Applications of Semi definite Optimization:** Examine real-world applications of SDP in areas like control theory, machine learning, structural optimization, and quantum mechanics. Explore how semi definite optimization is used in approximation algorithms and to solve problems in combinatorial optimization.

**CO-6 Numerical Methods for Solving SDPs:** Understand the computational methods used to solve semi definite programs, including interior-point methods and other algorithms. Learn how to implement these methods using software tools such as MATLAB, Python, or specialized optimization solvers.

**CO -7 Algebraic Structure in Optimization:** Explore how algebraic structures, such as matrix factorizations and linear algebraic properties, can simplify and improve the efficiency of solving SDPs. Investigate how algebraic techniques contribute to understanding the geometry of optimization problems.

## Course Contents

### Unit I

Semi definite programming (I), Semi definite programming (II), Algebra review, Univariate polynomials, Resultants and discriminants, Hyperbolic polynomials, SDP representability,

### Unit II

Newton polytopes/BKK bound, Sums of squares (I), Sums of squares (II), SOS Applications, Varieties, Ideals, Groebner bases, Nullstellensatz, Complexity analysis of interior point methods

### Unit III

Zero dimensional systems (I), Zero dimensional systems (II), Quantifier elimination, Real Nullstellensatz, Representation theorems, Practical implementations of semi definite programs

### Unit IV

Symmetry reduction methods, Apps: polynomial solving, Markov chains, Graph theoretic apps, Applications in control theory, machine learning, and combinatorial optimization

## **BAG-217 Livestock and Poultry Management**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding Livestock and Poultry Types:** Identify and classify various types of livestock and poultry breeds, including their characteristics, uses, and the role they play in agriculture and the economy.

**CO -2 Animal Health Management:** Learn the basic principles of animal health, including preventive measures, common diseases in livestock and poultry, and their treatment and control methods.

**CO-3 Animal Nutrition and Feeding:** Understand the nutritional needs of livestock and poultry, including the types of feed and their role in growth, reproduction, and overall health.

**CO-4 Housing and Environmental Management:** Explore the importance of proper housing, space requirements, and environmental conditions for livestock and poultry to ensure their well-being and productivity.

**CO-5 Reproductive Management:** Learn the principles of reproduction in livestock and poultry, including breeding techniques, estrous cycles, and the management of breeding programs.

**CO-6 Production Systems and Productivity:** Investigate the different livestock and poultry production systems (e.g., free-range, intensive, organic) and the factors that influence productivity, such as genetics, environment, and management practices.

**CO-7 Economic Aspects of Livestock and Poultry Farming:** Examine the economic considerations in livestock and poultry management, including cost analysis, market trends, and financial planning for sustainable farm operations.



## Course Contents

### Unit- I:

- Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals.

### Unit- II:

- Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.

### Unit- III:

- Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.

### Unit- IV:

- Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

### Practical:

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

## **BAG-202: Crop Production Technology–II (Rabi Crops)**

### **CO: COURSE OBJECTIVES**

**CO-1 Familiarize students with rabi crops:** Teach the types, characteristics, and importance of various rabi crops, such as wheat, barley, mustard, gram, peas, and others.

**CO-2 Develop technical knowledge:** Impart knowledge on the appropriate agronomic practices for rabi crop cultivation, including sowing techniques, irrigation, nutrient management, weed control, pest and disease management, and harvesting.

**CO-3 Understand climatic and soil conditions:** Enable students to understand the climatic conditions and soil types best suited for rabi crops and how to optimize environmental factors for successful crop production.

**CO-4 Explore modern technologies:** Introduce modern agricultural technologies and innovations that enhance productivity, such as mechanization, precision farming, and the use of improved crop varieties.

**CO-5 Promote sustainable practices:** Educate students on sustainable farming practices, efficient water usage, soil health management, and integrated pest management (IPM) for rabi crop production.

**CO-6 Increase crop productivity and quality:** Equip students with skills to improve both the yield and quality of rabi crops through scientific management and adoption of best agricultural practices.

**CO-7 Problem-solving and decision-making:** Develop problem-solving and decision-making abilities in the context of crop management for different rabi crops under diverse field conditions.

## Course Contents

### Unit- I:

- Origin, geographical distribution, economic importance

### Unit- II:

- Soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; cereals – wheat and barley, pulses – chickpea, lentil, peas,

### Unit- III:

- Oilseeds – rapeseed, mustard and sunflower; sugar crops – sugarcane;

### Unit- IV:

- Medicinal and aromatic crops – mentha, lemongrass and citronella,

### Unit- V:

- Forage crops – berseem, lucerne and oat.

### Practical:

Sowing methods of wheat and sugarcane, identification of weeds in rabi season crops, study of morphological characteristics of rabi crops, study of yield contributing characters of rabi season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of rabi crops at experimental farms. Study of rabi forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

## **BAG-204: Production Technology for Ornamental Crops, MAP and Landscaping**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding the Importance of Ornamental Crops and Landscaping:** To familiarize students with the role of ornamental plants in enhancing aesthetics and improving the quality of human environments, including urban, suburban, and rural landscapes.

**CO-2 Knowledge of Medicinal and Aromatic Plants (MAP):** To introduce the cultivation practices, uses, and economic importance of medicinal and aromatic plants in healthcare, pharmaceuticals, and the fragrance industry.

**CO-3 Cultivation Practices:** To study the best practices in the propagation, cultivation, and maintenance of ornamental plants and MAPs.

**CO-4 Landscape Design and Management:** To develop skills in the planning and design of landscapes using a variety of ornamental plants, including lawn management, flower beds, and shrubbery.

**CO-5 Environmental Impact and Sustainability:** To explore the environmental benefits of ornamental and medicinal plants, such as improving air quality, conserving biodiversity, and mitigating the effects of climate change.

**CO-6 Encourage Circular Economy in Agriculture:** To promote waste-to-energy processes (e.g., using agricultural by-products for bioenergy production) to create a circular economy model in agriculture.

**CO-7 Support Rural Development:** To contribute to the socio-economic development of rural areas by providing renewable energy access, creating green jobs, and improving agricultural resilience.

## Course Contents

### Unit- I:

- Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.

### Unit- II:

- Production technology of important cut flowers like rose, gerbera, carnation, lily and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.

### Unit- III:

- Package of practices for loose flowers like marigold and jasmine under open conditions.

### Unit- IV:

- Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver.

### Unit- V:

- Processing and value addition in ornamental crops and MAPs produce.

### Practical:

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post-harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit

## **BAG-206 Renewable Energy and Green Technology**

### **CO: COURSE OBJECTIVES**

**CO -1 Understand the Principles of Renewable Energy:** Develop a solid understanding of the basic principles and technologies behind renewable energy sources, such as solar, wind, geothermal, hydro, and biomass.

**CO-2 Evaluate the Environmental Impact of Energy Systems:** Analyze and compare the environmental impacts of conventional and renewable energy sources, focusing on sustainability, carbon footprints, and ecological consequences.

**CO -3 Assess the Technological Advancements in Green Technology:** Study the latest technological innovations in green technology, including energy-efficient appliances, smart grids, and carbon capture technologies.

**CO-4 Explore the Economics of Renewable Energy:** Understand the economic challenges and opportunities in renewable energy, including cost analysis, financing, and government incentives that promote clean energy solutions.

**CO-5 Analyze Policy and Regulatory Frameworks:** Investigate the global and local policies, regulations, and international agreements that shape the development and deployment of renewable energy and green technologies.

**CO-6 Design and Implement Renewable Energy Projects:** Learn how to design, plan, and implement renewable energy projects, including feasibility studies, site assessments, and integration with existing energy infrastructures.

**CO7 Promote Sustainable Practices and Energy Efficiency:** Encourage the adoption of energy-efficient practices and sustainable energy solutions across industries and communities, emphasizing the role of green technology in mitigating climate change.

## Course Contents

### Unit- I:

- Classification of energy sources, contribution of these sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application,

### Unit- II:

- Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource,

### Unit- III:

- Introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation,

### Unit- IV:

- Solar photovoltaic system and their application, introduction of wind energy and their application.

### Practical:

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifiers, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.

## **BAG-208: Problematic Soils and their Management**

### **CO: COURSE OBJECTIVES**

**CO-1 Identify Problematic Soils:** Enable students to recognize and classify various types of problematic soils, such as saline, sodic, acidic, expansive, and compacted soils.

**CO-2 Understand Soil Genesis and Characteristics:** Provide insights into the formation processes, physical, chemical, and biological properties that make soils problematic.

**CO-3 Assess Soil Degradation:** Develop the ability to evaluate the extent and causes of soil degradation through laboratory and field studies.

**CO-4 Explore Soil-Plant Relationships:** Examine the impact of problematic soils on plant growth and productivity, focusing on nutrient availability and water retention.

**CO-5 Management Strategies:** Equip students with techniques and practices for the reclamation, amendment, and sustainable management of problematic soils.

**CO-6 Mitigate Environmental Impacts:** Foster awareness of how problematic soils influence environmental systems and learn strategies to minimize adverse effects, such as erosion, pollution, or loss of biodiversity.

**CO-7 Promote Sustainable Land Use:** Advocate for integrated land management approaches that balance soil restoration with agricultural productivity and ecosystem health.



## Course Contents

### Unit- I:

- Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.

### Unit- II:

- Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.

### Unit- III:

- Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.

### Unit- IV:

- Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.

## **BAG-210: Production Technology for Fruit and Plantation Crops**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding Crop Requirements:** Develop a comprehensive understanding of the climatic, soil, and nutritional requirements of major fruit and plantation crops.

**CO-2 Knowledge of Cultivation Practices:** Learn scientific cultivation practices, including planting, spacing, irrigation, and fertilization methods, to enhance productivity and sustainability.

**CO-3 Pest and Disease Management:** Equip students with skills to identify, prevent, and manage pests and diseases affecting fruit and plantation crops using integrated pest management (IPM) techniques.

**CO-4 Post-Harvest Technology:** Understand the principles of harvesting, grading, packaging, and storage of fruit and plantation crops to maintain quality and reduce losses.

**CO-5 Improving Yield and Quality:** Gain knowledge about modern technologies, including high-yielding varieties, grafting techniques, and precision farming, to improve the yield and quality of crops.

**CO-6 Sustainability and Environmental Concerns:** Explore sustainable farming practices that balance production needs with environmental conservation, such as organic farming and agroforestry.

**CO-7 Market and Economic Analysis:** Analyze the market trends, value chains, and economic considerations related to the production and marketing of fruit and plantation crops.

## Course Content

### Unit- I:

- Importance and scope of fruit and plantation crop industry in India;

### Unit- II:

- Importance of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond

### Unit- III:

- Minor fruits-date, ber, pineapple, pomegranate, jackfruit, strawberry,

### Unit- IV:

- Plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

### Practical:

Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops. Description and identification of fruit. Preparation of plant bio regulators and their uses, important pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.

## **BAG-212: Principles of Seed Technology**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Basics of Seed Science:** Develop foundational knowledge of seed biology, including seed structure, development, and physiology.

**CO-2 Learn Seed Production Techniques:** Gain insights into modern methods and best practices for seed production in various crops to ensure high quality and yield.

**CO-3 Explore Seed Quality Parameters:** Study the factors affecting seed quality, including genetic purity, viability, vigor, and health.

**CO-4 Master Seed Processing and Handling:** Acquire practical knowledge of seed cleaning, grading, treatment, and storage methods to maintain seed quality.

**CO-5 Examine Seed Certification Standards:** Understand the principles and procedures of seed certification to comply with national and international standards.

**CO-6 Study Seed Testing and Analysis:** Learn techniques for seed testing, including germination tests, moisture determination, and seed health assessments.

**CO-7 Understand the Role of Seed Technology in Agriculture:** Analyze the economic and ecological importance of high-quality seeds in sustainable agriculture and food security.

## Course Contents

### Unit- I:

- Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.

### Unit- II:

- Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test.

### Unit- III:

- Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing.

### Unit- IV:

- Seed storage: general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.

### Unit- V:

- Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

### Practical:

Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi. Seed production in major pulses: Urd, Mung, Pigeon pea, Lentil, Gram, Field bean, pea. Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard. Seed production in important vegetable crops. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.

## **BAG-214: Farming System & Sustainable Agriculture**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand Farming Systems:** To provide students with a comprehensive understanding of various farming systems, including traditional, organic, and modern approaches, and their role in agricultural sustainability.

**CO-2 Analyze Agricultural Ecosystems:** To explore the interactions between crops, livestock, soil, water, and climate in farming systems, emphasizing the ecological principles underlying sustainable agriculture.

**CO-3 Promote Sustainable Practices:** To identify and evaluate sustainable agricultural practices that enhance productivity while conserving natural resources and maintaining ecological balance.

**CO-4 Address Environmental Challenges:** To analyze the environmental challenges associated with agriculture, such as soil degradation, water scarcity, and climate change, and develop strategies for mitigation and adaptation.

**CO-5 Foster Socioeconomic Sustainability:** To understand the socioeconomic dimensions of sustainable agriculture, including farmer livelihoods, market dynamics, and the role of policy in promoting sustainability.

**CO-6 Apply Technological Innovations:** To explore and apply innovative technologies, such as precision farming, agroecology, and climate-smart agriculture, to enhance sustainability and productivity in farming systems.

**CO-7 Encourage Critical Thinking and Problem-Solving:** To develop critical thinking and problem-solving skills for designing and implementing sustainable agricultural solutions tailored to specific regional and global challenges.

## Course Contents

### Unit- I:

- Farming System- scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system

### Unit- II:

- Sustainable agriculture- problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability

### Unit- III:

- Integrated farming system- historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques

### Unit- IV:

- Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/institutes and farmers field

## **BAG-216: Agricultural Marketing Trade & Prices**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Basics of Agricultural Marketing:** To provide students with foundational knowledge of agricultural marketing principles, including product flow, market channels, and the role of intermediaries.

**CO-2 Analyze Agricultural Market Structures:** To examine different agricultural market structures, such as perfect competition, monopolistic competition, and oligopoly, and their implications for pricing and trade.

**CO-3 Explore the Role of Agricultural Prices:** To help students understand how agricultural prices are determined, including factors like supply and demand, government policies, and market speculation.

**CO-4 Study International Agricultural Trade:** To introduce students to the global trade of agricultural products, including trade policies, international trade agreements, and how global market trends affect local farmers and markets.

**CO-5 Evaluate the Impact of Government Policies on Agriculture:** To analyze the effect of government interventions, such as subsidies, tariffs, and price supports, on agricultural markets and prices.

**CO-6 Assess the Role of Technology in Agricultural Marketing:** To investigate how advancements in technology, such as digital platforms, supply chain innovations, and data analytics, are transforming agricultural marketing and pricing.

**CO-7 Develop Practical Skills for Marketing Agricultural Products:** To equip students with the skills necessary for effective marketing strategies, including market research, pricing techniques, and communication strategies tailored to the agricultural sector.



## Course Contents

### Unit- I:

- Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agricultural commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agricultural commodities; product life cycle (PLC) and competitive strategies:

### Unit- II:

- Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process – concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels:

### Unit- III:

- Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs;

### Unit- IV:

- Role of Govt. in agricultural marketing: Public sector institutions – CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of future trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade:

### Unit- V:

- Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agricultural commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

### Practical:

Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour

over time for some selected commodities; Construction of index numbers; Visit to local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

## **BAG-218: Introductory Agro-meteorology & Climate Change**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand Basic Agro-meteorology Concepts:** Introduce students to fundamental concepts in agro-meteorology, including the role of weather and climate in agriculture and how meteorological phenomena affect crop growth and farming practices.

**CO-2 Analyze Weather Systems and Agricultural Impacts:** Develop skills to analyze various weather systems (such as precipitation, temperature, humidity, and wind) and understand their direct and indirect impacts on agricultural productivity and farming techniques.

**CO-3 Examine Climate Change and Its Effect on Agriculture:** Explore the causes, evidence, and impacts of climate change, with a particular focus on how shifting climatic patterns affect agriculture, including crop yield variations, water availability, and pest/disease outbreaks.

**CO-4 Learn Agro-meteorological Tools and Techniques:** Familiarize students with the tools, technologies, and data sources used in agro-meteorological research and applications, such as weather forecasting, climate models, and remote sensing.

**CO-5 Evaluate Climate Adaptation Strategies in Agriculture:** Teach students strategies to mitigate and adapt to climate change in agriculture, including the use of climate-resilient crops, water conservation techniques, and sustainable farming practices.

**CO-6 Assess the Role of Agro-meteorology in Agricultural Decision-Making:** Understand how agro-meteorological data is used by farmers, policymakers, and agricultural professionals in decision-making, from planting and irrigation scheduling to pest and disease management.

**CO-7 Promote Awareness of Climate Change Mitigation:** Encourage students to think critically about how to reduce the carbon footprint of agriculture and promote sustainable farming practices that contribute to global efforts in mitigating climate change.

## Course Contents

### Unit- I:

- Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze;

### Unit- II:

- Nature and properties of solar radiation, solar constant, depletion of solar radiation, shortwave, long-wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth;

### Unit- III:

- Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations;

### Unit- IV:

- Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

### Practical:

Visit of Agro-meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and long-wave radiation, and its estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of wind rose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapo-transpiration. Computation of PET and AET.

**BAG-2020:ElectiveCourse**

## **BAG-301:PrinciplesofIntegratedPestandDiseaseManagement**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding Pest and Disease Dynamics:** To familiarize students with the basic concepts of pest and disease biology, including their lifecycle, behavior, and factors influencing their populations.

**CO-2 Introduction to Integrated Pest Management (IPM):** To introduce the concept of Integrated Pest Management (IPM) as a sustainable approach that combines multiple pest control methods.

**CO-3 Identification and Diagnosis of Pests and Diseases:** To develop skills in identifying common pests, diseases, and symptoms affecting crops, and understanding their impact on yield and quality.

**CO-4 Pest and Disease Control Methods:** To provide knowledge of various pest control strategies, including cultural, biological, chemical, and mechanical methods.

**CO-5Principles of Disease Management:** To study the principles and practices of plant disease control, including sanitation, crop rotation, and the use of fungicides and other disease management tools.

**CO-6 Pesticide Management and Safety:** To educate students on the safe and effective use of chemical control methods, including the proper application techniques and safety protocols.

**CO-7 Sustainable Practices in Pest and Disease Management:** To highlight the importance of sustainable practices in pest and disease management to ensure long-term agricultural productivity.

**CO-8 Economic and Social Aspects of Pest and Disease Management:** To understand the economic importance of pest and disease management in agriculture, including cost-benefit analysis of various control measures.

## Course Contents

### Unit- I:

- Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis.

### Unit- II:

- Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.

### Unit- III:

- Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module.

### Unit- IV:

- Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

### Practical:

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economic of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma*, *Pseudomonas*, *Trichogramma*, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agro- ecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases. Awareness campaign at farmers fields.

## **BAG-303: Manures, Fertilizers and Soil Fertility Management**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding Soil Fertility and Nutrient Dynamics:** To comprehend the concepts of soil fertility, productivity, and factors influencing them. To study the physical, chemical, and biological properties of soil that affect nutrient availability.

**CO-2 Nutrient Functions and Deficiency Symptoms:** To understand the role of essential plant nutrients in crop growth and development. To identify nutrient deficiencies and toxicities and their impact on crops.

**CO-3 Manures and Organic Amendment:** To learn about the types, composition, and importance of organic manures like farmyard manure, compost, green manures, and biofertilizers. To explore methods of preparation, application, and benefits of organic amendments in sustainable agriculture.

**CO-4 Fertilizers: Types, Properties, and Application:** To study various chemical fertilizers, their composition, and nutrient content. To understand fertilizer application methods, including their timing and efficiency enhancement techniques.

**CO-5 Soil Fertility Evaluation and Management:** To gain proficiency in soil testing and plant analysis as tools for assessing soil fertility. To formulate site-specific nutrient management plans for sustainable crop production.

**CO-6 Environmental Implications and Best Practices:** To understand the environmental impacts of excessive or improper fertilizer use. To promote integrated nutrient management (INM) for sustainable and eco-friendly agriculture.

**CO-7 Practical Applications and Field Studies:** To provide hands-on experience in preparing organic manures, soil sampling, and fertilizer application. To familiarize students with fertilizer recommendations based on soil and crop requirements.

## Course Contents

### Unit- I:

- Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

### Unit- II:

- Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

### Unit- III:

- History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.

### Unit- IV:

- Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

### Practical:

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils. Estimation of soil extractable S in soils. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.



## **BAG-305:PestsofCropsandStoredGrainand their Management**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understanding Pest Dynamics**

- To familiarize students with the biology, ecology, and classification of major pests affecting field crops and stored grains.
- To understand the life cycles and damage caused by these pests to identify them effectively.

#### **CO-2Pest-Management Strategies**

- To introduce various integrated pest management (IPM) approaches, including cultural, mechanical, biological, and chemical methods.
- To emphasize the safe and effective use of pesticides, focusing on resistance management and environmental sustainability.

#### **CO-3Storage Pest Management**

- To highlight the factors affecting pest infestations in storage environments and methods for preventing losses in stored grains.

#### **CO-4Economic Threshold Levels and Decision-Making**

- To develop the ability to assess economic thresholds and make informed pest management decisions based on cost-benefit analysis.

#### **CO-5Sustainable Agriculture and Food Security**

- To encourage the adoption of sustainable pest control measures that align with environmental conservation and global food security goals.

#### **CO-6Practical Skills Development**

- To provide hands-on experience in pest identification, monitoring, and implementing management techniques through field visits and lab exercises.

## Course Contents

### Unit- I:

- General account on nature and type of damage by different arthropods pests.

### Unit- II:

- Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.

### Unit- III:

- Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management.

### Unit- IV:

- Storage structure and methods of grain storage and fundamental principles of grain store management.

### Practical:

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticide application technique. Fumigation of grain store/godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.

## **BAG-307:DiseasesofField and HorticulturalCrops and their ManagementI**

### **CO: COURSE OBJECTIVES**

**CO-1Understanding Plant Diseases:** To familiarize students with the various diseases affecting field and horticultural crops, including their symptoms, etiology, and epidemiology.

**CO-2Diagnosis and Identification:** To develop the ability to identify and diagnose crop diseases based on visible symptoms, causal agents, and environmental factors.

**CO-3Pathogen Biology:** To understand the biology, life cycle, and interaction of pathogens with host plants, contributing to the development of diseases.

**CO-4Disease Management Practices:** To study and analyze various disease management strategies, including cultural, chemical, biological, and integrated pest management (IPM) approaches.

**CO-5Economic Impact Assessment:** To assess the economic impact of diseases on crop production and explore cost-effective and sustainable management practices.

**CO-6Latest Technologies and Research:** To introduce students to modern tools and techniques such as disease forecasting models, molecular diagnostics, and biotechnological approaches in disease management.

**CO-7Practical Applications:** To provide hands-on training in field diagnosis, sample collection, pathogen isolation, and identification techniques for effective disease management.

## Course Contents

### Unit- I:

- Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra : downy mildew and ergot; Groundnut: early and late leaf spots, wilt

### Unit- II:

- Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeon pea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; Black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic.

### Unit- III:

- Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot;

### Unit- IV:

- Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

### Practical:

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.

## **BAG-309: Crop Improvement-I(Kharif Crops)**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understanding Crop Breeding Principles:**

- To provide fundamental knowledge of plant breeding concepts, methods, and techniques applied to kharif crops.

#### **CO-2 Familiarity with Kharif Crop Varieties:**

- To study the major kharif crops such as rice, maize, sorghum, pearl millet, groundnut, cotton, and pulses.
- To understand the characteristics of existing high-yielding, disease-resistant, and region-specific varieties.

#### **CO-3 Knowledge of Crop Improvement Strategies:**

- To explore various breeding approaches like hybridization, mutation breeding, and molecular techniques for developing improved kharif crop varieties.

#### **CO-4 Genetic Resource Management:**

- To familiarize students with the conservation, evaluation, and utilization of plant genetic resources for crop improvement.

#### **CO-5 Problem-Solving Skills:**

- To identify the challenges related to kharif crop production, such as pests, diseases, and abiotic stresses, and develop strategies for improvement.

#### **CO-6 Practical Exposure:**

- To provide hands-on training in breeding techniques, hybridization, and evaluation of breeding material for kharif crop.

## Course Contents

### Unit- I:

- Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops;

### Unit- II:

- Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops;

### Unit- III:

- Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);

### Unit- IV:

- Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeon pea, etc. Ideotype concept and climate resilient crop varieties for future.

### Practical:

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeon pea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of different kharif crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed descent methods; Study of field techniques for seed production and hybrid seeds production in Kharif crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

## **BAG-311: Entrepreneurship Development and Business**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understanding the Basics of Entrepreneurship:**

- To introduce students to the fundamental concepts of entrepreneurship, including the role of entrepreneurs in economic development.
- To explore entrepreneurial traits, skills, and competencies relevant to the agricultural sector.

#### **CO-2 Promoting an Entrepreneurial Mindset:**

- To instill a proactive approach to identifying opportunities and solving challenges within the agribusiness and allied sectors.
- To encourage creativity, innovation, and risk-taking among students.

#### **CO-3 Development of Managerial and Business Skills:**

- To equip students with essential knowledge of business planning, financial management, and marketing strategies specific to agriculture.
- To familiarize students with legal, regulatory, and procedural aspects of starting and running a business.

#### **CO-4 Exposure to Agripreneurship:**

- To develop an understanding of agribusiness models, value chain development, and opportunities in modern agriculture, including organic farming, precision farming, and agro-processing.
- To explore rural entrepreneurship and cooperatives as pathways for sustainable development.
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#### **CO-5 Practical Application and Skill Development:**

- To provide hands-on experience in creating business plans and feasibility reports tailored for agricultural ventures.
- To enhance leadership, decision-making, and problem-solving skills through case studies, field visits, and projects.

#### **CO-6 Leveraging Technology and Innovation:**

- To emphasize the role of digital technologies, e-commerce, and ICT tools in modern agricultural business development.
- To understand how technological advancements can drive profitability and efficiency in agriculture-related enterprises.

## Course Contents

### Unit- I:

- Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation,

### Unit- II:

- Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/Agri enterprises,

### Unit- III:

- Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills,

### Unit- IV:

- Business Leadership Skills (Communication, direction and motivation skills), Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.

### Practical:

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.



## **BAG-311A: Communication & English Grammar-III**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Develop Advanced Communication Skills**

Enhance students' ability to communicate effectively in academic, professional, and social settings, with a focus on oral and written English.

#### **CO-2 Strengthen Grammatical Proficiency**

Provide in-depth knowledge of advanced English grammar, including complex sentence structures, clauses, voice, and reported speech.

#### **CO-3 Promote Critical Thinking and Expression**

Foster critical thinking and the ability to express ideas clearly and concisely in English.

#### **CO-4 Enhance Professional Writing Skills**

Equip students with skills for writing formal letters, emails, reports, and proposals relevant to agricultural and allied sectors.

#### **CO-5 Improve Presentation and Public Speaking Skills**

Train students in delivering effective presentations and participating in group discussions and debates.

#### **CO-6 Cultural and Contextual Understanding**

Enable students to use language effectively in diverse cultural and professional contexts, especially in the agricultural field.

#### **CO-7 Prepare for Competitive Exams**

Provide a foundation for language proficiency in competitive exams and professional applications, such as research papers and project reports.

## CourseContents

### Unit 1: Grammar and Composition

1. **Advanced Grammar:** Subject-Verb Agreement, Tenses and Voice (Active and Passive), Direct and Indirect Speech, Sentence Transformation (Simple, Complex, Compound), Phrasal Verbs and Idiomatic Expressions, Use of Articles and Prepositions, Correction of Common Errors in English
2. **Essay Writing:** Structure of an Essay (Introduction, Body, Conclusion) Descriptive, Narrative, Persuasive, and Expository Essays
3. **Comprehension:** Reading Skills, Understanding Context Summarization and Paraphrasing
4. **Letter Writing:** Formal and Informal Letters, Applications and Complaint Letters, Cover Letters and Resume

### Unit 2: Communication Skills

1. **Basics of Communication:** Definition and Process of Communication, Verbal and Non-Verbal Communication, Barriers to Communication and Overcoming Them
2. **Speaking Skills:** Extempore Speaking, Group Discussions, Presentations and Public Speaking
3. **Listening Skills:** Techniques for Active Listening, Understanding Tone and Context in Conversations
4. **Writing for Communication:** Business Writing (Memos, Notices, Emails), Report Writing

### Unit 3: Functional English

1. **Vocabulary Building:** Synonyms and Antonyms, One-Word Substitutes, Collocations and Word Formation
2. **Technical English:** Agriculture-Specific Terminology, Writing Research Proposals and Abstracts
3. **Reading and Interpretation:** Understanding Scientific Texts, Critical Analysis of Articles

### Unit 4: Personality Development

1. **Soft Skills:** Confidence Building, Time Management, Leadership and Teamwork Skills
2. **Interview Preparation:** Resume Writing, Mock Interviews and Question Patterns
3. **Interpersonal Communication:** Building Relationships, Networking and Professional Etiquette.

## **BAG-311B: Soft Skills-III**

### **CO: COURSE OBJECTIVES**

**CO-1 Effective Communication:** Develop advanced verbal and written communication skills tailored for professional and social contexts.

**CO-2 Teamwork and Collaboration:** Foster teamwork abilities, emphasizing the importance of collaboration in agricultural and multidisciplinary settings.

**CO-3 Problem-Solving and Critical Thinking:** Cultivate the ability to analyze problems, think critically, and develop innovative solutions in agriculture-related fields.

**CO-4 Leadership and Interpersonal Skills:** Build leadership qualities and interpersonal skills essential for managing teams and working effectively in diverse groups.

**CO-5 Time and Stress Management:** Equip students with strategies for effective time management and coping with stress to enhance productivity.

**CO-6 Adaptability and Emotional Intelligence:** Develop the ability to adapt to changing environments and improve emotional intelligence for better personal and professional relationships.

**CO-7 Ethics and Professionalism:** Instill a sense of ethics, integrity, and professionalism in communication and decision-making.

## **CourseContents**

### **Unit I**

Personality Enrichment, Positive attitude, SWOT Analysis, Self-confidence and motivation, Inter-personal skills, projecting a positive social image.

### **Unit II**

Time Management, Goal setting and prioritization, ABC Analysis—preparing a personal schedule, Short term and long term goals, Implementing goals.

### **Unit III**

Leadership Skills, Planning, organizing, setting objectives and taking initiatives, Task list organization.

### **Unit IV**

Persuading and negotiating, Team work, maintaining morale, Visualizing, inspiring others.

## **BAG-311C: Life Management-III**

### **CO: COURSE OBJECTIVES**

**CO-1 Holistic Development:** To enable students to develop a balanced approach toward personal and professional life, fostering physical, mental, emotional, and spiritual well-being.

**CO-2 Stress Management:** To introduce students to practical techniques and strategies for managing stress and maintaining a positive outlook amidst challenges in academic and agricultural careers.

**CO-3 Interpersonal Skills:** To improve communication, teamwork, and leadership skills, ensuring effective collaboration in diverse environments.

**CO-4 Time Management:** To equip students with methods to prioritize tasks, manage time effectively, and increase productivity in their studies and work.

**CO-5 Ethics and Values:** To instill a strong foundation of ethical principles and values that guide responsible behavior in both personal and professional spheres.

**CO-6 Decision-Making Skills:** To develop analytical and critical thinking abilities to make informed and impactful decisions in various life situations.

**CO-7 Resilience Building:** To foster resilience and adaptability, enabling students to overcome challenges and excel in a dynamic agricultural industry.

**CO-8 Goal Setting and Motivation:** To assist students in setting realistic goals, maintaining focus, and staying motivated to achieve success in their academic and personal endeavors.

## **CourseContents**

### **Unit I**

Basics of Life Style, Daily Routine, View of Life, Goal and Ideal your life, Self-Evaluation

### **Unit II**

Process of life Style Management, Spiritual practice-(Upasana/japa/meditation), Creative potentials & positive use of negativity,

### **Unit III**

Personality Skills, Creative Reading and Writing Skills, Communication Skills-Self-Management Skills

### **Unit IV**

Art of Positive Thinking, Environmental Ethics, Behavior skills and relationship, Stress (causes, effects & management)

## **BAG-313:Geo-informatics,Nano-technologyandPrecision Farming**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Introduction to Geo-Informatics:**

- To develop an understanding of the principles and applications of Geographic Information Systems (GIS) and Remote Sensing in agriculture.
- To enable students to analyze spatial data and apply mapping techniques for agricultural planning and resource management.

#### **CO-2Fundamentals of Nano-Technology in Agriculture:**

- To introduce the concepts of nanotechnology and its potential applications in improving agricultural productivity and sustainability.
- To familiarize students with nano-based tools, devices, and materials for soil and water management, pest control, and crop improvement.

#### **CO-3Precision Farming Concepts:**

- To provide insights into the principles and practices of precision farming for efficient resource utilization.
- To train students in the use of modern tools such as sensors, drones, and automated systems for real-time monitoring and decision-making in agriculture.

#### **CO-4Integration of Technologies:**

- To explore the combined use of geo-informatics, nanotechnology, and precision farming to address challenges in modern agriculture.
- To enhance skills in data-driven decision-making and sustainable agricultural practices.

#### **CO-5Sustainability and Innovation:**

- To promote the adoption of innovative and sustainable technologies to improve agricultural productivity while minimizing environmental impacts.
- To encourage critical thinking and research-oriented approaches in leveraging emerging technologies for rural and agricultural development.

#### **CO-6Hands-on Experience:**

- To provide practical exposure to GIS software, remote sensing tools, nano-materials, and precision agriculture equipment.

## Course Contents

### Unit- I:

- Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.

### Unit- II:

- Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remotesensing concepts and application in agriculture; Image processing and interpretation ;

### Unit- III:

- Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture;

### Unit- IV:

- Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

### Practical:

Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. Generation of spectral



## **BAG-315 PracticalCrop Production –I(Kharif crops)**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understanding the Kharif Cropping System**

- To provide students with in-depth knowledge of the climatic, soil, and water requirements of major Kharif crops.
- To familiarize students with the cropping patterns and production constraints of Kharif season crops.

#### **CO-2 Practical Crop Management**

- To develop skills in the preparation of field operations, including land preparation, sowing, irrigation, and weed management.
- To impart knowledge about integrated nutrient, pest, and disease management practices for Kharif crops.

#### **CO-3 Seed and Input Management**

- To train students in the selection, storage, and treatment of quality seeds.
- To enhance understanding of fertilizer application methods, organic manures, and bio-fertilizers for sustainable crop production.

#### **CO-4 Crop Monitoring and Evaluation**

- To enable students to monitor crop growth, identify stress conditions, and take corrective measures.
- To train students in yield estimation, harvesting techniques, and post-harvest handling.

#### **CO-5 Economic and Sustainable Practices**

- To teach cost-effective and sustainable agricultural practices for optimizing the productivity of Kharif crops.
- To create awareness of climate-smart agriculture and water-efficient practices.

#### **CO-6 Hands-On Experience**

- To provide hands-on experience in the cultivation of major Kharif crops like paddy, maize, sorghum, pearl millet, groundnut, soybean, cotton, etc.
- To involve students in fieldwork, covering all aspects of crop production from sowing to harvesting.

#### **CO-7 Practical Record Maintenance**

- To ensure students can maintain detailed field records, analyze data, and prepare reports on crop performance.

## Course Contents

### **Practical:**

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests/diseases of crops, harvesting, threshing, drying, winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

## **BAG-317 IntellectualPropertyRights**

### **CO: COURSE OBJECTIVES**

#### **CO-1 To Understand the Fundamentals of IPR**

- To introduce students to the basic concepts, types, and significance of Intellectual Property Rights (IPR) in agriculture and related fields.

#### **CO-2 To Explore Legal and Policy Frameworks**

- To familiarize students with national and international legal frameworks governing intellectual property, such as patents, trademarks, copyrights, and plant breeders' rights, with specific relevance to agriculture.

#### **CO-3 To Encourage Innovation and Entrepreneurship**

- To promote awareness of the role of IPR in fostering innovation, research, and development, encouraging students to explore entrepreneurial opportunities in agriculture.

#### **CO-4 To Address Ethical and Social Issues**

- To develop an understanding of the ethical, social, and environmental implications of IPR in agriculture, including issues of biopiracy, traditional knowledge, and biodiversity conservation.

#### **CO-5 To Equip Students with Practical Knowledge**

- To provide students with knowledge of procedures for patent filing, geographical indications, copyrights, and plant variety protection, equipping them with skills to apply IPR concepts in agricultural practice.

#### **CO-6 To Prepare for Future Challenges**

- To prepare students to address future challenges related to technology transfer, Commercialization, and the global competitiveness of agricultural products.

## Course Contents

### Unit- I:

- Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

### Unit- II:

- Types of Intellectual Property and legislations covering IPR in India:- Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

### Unit- III:

- Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.

### Unit- IV:

- Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

## **BAG-317A: Research Methodology**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understanding Research Fundamentals:**

- To develop a clear understanding of the principles, concepts, and importance of research in agriculture.
- To familiarize students with the types, objectives, and methodologies of agricultural research.

#### **CO-2 Problem Identification and Formulation:**

- To enable students to identify, define, and articulate research problems specific to agricultural sciences.
- To guide students in framing research hypotheses and objectives.

#### **CO-3 Research Design and Methodology:**

- To introduce students to various research designs, sampling techniques, and data collection methods suited to agricultural studies.
- To train students in the preparation and execution of research plans.

#### **CO-4 Data Analysis and Interpretation:**

- To teach students basic statistical tools and techniques for data analysis in agricultural research.
- To guide students in interpreting research results and deriving meaningful conclusions.

#### **CO-5 Scientific Writing and Reporting:**

- To develop skills for writing research proposals, reports, and scientific papers in the field of agriculture.
- To train students in effective communication and presentation of research findings.

#### **CO-6 Application of Research Tools:**

- To familiarize students with modern tools and software used in agricultural research.
- To emphasize ethical practices in conducting research and handling data.

#### **CO-7 Problem-Solving and Decision-Making:**

- To cultivate critical thinking and analytical skills necessary for addressing real-world agricultural challenges through research.

## CourseContents

### Unit I

Introduction to Research: The concept of research, characteristics of good research, Application of Research, Meaning and sources of Research problem, characteristics of good Research problem, Research process, outcomes, application of Research, Meaning and types of Research hypothesis, Importance of Review of Literature, Organizing the Review of Literature.

### Unit II

Types of Research: Types of research, pure (basic, fundamental) and applied research, qualitative and quantitative. Research Design: Meaning, need, types of research design – Exploratory, Descriptive, Casual research Design, Components of research design, and Features of good Research design. Experiments, surveys and case study Research design

### Unit III

Sampling, Data Collection and analysis: Types and sources of data – Primary and secondary, Methods of collecting data, Concept of sampling and sampling methods – sampling frame, sample, characteristics of good sample, simple random sampling, purposive sampling, convenience sampling, snowball sampling, classification and tabulation of data, graphical representation of data, graphs and charts – Histograms, frequency polygon and frequency curves, bell shaped curve and its properties. Statistical Methods for Data Analysis: Applications of Statistics in Research, measures of central tendency and dispersion

### Unit IV

Research Report: Research report and its structure, journal articles – Components of journal article. Explanation of various components. Structure of an abstract and keywords. Thesis and dissertations. Components of thesis and dissertations. Referencing styles and bibliography. Ethics in Research - Plagiarism - Definition, different forms, consequences, unintentional plagiarism, copyright infringement, collaborative work. Qualities of good Researcher

### Unit V

ICT Tools for Research : Role of computers in research, maintenance of data using software such as Mendeley, Endnote, Tabulation and graphical presentation of research data and software tools. Web search: Introduction to Internet, use of Internet and WWW, using search engines and advanced search tools.

## **BAG-317B: Publication Ethics and Emerging trends in Research**

### **CO: COURSE OBJECTIVES**

#### **CO-1 Understanding Research Fundamentals:**

- To develop a clear understanding of the principles, concepts, and importance of research in agriculture.
- To familiarize students with the types, objectives, and methodologies of agricultural research.

#### **CO-2 Problem Identification and Formulation:**

- To enable students to identify, define, and articulate research problems specific to agricultural sciences.
- To guide students in framing research hypotheses and objectives.

#### **CO-3 Research Design and Methodology:**

- To introduce students to various research designs, sampling techniques, and data collection methods suited to agricultural studies.
- To train students in the preparation and execution of research plans.

#### **CO-4 Data Analysis and Interpretation:**

- To teach students basic statistical tools and techniques for data analysis in agricultural research.
- To guide students in interpreting research results and deriving meaningful conclusions.

#### **CO-5 Scientific Writing and Reporting:**

- To develop skills for writing research proposals, reports, and scientific papers in the field of agriculture.
- To train students in effective communication and presentation of research findings.

#### **CO-6 Application of Research Tools:**

- To familiarize students with modern tools and software used in agricultural research.
- To emphasize ethical practices in conducting research and handling data.

#### **CO-7 Problem-Solving and Decision-Making:**

- To cultivate critical thinking and analytical skills necessary for addressing real-world agricultural challenges through research.

## CourseContents

### Unit I

Introduction to Research Philosophy: Concept; Definitions; Nature & Scope, General Characteristics of a value-based Research, Axiological approach, Research Ethics; Definition; Moral Philosophy; Nature of Moral Judgments, Political Issues in Research, Ethical Norms & Responses, Enhancing research interests, Research Collaboration & Research Recognition, Ethical guidelines in field research, Concealed Information & Extent of Respondents' rights.

### Unit II

Elements of Research Ethics & Types of Research, Mixed Methods in Applied & Action Research, Internet search, deep web search, Authenticated v. Fake information, Research Integrity & Academic Honesty in Interdisciplinary Research, Redundant Publications; Duplicate & Overlapping Publications; Salami Slicing, Selective Reporting and Misrepresentation of Data.

### Unit III

Publication Ethics: Introduction, Definition, & Importance, Scientific Research Misconduct; Falsification, Fabrication & Plagiarism/Self-plagiarism, Kinds & Remedies, Intellectual Property; Reasonable & Fair Use; Copyright and related IPR Issues, Violation of Publication Ethics; Authorship/Co-authorship, Joint research/ Contributorship & Patentable Inventions- Extent of Rights & Claims, Best Practices/Standards Setting Initiatives and guidelines; COPE, WAME, UGC-CARE list etc. Publication Misconduct; Concept; Definition & Kinds of Problems & Unethical Behaviour, Identification of Publication Misconduct, Complaints & Appeal Provisions.

### Unit IV

Open Access Publications and Initiatives, Creative Common License, Predatory Publishers & Journals, Reference Management & Referencing Standards in Open Access Publishing iv. SHERPA/RoMEO; Online Resources for Publisher Copyright & Self-archiving Policies, Data Management, Data Sharing Techniques, Data Reuse & Data Citation, Software Tool to identify Predatory Publications developed by SPPU, Journal Finder/ Journal suggestions tools viz., JANE, Elsevier Journal Finder, Springer Journal Suggester etc.

### Unit V

Subject specific Ethical Issues, FFP, Authorship, Conflict of Interests; Copyright/Plagiarism Issues, Sharing of data collected for a research (confidentiality, reuse, dissemination or republishing), Consent in publishing/ using different kinds of data and Simultaneous Submission, Complaints & Appeals: Case Studies/Examples of Publication Frauds from India & abroad, Research Literacy & Advocacy; Digital Humanities, Use of Plagiarism Software like Turnitin, Urkund & other Open Source Software Tools.



## **BAG-302 Rainfed Agriculture & Watershed Management**

### **CO: COURSE OBJECTIVES**

**CO-01 Understanding Rainfed Agriculture Systems:** To comprehend the characteristics, challenges, and potential of agricultural systems in rainfed areas and their role in sustainable food production.

**CO-02 Enhancing Water Use Efficiency:** To study techniques for optimizing water use in rainfed agriculture through soil moisture conservation, efficient irrigation methods, and crop selection.

**CO-03 Soil and Water Conservation:** To develop knowledge of soil erosion control, water harvesting techniques, and strategies for enhancing soil fertility in rainfed regions.

**CO- 04 Climate Resilience in Rainfed Areas:** To learn about the impacts of climate change on rainfed agriculture and strategies to build resilience through adaptive cropping systems and agroforestry.

**CO- 05 Integrated Watershed Development:** To study the integration of agricultural productivity, water resource development, and ecological balance in watershed management projects.

**CO- 06 Policy and Socioeconomic Aspects:** To analyze policies, community participation, and economic strategies for the sustainable development of rainfed and watershed-based agriculture.

## Course Contents

### Unit- I:

- Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India;

### Unit- II:

- Problems and prospects of rainfed agriculture in India ; Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants,

### Unit- III:

- Crop adaptation and mitigation to drought; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices,

### Unit- IV:

- Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

### Practical:

Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

## **BAG-304 Protected Cultivation and Secondary Agriculture**

### **CO:COURSE OBJECTIVES**

**CO- 1 Understand the Principles of Protected Cultivation:** Equip students with knowledge about the fundamentals of protected cultivation, including greenhouse design, climate control systems, and production technologies.

**CO- 2 Learn Modern Cultivation Practices:** Introduce advanced cultivation techniques like hydroponics, aeroponics, and vertical farming to optimize crop yields and resource efficiency.

**CO- 3 Develop Skills in Environmental Control:** Teach methods for managing temperature, humidity, light, and ventilation in controlled environments to enhance crop quality and productivity.

**CO- 4 Promote Resource Efficiency:** Emphasize sustainable practices, including water-use efficiency, integrated pest management, and energy conservation in protected farming systems.

**CO- 5 Understand the Role of Secondary Agriculture:** Highlight the importance of post-harvest processing, value addition, and storage techniques in reducing agricultural losses and increasing farmer income.

## Course Contents

### Unit- I:

- Green house technology: Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses,

### Unit- II:

- Design criteria of greenhouse for cooling and heating purposes. Greenhouse equipments, materials of construction for traditional and low cost greenhouses. Irrigation systems used in greenhouses, typical applications, passive solar greenhouse, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

### Unit- III:

- Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer).

### Unit- IV:

- Material handling equipment; conveyer and elevators, their principle, working and selection.

### Practical:

Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

## **BAG-306 Diseases of Field and Horticultural Crops and their Management-II**

### **CO: COURSE OBJECTIVES**

**CO- 1 Understand Major Crop Diseases:** To provide an in-depth understanding of the major diseases affecting field and horticultural crops, including their etiology, symptoms, and epidemiology.

**CO- 2 Identify Disease Symptoms:** To equip students with the skills to accurately identify diseases in crops through field observations and laboratory diagnostics.

**CO- 3 Analyze Disease Dynamics:** To study the factors influencing disease development and spread, including climatic, biological, and cultural conditions.

**CO- 4 Apply Management Strategies:** To introduce integrated disease management strategies, including cultural, biological, chemical, and genetic approaches.

**CO- 5 Evaluate Disease Resistance:** To understand the role of plant resistance and breeding for disease-resistant crop varieties.

**CO- 6 Implement Disease Monitoring Tools:** To teach techniques for monitoring disease outbreaks and predicting potential epidemics using modern tools and technologies.

**CO- 7 Promote Sustainable Practices:** To emphasize the importance of eco-friendly and sustainable disease management practices to minimize environmental impact and ensure long-term crop health.

## Course Contents

### Unit- I:

- Symptoms, etiology, disease cycle and management of following diseases: Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng; Sunflower: Sclerotinia stem rot and Alternaria blight;

### Unit- II:

- Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

### Unit- III:

- Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl.

### Unit- IV:

- Strawberry: leaf spot, Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot; Coriander: stem gall, Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.

### Practical:

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

Note: Students should submit 50 pressed and well-mounted specimens.

## **BAG-308 Post-harvest Management and Value Addition of Fruits and Vegetables**

### **CO: COURSE OBJECTIVES**

**CO- 1 Understand Post-Harvest Physiology:** To explain the physiological and biochemical changes occurring in fruits and vegetables after harvest, including ripening, senescence, and spoilage.

**CO- 2 Minimize Post-Harvest Losses:** To identify factors contributing to post-harvest losses and develop strategies to minimize these losses during handling, storage, and transportation.

**CO- 3 Learn Preservation Techniques:** To study various preservation methods, such as refrigeration, canning, drying, and freezing, to extend the shelf life of fruits and vegetables.

**CO- 4 Enhance Value Addition Skills:** To explore processes for transforming fresh produce into value-added products such as juices, jams, pickles, and dried snacks.

**CO- 5 Understand Quality Standards:** To examine quality assessment techniques and standards for fruits and vegetables to ensure food safety and market acceptability.

**CO- 6 Develop Packaging and Storage Solutions:** To design appropriate packaging and storage systems that maintain the quality and nutritional value of fruits and vegetables.

## Course Contents

### Unit- I:

- Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post-harvest losses;

### Unit- II:

- Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric);

### Unit- III:

- Value addition concept; Principles and methods of preservation; Intermediate moisture food - Jam, jelly, marmalade, preserve, candy – Concepts and Standards;

### Unit- IV:

- Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning – Concepts and Standards, packaging of products.

### Practical:

Applications of different types of packaging, containers for shelf life extension. Effect of temperature on shelf life and quality of produce. Demonstration of chilling and freezing injury in vegetables and fruits. Extraction and preservation of pulps and juices. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products. Quality evaluation of products -- physico-chemical and sensory. Visit to processing unit/industry.



## **BAG-310 Management of Beneficial Insects**

### **CO: COURSE OBJECTIVES**

**CO-1 Identify Beneficial Insects:** Develop the ability to recognize and classify key beneficial insect species, including pollinators, predators, and parasitoids, based on their roles in ecosystems and agriculture.

**CO-2 Understand Ecological Roles:** Gain comprehensive knowledge about the ecological functions of beneficial insects, including their contributions to pollination, pest control, and biodiversity.

**CO-3 Explore Habitat Requirements:** Learn to assess the habitat needs of beneficial insects and understand how to create or manage environments that support their survival and effectiveness.

**CO-4 Implement Conservation Strategies:** Develop strategies for conserving and enhancing populations of beneficial insects through sustainable practices such as integrated pest management (IPM) and agroecological approaches.

**CO-5 Evaluate Environmental Impact:** Analyze the effects of agricultural practices, pesticide use, and climate change on beneficial insect populations and their ecological functions.

**CO-6 Promote Sustainable Agriculture:** Understand the integration of beneficial insects into sustainable agricultural systems to improve crop yields, reduce chemical inputs, and foster environmental health.

**CO-7 Develop Management Plans:** Design and implement practical management plans for promoting beneficial insects in agricultural and natural ecosystems, tailored to specific regions or crop systems.

## Course Contents

### Unit- I:

- Importance of beneficial insects, beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honeybee. Role of pollinators in cross-pollinated plants.

### Unit- II:

- Types of silkworm, vernalism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.

### Unit- III:

- Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control.

### Unit- IV:

- Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

### Practical:

Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, vernalism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.

## **BAG-312 Crop Improvement-II (Rabi crops)**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding the Importance of Rabi Crops:** Explain the economic and nutritional significance of major Rabi crops in agriculture and their role in ensuring food security.

**CO-2 Exploring Crop Breeding Techniques:** Study advanced breeding methods, including hybridization, mutation breeding, and biotechnological approaches, for the genetic improvement of Rabi crops.

**CO-3 Enhancing Stress Tolerance:** Develop strategies to improve Rabi crops' tolerance to abiotic stresses like drought, frost, and nutrient deficiencies, as well as biotic stresses such as pests and diseases.

**CO-4 Focusing on Yield and Quality Traits:** Improve the productivity, nutritional quality, and marketability of Rabi crops through targeted breeding and selection techniques.

**CO-5 Integrating Genomics and Biotechnology:** Apply molecular biology tools, such as marker-assisted selection (MAS) and genetic engineering, for faster and more precise crop improvement.

## Course Contents

### Unit- I:

- Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; food crops and cash crops; vegetable and horticultural crops;

### Unit- II:

- Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters;

### Unit- III:

- Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);

### Unit- IV:

- Hybrid seed production technology of major crops. Ideotype concept and climate resilient crop varieties for future.

## Course Contents

### **Practical:**

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem, Sugarcane, Tomato, Chilli, Onion; Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed descent methods; Study of field techniques for seed production and hybrid seed production in Rabi crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops

## **BAG-314 Practical Crop Production –II (Rabi crops)**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand Rabi Crop Management:** Develop a comprehensive understanding of the principles and practices involved in the cultivation of major Rabi crops, including wheat, barley, mustard, chickpea, and lentils.

**CO-2 Learn Soil Preparation Techniques:** Gain practical knowledge of soil preparation, nutrient management, and seedbed preparation techniques suitable for Rabi crop cultivation.

**CO-3 Master Sowing Practices:** Acquire skills in selecting, treating, and sowing seeds at appropriate times and methods to ensure optimal germination and yield.

**CO-4 Implement Irrigation Strategies:** Learn the principles of water management and irrigation scheduling specific to the requirements of Rabi crops.

**CO-5 Apply Pest and Weed Management:** Develop proficiency in identifying and managing pests, diseases, and weeds that affect Rabi crops using integrated pest management (IPM) strategies.

**CO-6 Practice Harvesting and Post-Harvest Techniques:** Understand the methods of harvesting, threshing, storage, and quality preservation of Rabi crops to minimize losses and maintain market standards.

## Course Contents

### **Practical:**

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests/diseases of crops, harvesting, threshing, drying, winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

## **BAG-316 Principles of Organic Farming**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Fundamentals of Organic Farming:** Learn the basic principles, philosophy, and historical development of organic agriculture.

**CO-2 Recognize the Importance of Soil Health:** Study the role of soil fertility and health in organic farming, including practices like composting, crop rotation, and cover cropping.

**CO-3 Explore Organic Farming Practices:** Examine the techniques used in organic farming, such as natural pest management, weed control, and water conservation methods.

**CO-4 Analyze Certification Standards:** Understand the rules, regulations, and certification processes for organic farming at national and international levels.

**CO-5 Promote Environmental Sustainability:** Assess how organic farming contributes to environmental sustainability by reducing chemical inputs and promoting biodiversity.



## Course Contents

### Unit- I:

- Organic farming, principles and its scope in India; Initiatives taken by Government (central/ state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts;

### Unit- II:

- Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming;

### Unit- III:

- Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP;

### Unit- IV:

- Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

### Practical:

Visit of organic farms to study the various components and their utilization; Preparation of enriched compost, vermin-compost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest, disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

## **BAG-318 Farm Management, Production & Resource Economics**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Principles of Farm Management:** Equip students with knowledge of the core principles of managing a farm, including planning, organizing, directing, and controlling agricultural operations.

**CO-2 Analyze Agricultural Production Systems:** Develop the ability to assess and optimize production systems to improve efficiency and productivity in farm enterprises.

**CO-3 Apply Economic Principles to Resource Allocation:** Train students to apply economic concepts to allocate resources effectively, ensuring sustainability and profitability in agriculture.

**CO-4 Evaluate Financial Performance of Farms:** Enable students to use financial tools and techniques to evaluate the profitability, liquidity, and solvency of farm businesses.

**CO-5 Understand Risk and Uncertainty in Agriculture:** Teach strategies to manage risks and uncertainties in farming caused by market fluctuations, climate variability, and policy changes.

**CO-6 Optimize Resource Use for Sustainable Farming:** Instill knowledge about sustainable use of land, labor, capital, and technology to achieve long-term agricultural viability.

## Course Contents

### Unit- I:

- Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factors determining types and size of farms. Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship, law of equi-marginal or principles of opportunity cost and law of comparative advantage.

### Unit- II:

- Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises.

### Unit- III:

- Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance

### Unit- IV:

- Weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

### Practical:

Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs use in a farm production process. Determination of least cost combination of inputs. Selection of most profitable enterprise combination. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India.

## **BAG-320 Principles of Food Science and Nutrition**

### **CO: COURSE OBJECTIVES**

**CO-1 Understand the Fundamentals of Food Science:** Explain the physical, chemical, and biological principles underlying food systems and their application in food production and processing.

**CO-2 Explore Nutritional Requirements:** Analyze the role of essential nutrients in human health and their impact on growth, development, and disease prevention.

**CO-3 Evaluate Food Quality and Safety:** Assess factors that affect food quality, safety, and shelf life, including food preservation techniques and contamination risks.

**CO-4 Investigate Food Processing Methods:** Identify and describe common food processing methods and their influence on nutritional value, sensory properties, and food functionality.

**CO-5 Examine the Role of Food in Society:** Discuss the cultural, social, and economic factors that influence food choices and dietary habits globally.

**CO-6 Apply Principles of Nutrition:** Design balanced diets and recommend nutritional interventions based on scientific evidence to address specific health conditions or goals.

## Course Contents

### Unit- I:

- Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.);

### Unit- II:

- Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions);

### Unit- III:

- Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods);

### Unit- IV:

- Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.); Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders;

### Unit- V:

- Energy metabolism (carbohydrate, fat, proteins); Balanced/modified diets, Menu planning, New trends in food science and nutrition.

**BAG-321:ElectiveCourse**

## **B.Sc. (Ag.) VII Semester**

### **BAG-401 General orientation & on campus training by different Faculties**

#### **CO: COURSE OBJECTIVES**

**CO-1 Familiarization with the Institution:** Introduce students to the institution's culture, values, and infrastructure. Provide an overview of various academic and co-curricular resources available on campus.

**CO-2 Interdisciplinary Exposure:** Facilitate interaction with faculty members from different disciplines to broaden students' academic perspectives. Encourage understanding of multidisciplinary approaches to problem-solving and learning.

**CO-3 Skill Development:** Enhance communication, teamwork, and interpersonal skills through interactive sessions. Introduce students to tools and techniques relevant to academic and professional success.

**CO-4 Guidance on Academic Pathways:** Offer insights into academic programs, research opportunities, and career trajectories. Provide orientation on the curriculum, evaluation systems, and academic expectations.

**CO-5 Motivation and Goal Setting:** Inspire students through lectures and interactions with experienced faculty. Help students set personal and academic goals for their educational journey.

**CO-6 Community Building:** Create a sense of belonging and engagement among students by fostering peer and faculty interactions. Encourage participation in campus life, clubs, and other student activities.

## **BAG-403 Village attachment**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding Rural Life:** To familiarize students with the day-to-day lifestyle, culture, traditions, and challenges faced by rural communities.

**CO-2 Knowledge of Agricultural Practices:** To observe and analyze the farming systems, cropping patterns, and the use of modern and traditional agricultural techniques.

**CO-3 Socio-Economic Awareness:** To assess the socio-economic structure of rural areas, including income sources, living standards, education, healthcare, and social organization.

**CO-4 Community Engagement:** To encourage students to interact with farmers, laborers, and village authorities to understand their perspectives and aspirations.

**CO-5 Identification of Problems:** To identify key issues in rural development, such as water scarcity, soil degradation, lack of education, or health facilities, and suggest possible solutions.

**CO-6 Application of Knowledge:** To apply classroom knowledge in real-life rural scenarios, enhancing problem-solving skills and practical learning.

**CO-7 Promoting Sustainable Practices:** To educate villagers about sustainable agricultural and livelihood practices, emphasizing the importance of environmental conservation.



## **BAG-405 Unit attachment in University/College/KVK / Research Station Attachment**

### **CO: COURSE OBJECTIVES**

**CO-1 Skill Development:** Equip students with practical knowledge and skills in agricultural practices, laboratory techniques, and modern research methodologies. Develop competencies in handling scientific instruments and performing field trials.

**CO-2 Practical Knowledge Application:** Provide exposure to real-life applications of theoretical concepts learned in classrooms. Enable students to analyze and solve on-ground agricultural challenges.

**CO-3 Research Familiarity:** Introduce students to research station operations and research methodologies, including data collection, analysis, and reporting. Foster a research-oriented mindset.

**CO-4 Knowledge of Extension Services:** Understand the role of Krishi Vigyan Kendras (KVKs) in technology dissemination and farmer training. Participate in outreach programs, on-farm demonstrations, and training sessions conducted for farmers.

**CO-5 Collaborative Learning:** Facilitate interaction with agricultural scientists, extension workers, and farmers to gain diverse perspectives on agriculture. Promote teamwork in multidisciplinary agricultural projects.

**CO-6 Exposure to Advanced Techniques:** Familiarize students with advanced agricultural techniques like precision farming, integrated pest management, and sustainable resource management. Gain insights into recent innovations in agriculture and their implementation.

**CO-7 Career Readiness:** Prepare students for future roles in academics, research, and extension services. Enhance employability through experience in professional agricultural setups.

## **BAG-407 Plant Clinic**

### **CO: COURSE OBJECTIVES**

**CO-1 Diagnosis of Plant Problems:** Develop the ability to identify symptoms of diseases, pests, nutrient deficiencies, and abiotic stresses in plants.

**CO-2 Integrated Pest and Disease Management (IPDM):** Understand and implement IPDM strategies to manage plant health issues sustainably.

**CO-3 Understanding Plant-Pathogen Interactions:** Learn the mechanisms of how pathogens, pests, and environmental factors affect plant growth and productivity.

**CO-4 Use of Diagnostic Tools and Techniques:** Train in the application of modern diagnostic tools, such as microscopy, molecular methods, and field-based techniques.

**CO-5 Prescribing Solutions:** Gain expertise in recommending suitable control measures, including chemical, biological, and cultural practices.

**CO-6 Monitoring and Early Warning Systems:** Learn to establish monitoring systems for early detection of plant health problems.

**CO-7 Advisory Services:** Prepare to provide guidance to farmers and stakeholders on plant health management.

## **BAG-409 Agro-Industrial Attachment**

### **CO: COURSE OBJECTIVES**

**CO-1 Practical Exposure:** Provide students with hands-on experience in agro-industrial operations, enabling them to understand the real-world functioning of agriculture-related industries.

**CO-2 Skill Development:** Develop technical and managerial skills through active participation in various industrial processes, including production, processing, and quality management.

**CO-3 Industry-Academia Interface:** Strengthen the connection between educational institutions and industries to align academic training with industrial requirements.

**CO-4 Understanding Industrial Processes:** Familiarize students with the working principles, technologies, and machinery used in agro-industrial units, such as food processing, agrochemicals, or farm machinery.

**CO-5 Professional Networking:** Build relationships with industry professionals, which can help students understand market trends, entrepreneurship opportunities, and career prospects.

**CO-6 Problem-Solving Ability:** Encourage students to identify and analyze real-time challenges in agro-industries and propose innovative solutions.

**CO-7 Entrepreneurship Development:** Inspire entrepreneurial mindset by exposing students to industrial strategies, supply chain mechanisms, and business models in agriculture.

**CO-8 Value Addition Awareness:** Help students understand the importance of value addition in agriculture and its role in enhancing income and sustainability.

## **BAG-411 Project Report Preparation, Presentation and Evaluation General Orientation & On campus training by different Faculties**

### **CO: COURSE OBJECTIVES**

**CO-1 Skill Development in Research Methodology:** Equip students with the knowledge to design and implement research projects systematically. Teach proper techniques for data collection, analysis, and interpretation.

**CO-2 Enhancing Report Writing Skills:** Develop the ability to prepare well-structured, concise, and comprehensive project reports. Focus on correct formatting, citation, and documentation practices.

**CO-3 Effective Presentation Techniques:** Train students to present their research findings clearly and confidently using various tools (e.g., PowerPoint, charts, graphs). Improve communication skills for academic and professional contexts.

**CO-4 Evaluation and Feedback Integration:** Enable students to critically evaluate research work (their own and others'). Incorporate constructive feedback to refine their research and reporting skills.

**CO-5 Team Collaboration and Interdisciplinary Exposure:** Promote teamwork and exchange of ideas among peers. Foster an understanding of interdisciplinary approaches to problem-solving.

**CO-6 Practical Exposure through Faculty Training:** Gain insights into specialized topics through on-campus training sessions conducted by expert faculty members. Learn from real-world case studies, faculty experiences, and practical demonstrations.

**CO-7 Career Readiness:** Prepare students for professional roles requiring project planning, execution, and reporting skills. Build confidence in handling future academic or industrial projects.

**CO-8 Critical Thinking and Problem Solving:** Develop analytical skills to identify challenges and propose solutions within a project framework.

### Rural Agricultural Work Experience (RAWE) and Agro-Industrial Attachment (AIA)

- This program will be undertaken by the students during the seventh semester for a total duration of 20 weeks with a weightage of 0+20 credit hours in two parts, namely, RAWE and AIA.
- It will consist of general orientation and on-campus training by different faculties followed by village attachment/unit attachment in university/college/KVK or a research station.
- The students would be attached with the agro-industries to get an experience of the industrial environment and working.
- Due weightage in terms of credit hours will be given depending upon the duration of stay of students in villages/agro-industries.
- At the end of RAWE/AIA, the students will be given one week for project report preparation, presentation and evaluation.

The Rural Agricultural Work Experience (RAWE) helps the students primarily to understand the rural situations, status of agricultural technologies adopted by the farmers to prioritize the farmers' problems and to develop skills & attitude of working with farm families for overall development in rural area. The timings for RAWE can be flexible for specific regions to coincide with the main cropping season.

## RAWECOMPONENT-I:VillageAttachmentTrainingProgramme

S. No	Activity	Duration
1	Orientation andSurveyofVillage	1 week
2	AgronomicalInterventions	1 week
3	PlantProtection Interventions	1 week
4	SoilImprovement Interventions(Soil samplingand testing)	1 week
5	FruitandVegetableproductioninterventions	1 week
6	FoodProcessingand Storageinterventions	
7	AnimalProductionInterventions	1 week
8	Extension andTransferofTechnologyactivities	1 week

## **RAWE Component –II:AgroIndustrialAttachment**

- StudentsshallbeplacedinAgro- andCottageindustriesandCommoditiesBoardsfor03weeks.
- IndustriesincludeSeed/Saplingproduction,Pesticides-insecticides,Post-harvest-processing-value addition, Agri-financeinstitutions, etc.

### **ActivitiesandTasksduringAgro-IndustrialAttachmentProgramme**

- Acquaintancewithindustryandstaff
- Studyofstructure, functioning,objectiveandmandatesof theindustry
- Studyofvariousprocessingunitsandhands-ontrainingsundersupervisionofindustrystaff
- Ethics of industry
- Employmentgeneratedbytheindustry
- Contribution of the industrypromotingenvironment
- Learningbusinessnetwork includingoutlets of the industry
- Skilldevelopment inallcrucialtasks of the industry
- Documentation oftheactivities and task performed bythe students
- Performanceevaluation,appraisalandrakingofstudents

## **B.Sc. (Ag.) VIII Semester**

### **BAG-402 Production Technology for Bioagents and Biofertilizer**

#### **CO: COURSE OBJECTIVES**

**CO-01 Understanding Bioagents and Biofertilizers:** Familiarize students with the concept, types, and importance of bioagents (e.g., biocontrol agents like Trichoderma, Bacillus) and biofertilizers (e.g., Rhizobium, Azotobacter, Mycorrhiza).

**CO-02 Production Technologies:** Equip students with knowledge about the production processes, culture techniques, and maintenance of bioagents and biofertilizers under laboratory and industrial conditions.

**CO-03 Formulation and Quality Control:** Teach methods for the formulation, packaging, and quality assessment of bioagents and biofertilizers to ensure their efficacy and shelf life.

**CO-04 Application Techniques:** Train students in the effective application methods of bioagents and biofertilizers in agriculture for sustainable crop production.

**CO-05 Environmental and Economic Benefits:** Highlight the role of bioagents and biofertilizers in reducing chemical inputs, improving soil health, enhancing crop productivity, and promoting eco-friendly agricultural practices.

**CO-06 Entrepreneurial Opportunities:** Encourage students to explore entrepreneurship in the biofertilizer and bioagent production sector as a sustainable business model.



## **BAG-404 Seed Production and Technology**

### **CO: COURSE OBJECTIVES**

**CO-01 Understanding Seed Science:** To provide a thorough understanding of the principles of seed biology, including seed development, physiology, and germination.

**CO-02 Seed Production Techniques:** To learn the methodologies and technologies used in the production of quality seeds for various crops.

**CO-03 Seed Certification and Quality Control:** To understand the standards, procedures, and practices involved in seed certification, labeling, and maintaining quality standards.

**CO-04 Seed Storage and Preservation:** To study the principles and techniques of seed storage, maintaining seed viability, and longevity under various conditions.

**CO-05 Hybrid Seed Production:** To explore techniques for hybrid seed production, including pollination control mechanisms and genetic purity maintenance.

**CO-06 Seed Health and Testing:** To familiarize students with seed testing protocols for germination, vigor, purity, and health.

**CO-07 Role in Crop Improvement:** To highlight the role of quality seed production in improving crop yield, disease resistance, and overall agricultural productivity.

## **BAG-406 Mushroom Cultivation Technology**

### **CO: COURSE OBJECTIVES**

**CO-01 Understanding Mushroom Biology:** Learn about the taxonomy, morphology, and physiology of edible and medicinal mushrooms. Understand the ecological role and nutritional importance of mushrooms.

**CO-02 Cultivation Techniques:** Develop skills in the preparation of substrates for mushroom cultivation. Understand the methods of spawn production and management. Learn cultivation practices for different types of mushrooms (e.g., button, oyster, shiitake, and milky mushrooms).

**CO-03 Post-Harvest Management:** Gain knowledge about harvesting, processing, and packaging techniques. Explore value-added products and storage methods to enhance shelf life.

**CO-04 Disease and Pest Management:** Understand common diseases, pests, and environmental issues affecting mushroom production. Learn preventive and curative measures.

**CO-05 Economic and Entrepreneurial Skills:** Develop an understanding of the commercial potential of mushroom cultivation. Gain knowledge of cost-effective production, market trends, and business planning. Explore opportunities for small-scale and large-scale entrepreneurship.

**CO-06 Sustainability and Waste Utilization:** Learn about sustainable practices in mushroom cultivation. Explore the use of agricultural waste and by-products as substrates for cultivation.

**CO-07 Practical Applications and Hands-on Training:** Engage in hands-on training for setting up mushroom farms and spawn production units.

## **BAG-408 Soil, Plant, Water and Seed Testing**

### **CO: COURSE OBJECTIVES**

**CO-01 Understand Soil Testing:** Develop expertise in analyzing soil physical, chemical, and biological properties. Provide recommendations for sustainable soil fertility management based on test results.

**CO-02 Plant Testing and Analysis:** Learn to assess plant tissue for nutrient status to identify deficiencies, toxicities, or imbalances. Integrate plant analysis data with soil tests for efficient nutrient management.

**CO-03 Water Testing:** Evaluate water quality parameters like pH, electrical conductivity, salinity, and contaminant levels for agricultural use. Understand the suitability of water for irrigation and its impact on soil and crop health.

**CO-04 Seed Testing:** Develop skills in determining seed quality, including germination percentage, vigor, moisture content, and purity. Learn methods to ensure high-quality seed production for better crop yields.

**CO-05 Promote Sustainable Agriculture:** Integrate testing practices to make informed decisions for sustainable and environmentally friendly farming practices.

**CO-06 Enhance Research and Analytical Skills:** Train in the use of advanced instruments and methodologies for precise analysis. Foster critical thinking and problem-solving in agricultural resource management.

**CO-07 Policy and Advisory Role:** Equip participants to work as advisors or policymakers in agriculture, ensuring resource-efficient and sustainable practices are adopted at local and regional levels.

## **BAG-410 Commercial Beekeeping**

### **CO: COURSE OBJECTIVES**

**CO-01 Introduction to Beekeeping:** Understanding the fundamentals of beekeeping, including bee biology, behavior, and the role of bees in agriculture and biodiversity.

**CO-02 Bee Management Practices:** Learning how to manage bee colonies effectively for honey production, pollination, and other byproducts like beeswax, propolis, and royal jelly.

**CO-03 Hive Management:** Training on how to maintain and manage beehives, including setting up, inspecting, and maintaining healthy hives for maximum productivity.

**CO-04 Disease and Pest Control:** Understanding common diseases and pests that affect bees and how to manage them to ensure a thriving colony.

**CO-05 Pollination Services:** Exploring the commercial aspects of pollination services for crops, especially for fruit, vegetable, and seed production.

**CO-06 Honey Harvesting and Processing:** Learning the best practices for harvesting honey and other bee products, followed by methods of extraction, processing, and packaging for sale.

**CO-07 Marketing and Business Skills:** Developing the skills needed to run a successful commercial beekeeping operation, including market analysis, business planning, and product distribution.

## **BAG-412 Poultry Production Technology**

### **CO: COURSE OBJECTIVES**

**CO-01 Understanding Poultry Husbandry:** Teaching the basics of poultry farming, including the care, breeding, and management of poultry species such as chickens, ducks, turkeys, and geese.

**CO-02 Poultry Nutrition:** Understanding the nutritional requirements of poultry for different stages of growth (chicks, growers, and layers), including feed formulation and feeding techniques.

**CO-03 Poultry Health Management:** Learning about common diseases in poultry, their prevention, and control measures, along with vaccination schedules and biosecurity practices.

**CO-04 Poultry Breeding:** Gaining knowledge of selective breeding techniques for improving traits like egg production, meat quality, and disease resistance.

**CO-05 Egg and Meat Production:** Developing the skills required to manage egg-laying and meat-producing flocks, ensuring high productivity and quality.

**CO-06 Poultry Farm Management:** Acquiring skills in managing a poultry farm, including housing design, waste management, record-keeping, and financial management.

**CO-07 Poultry Processing and Marketing:** Understanding the steps involved in processing poultry products (eggs, meat) for market readiness, along with packaging, storage, and marketing strategies.

**CO-08 Sustainable Practices:** Promoting environmentally sustainable poultry farming practices, including waste management, resource optimization, and minimizing environmental impact.

## **BAG-414 Commercial Horticulture**

### **CO: COURSE OBJECTIVES**

**CO-01 Understanding Horticultural Practices:** Learn about the scientific principles and techniques involved in the cultivation of various horticultural crops, including soil preparation, irrigation, fertilization, and pest management.

**CO-02 Business and Economic Aspects:** Develop the ability to assess the economic viability of horticultural ventures, including cost analysis, market trends, and profitability. Understanding the economics of large-scale horticultural production is crucial for success in commercial farming.

**CO-03 Sustainable Practices:** Focus on the adoption of sustainable farming methods, such as organic farming, integrated pest management (IPM), and water conservation techniques, ensuring long-term productivity without compromising environmental health.

**CO-04 Advanced Technologies:** Explore the use of modern technologies in horticulture, including greenhouse production, hydroponics, precision agriculture, and the application of biotechnology in crop improvement.

**CO-05 Post-Harvest Management:** Understand the techniques for post-harvest handling, storage, and transportation to reduce losses and maintain product quality, which is key to the success of commercial horticultural enterprises.

**CO-06 Market and Supply Chain Management:** Gain insights into market demand, packaging, distribution, and logistics involved in the commercialization of horticultural products, including export opportunities.

**CO-07 Entrepreneurial Skills:** Equip students with entrepreneurial skills to start their own horticulture-based ventures, focusing on innovation, business planning, and financial management.

## **BAG-416 Floriculture and Landscaping**

### **CO: COURSE OBJECTIVES**

**CO-01 Understanding of Floriculture:** To provide students with knowledge about the production, cultivation, and management of flowers and ornamental plants. This includes learning about plant varieties, their growth requirements, and techniques for effective flower cultivation.

**CO-02 Landscape Design Principles:** To teach the principles of designing functional, aesthetically pleasing, and sustainable landscapes. This covers aspects such as site analysis, plant selection, design concepts, and landscaping elements (e.g., pathways, fountains, and sculptures).

**CO-03 Techniques in Landscaping:** To equip students with practical skills in landscape maintenance, soil preparation, irrigation, and pest management, which are essential for creating and maintaining beautiful gardens and landscapes.

**CO-04 Environmental Sustainability:** To highlight the role of floriculture and landscaping in promoting environmental sustainability, including water conservation, biodiversity, and reducing carbon footprints through green spaces.

**CO-05 Economic Aspects of Floriculture and Landscaping:** To explore the economic potential of floriculture as a business, including the marketing of flowers, plants, and landscaping services, as well as the role of landscaping in urban development.

**CO-06 Horticultural Practices:** To teach students the various horticultural practices specific to the cultivation of flowers and ornamental plants, such as propagation, pruning, and harvesting.

## **BAG-418 Food Processing**

### **CO: COURSE OBJECTIVES**

**CO-01 Understanding Food Processing Principles:** To introduce students to the fundamental principles of food processing, such as preservation, fermentation, freezing, drying, and packaging, and their role in enhancing shelf life, nutritional value, and sensory qualities of food.

**CO-02 Exploring Different Processing Techniques:** To familiarize students with various processing techniques used in the food industry, including thermal processing, refrigeration, dehydration, canning, pasteurization, and extrusion.

**CO-03 Food Safety and Quality Control:** To emphasize the importance of food safety, sanitation, and quality control measures during processing to prevent contamination and ensure that food products meet regulatory standards.

**CO-04 Impact on Nutritional Content:** To examine how different processing methods affect the nutritional content, bioavailability of nutrients, and sensory attributes (taste, color, texture) of food products.

**CO-05 Technology and Innovation:** To expose students to the latest advancements in food processing technology, including automation, use of enzymes, nanotechnology, and other innovative methods for improving efficiency and sustainability in food production.

**CO-06 Understanding Food Product Development:** To equip students with skills in food product formulation and development, enabling them to create new food products based on consumer demands, market trends, and nutritional needs.

**CO-07 Economic and Environmental Aspects:** To analyze the economic feasibility of food processing operations, including cost analysis, resource utilization, and the environmental impact of food processing techniques.

**Practical Application:** To provide hands-on experience through laboratory work or industry internships, where students can apply theoretical knowledge to real-world food processing challenges.



## **BAG-420 Agriculture Waste Management**

### **CO: COURSE OBJECTIVES**

**CO-01 Understanding Agricultural Waste:** Learn about the types of agricultural waste generated (e.g., crop residues, animal manure, and agro-industrial waste) and their environmental impact.

**CO-02 Waste Disposal and Recycling:** Explore methods for the safe disposal and recycling of agricultural waste to minimize environmental pollution.

**CO-03 Waste-to-Energy Technologies:** Study technologies that convert agricultural waste into energy (e.g., biogas production, biofuels).

**CO-04 Composting and Soil Health:** Understand how agricultural waste can be composted and used to improve soil health and fertility.

**CO-05 Environmental Impact Assessment:** Evaluate the environmental implications of poor waste management practices and the importance of sustainable waste management in agriculture.

**CO-06 Policy and Regulation:** Study national and international policies, regulations, and standards related to agricultural waste management.

## **BAG-422 Organic Production Technology**

### **CO: COURSE OBJECTIVES**

**CO-01 Understanding Organic Farming Principles:** Introduce students to the fundamental principles of organic farming, emphasizing the importance of sustainability, biodiversity, and soil health.

**CO-02 Techniques of Organic Crop Production:** Equip students with knowledge of various organic farming practices such as crop rotation, composting, green manure, mulching, and organic pest management.

**CO-03 Soil Health Management:** Teach students how organic production emphasizes soil fertility through the use of organic matter, bio-fertilizers, and soil-friendly techniques, avoiding chemical inputs.

**CO-04 Organic Inputs and Fertilization:** Focus on the sources and use of organic fertilizers, including compost, vermicompost, biofertilizers, and plant-based nutrient amendments.

**CO-05 Certification and Standards:** Provide knowledge on organic certification processes, standards, and regulations to ensure products meet the requirements for organic labeling.

**CO-06 Pest and Disease Management in Organic Systems:** Teach students how to manage pests and diseases through non-chemical means like biological control, physical methods, and plant resistance.

## **BAG-424 Commercial Sericulture**

### **CO: COURSE OBJECTIVES**

**CO-1 Understanding Sericulture Basics:** To introduce students to the history, principles, and biology of sericulture, focusing on silk-producing organisms, particularly silkworms (*Bombyxmori*).

**CO-2 Silkworm Rearing Techniques:** To train students in the various techniques involved in silkworm rearing, including the selection of appropriate breeds, feeding, and care of silkworms to enhance silk production.

**CO-03 Silk Cocoon Production:** To impart knowledge about cocoon harvesting, handling, and processing for commercial silk production.

**CO-04 Sericulture Infrastructure:** To educate students on setting up and managing a sericulture farm, including the design of rearing houses, mulberry cultivation for silkworm feed, and other necessary infrastructure.

**CO-05 Economic Aspects:** To explore the economic potential of sericulture, including cost analysis, profit margins, market trends, and the development of a business model.

**CO-06 Post-harvest Processing:** To provide hands-on training in processing cocoons into silk threads, including reeling, twisting, dyeing, and weaving.

**CO-07 Sustainability in Sericulture:** To discuss sustainable sericulture practices, pest management, and environmental concerns associated with silk farming.

## Modules for Skill Development and Entrepreneurship

A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the following package of modules in the VIII semester.

NOTE: In addition to above ELP modules other important modules may be given to the students by SAUs.

S. No	Subject Code	Title	Credit Hours			
			Cr	L	T	P
1.	BAG-402	Production Technology for Bioagents and Biofertilizer	1	0	0	2
2.	BAG-404	Seed Production and Technology	1	0	0	2
3.	BAG-406	Mushroom Cultivation Technology	1	0	0	2
4.	BAG-408	Soil, Plant, Water and Seed Testing	1	0	0	2
5.	BAG-410	Commercial Beekeeping	1	0	0	2
6.	BAG-412	Poultry Production Technology	1	0	0	2
7.	BAG-414	Commercial Horticulture	1	0	0	2
8.	BAG-416	Floriculture and Landscaping	1	0	0	2
9.	BAG-418	Food Processing	1	0	0	2
10.	BAG-420	Agriculture Waste Management	1	0	0	2
11.	BAG-422	Organic Production Technology	1	0	0	2
12.	BAG-424	Commercial Sericulture	1	0	0	2
<b>Total</b>			<b>12</b>	<b>0</b>	<b>0</b>	<b>24</b>

Evaluation of Experiential Learning Programme/Hands-on Training (HOT)

S. No	Parameters	Max. Marks
11.	Project Planning and Writing	10
12.	Presentation	10
13.	Regularity	10
14.	Monthly Assessment	10
15.	Output delivery	10
16.	Technical Skill Development	10
17.	Entrepreneurship Skills	10
18.	Business networking skills	10
19.	Report Writing Skills	10
20.	Final Presentation	10
<b>Total</b>		<b>100</b>

## **Elective Courses**

A student can select three elective courses out of the following and offer during 4<sup>th</sup> (BAG-220), 5<sup>th</sup> (BAG-319) and 6<sup>th</sup> (BAG-321) semesters.

## **Agribusiness Management**

### **CO: COURSE OBJECTIVE**

**CO-1 Maximize Profitability:** Optimize the use of resources, including land, labor, capital, and technology, to ensure the profitability and financial sustainability of agribusiness operations.

**CO-2 Efficient Resource Utilization:** Ensure the efficient use of inputs like seeds, fertilizers, water, and machinery to reduce waste and increase productivity.

**CO-3 Market Competitiveness:** Develop strategies to compete effectively in local and global markets, including pricing, branding, and distribution.

**CO-4 Sustainability and Environmental Stewardship:** Promote environmentally sustainable practices by reducing the ecological impact of agricultural operations, conserving natural resources, and supporting biodiversity.

**CO-5 Risk Management:** Identify, analyze, and mitigate risks related to price volatility, climate change, pests, diseases, and market uncertainties.

**CO-6 Enhance Supply Chain Efficiency:** Streamline processes from production to distribution, ensuring timely delivery of products while maintaining quality and minimizing costs.

**CO-7 Support Rural Development:** Contribute to rural economic growth by creating employment opportunities, fostering community development, and improving the livelihood of farmers and workers.

## Course Contents

### Unit- I:

- Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries,

### Unit- II:

- Classification of industries and types of agro-based industries. Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries.

### Unit- III:

- Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies, procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation.

### Unit- IV:

- Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning.

### Unit- V:

- Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and valuation techniques.

### Practical:

Study of agri-input markets: Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retail trade commodity trading, and value added products. Study of financing institutions - Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD. Preparations of projects and Feasibility reports for agribusiness entrepreneur. Appraisal/evaluation techniques of identifying viable project - Non-discounting techniques. Case study of agro-based industries. Trend and growth rate of prices of agricultural commodities. Net present worth technique for selection of viable project. Internal rate of return.

## **Agrochemicals**

### **CO: COURSE OBJECTIVE**

**CO-1 Enhance Crop Yield:** Increase agricultural productivity by providing essential nutrients, protecting crops from pests, and improving growth conditions.

**CO-2 Pest and Disease Control:** Protect crops from harmful pests, weeds, and diseases that can reduce yields and quality.

**CO-3 Improve Crop Quality:** Ensure better-quality produce by preventing nutrient deficiencies, diseases, and pest damage.

**CO-4 Promote Efficient Resource Use:** Maximize the effectiveness of water, nutrients, and soil resources through targeted applications.

**CO-5 Support Sustainable Farming Practices:** Help maintain soil fertility and health while minimizing land degradation when used responsibly.

**CO-6 Facilitate Large-Scale Farming:** Enable efficient management of large agricultural areas by reducing the labor required for pest control and fertilization.

**CO-7 Adapt to Changing Climate Conditions:** Provide tools to combat stress factors such as drought, high temperatures, or nutrient depletion caused by climate changes.



## Course Contents

### Unit- I:

- An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture. Herbicides - Major classes, properties and important herbicides. Fate of herbicides, Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action - Bordeaux mixture and copper oxychloride.

### Unit- II:

- Organic fungicides - Mode of action - Dithiocarbamates - characteristics, preparation and use of Zineb and maneb, Systemic fungicides - Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides

### Unit- III:

- Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids, Neonicotinoids, Bio-rational, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

### Unit- IV:

- Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate.

### Unit- V:

- Mixed and complex fertilizers: Sources and compatibility – preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

### Practical:

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available in market. Estimation of nitrogen in Urea. Estimation of water soluble P<sub>2</sub>O<sub>5</sub> and citrate soluble P<sub>2</sub>O<sub>5</sub> in single superphosphate. Estimation of potassium in Murreite of Potash/Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

## Commercial Plant Breeding

### CO: COURSE OBJECTIVE

**CO-1 Improved Yield:** To increase the productivity of crops per unit area, ensuring higher returns for farmers and food security for populations.

**CO-2 Disease and Pest Resistance:** To develop plant varieties resistant to specific diseases and pests, reducing crop losses and the need for chemical pesticides.

**CO-3 Abiotic Stress Tolerance:** To breed plants capable of withstanding adverse environmental conditions such as drought, salinity, extreme temperatures, and flooding.

**CO-4 Enhanced Quality:** To improve the nutritional value, taste, texture, shelf life, and appearance of crops, meeting consumer demands and market standards.

**CO-5 Adaptation to Mechanization:** To produce crop varieties that are suited to modern agricultural practices, including mechanical planting, harvesting, and processing.

**CO-6 Shorter Growing Cycles:** To develop varieties with reduced maturity periods, enabling multiple cropping in a year or better adaptation to specific growing seasons.

**CO-7 Market-Specific Traits:** To tailor crops for specific industrial uses (e.g., high oil content in oilseeds, gluten content in wheat, or sugar content in sugarcane) and regional consumer preferences.

## Course Contents

### Unit- I:

- Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two lines system) for development of hybrids and seed production.

### Unit- II:

- Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton, pigeon pea, Brassica etc.

### Unit- III:

- Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.

### Unit- IV:

- IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

### Practical:

Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniques of seed production in self and cross pollinated crops using A/B/R and two lines system. Learning techniques in hybrid seed production using male-sterility in field crops. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz., grading and packaging. Visit to public private seed production and processing plant.

## Landscaping

### CO: COURSE OBJECTIVE

**CO-1 Aesthetic Enhancement:** Create visually appealing spaces through the use of plants, structures, and other landscape elements.

**CO-2 Functional Use:** Optimize outdoor spaces for practical purposes, such as recreation, dining, walking paths, or seating areas.

**CO-3 Environmental Sustainability:** Promote ecological balance by incorporating native plants, conserving water, and providing habitats for wildlife.

**CO-4 Climate Moderation:** Use landscaping elements like trees and shrubs to regulate temperature, reduce heat, and provide shade or windbreaks.

**CO-5 Erosion and Soil Protection:** Prevent soil erosion and degradation by using ground covers, terraces, and retaining walls.

**CO-6 Increase Property Value:** Enhance the market value of a property through thoughtful and well-maintained landscaping.

**CO-7 Improved Air and Noise Quality:** Use plants to purify the air and act as natural sound barriers to reduce noise pollution.

## Course Contents

### Unit- I:

- Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawnmaking, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.

### Unit- II:

- Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting,

### Unit- III:

- Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management.

### Unit- IV:

- Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application

### Practical:

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.

## **Food Safety and Standards**

### **CO: COURSE OBJECTIVE**

**CO-1 Ensure Public Health:** Protect consumers by ensuring that food is safe, nutritious, and free from contaminants, thereby reducing foodborne illnesses.

**CO-2 Regulate Food Quality:** Establish and enforce standards for food products to ensure consistent quality and safety throughout the food supply chain.

**CO-3 Prevent Adulteration:** Monitor and prevent the adulteration of food products to maintain their authenticity and protect consumer rights.

**CO-4 Promote Hygiene in Food Handling:** Encourage hygienic practices at every stage, from production and processing to storage, distribution, and consumption.

**CO-5 Facilitate Fair Trade Practices:** Ensure that food businesses adhere to ethical practices, avoiding misleading claims and labeling to protect consumer interests.

**CO-6 Support Consumer Awareness:** Educate consumers about food safety, labeling, and nutritional information to enable informed choices.

**CO-7 Encourage Innovation and Research:** Promote advancements in food technology, safety standards, and sustainable practices to improve the overall food ecosystem.

## Course Contents

### Unit- I:

- Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards- Biological, Chemical, Physical hazards. Management of hazards- Need. Control of parameters. Temperature control.

### Unit- II:

- Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures.

### Unit- III:

- Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.

### Unit- IV:

- Food laws and Standards- Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling.

### Unit- V:

- Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

### Practical:

Water quality analysis physico-chemical and microbiological. Preparation of different types of media. Microbiological Examination of different food samples. Assessment of surface sanitation by swab/rinse method. Assessment of personal hygiene. Biochemical tests for identification of bacteria. Scheme for the detection of food borne pathogens. Preparation of plans for Implementation of FSMS-HACCP, ISO: 22000.

## **Biopesticides&Biofertilizers**

### **CO: COURSE OBJECTIVE**

**CO-1 Enhance Crop Productivity:** Improve soil fertility and plant health to increase crop yields.

**CO-2 Promote Sustainable Agriculture:** Reduce reliance on chemical pesticides and fertilizers, fostering eco-friendly farming practices.

**CO-3 Improve Soil Health:** Restore and maintain soil microbial diversity and organic matter content.

**CO-4 Reduce Environmental Impact:** Minimize soil, water, and air pollution by avoiding harmful chemical inputs.

**CO-5 Support Integrated Pest and Nutrient Management:** Provide targeted pest control and nutrient supplementation without disrupting natural ecosystems.

**CO-6 Enhance Crop Quality:** Improve the nutritional value, flavor, and shelf life of agricultural produce.

**CO-7 Promote Farmer and Consumer Safety:** Reduce health risks associated with synthetic agrochemicals for farmers and consumers.



## Course Contents

### Unit- I:

- History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanic al pesticides, and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.

### Unit- II:

- Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.

### Unit- III:

- Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia; Cyanobacteria biofertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation- Free living and symbiotic nitrogen fixation.

### Unit- IV:

- Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers.

### Unit- V:

- FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers - Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

### Practical:

Isolation and purification of important biopesticides: Trichoderma Pseudomonas, Bacillus, Metarhizium etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of Azospirillum, Azotobacter, Rhizobium, P-solubilizers and cyanobacteria. Mass multiplication and inoculum production of biofertilizers. Isolation of AM fungi- Wetsieving method and sucrose gradient method. Mass production of AM inoculants.

## Protected Cultivation

### CO: COURSE OBJECTIVE

**CO-1 Enhanced Crop Productivity:** To increase the yield per unit area by optimizing environmental conditions like temperature, humidity, and light for plant growth.

**CO-2 Quality Improvement:** To produce high-quality crops with uniformity in size, shape, and color by minimizing environmental stress and pest damage.

**CO-3 Extended Growing Seasons:** To enable off-season production or extend the growing season of specific crops, ensuring a continuous supply to the market.

**CO-4 Resource Efficiency:** To conserve resources such as water and nutrients through efficient irrigation systems like drip irrigation and fertigation.

**CO-5 Pest and Disease Management:** To reduce crop loss by providing a physical barrier against pests and diseases, minimizing the need for chemical pesticides.

**CO-6 Climate Resilience:** To mitigate the adverse effects of extreme weather events such as frost, hail, excessive rain, or drought, ensuring stable crop production.

**CO-7 Diversification and Innovation:** To enable the cultivation of high-value crops, exotic vegetables, flowers, and fruits that might not thrive in open-field conditions due to climatic limitations.

## Course Contents

### Unit- I:

- Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ polyhouse.

### Unit- II:

- Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management.

### Unit- III:

- Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lily, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

### Unit- IV:

- Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

### Practical:

Raising of seedlings and saplings under protected conditions, use of pro trays in quality planting material production, Bed preparation and planting of crop for production, Intercultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizer through drip, fogging and misting.

## **Micro propagation Technologies**

### **CO: COURSE OBJECTIVE**

**CO-1 Mass Production of Plants:** To produce a large number of genetically identical plants in a relatively short time, ensuring consistent traits and uniform quality.

**CO-2 Preservation of Genetic Traits:** To maintain and propagate plants with specific desirable characteristics, such as disease resistance, high yield, or ornamental value.

**CO-3 Propagation of Rare or Endangered Species:** To conserve and multiply species that are rare, endangered, or difficult to propagate through conventional methods.

**CO-4 Production of Disease-Free Plants:** To obtain pathogen-free plants by using meristem or shoot-tip cultures, particularly in cases where diseases are transmitted through seeds or vegetative propagation.

**CO-5 Year-Round Production:** To enable plant propagation irrespective of seasonal or environmental limitations, ensuring a continuous supply of plants.

**CO-6 Development of Genetically Engineered Plants:** To propagate transgenic plants or plants developed through genetic engineering techniques that may have enhanced traits such as pest resistance or stress tolerance.

**CO-7 Facilitation of International Trade:** To produce plants in sterile, contamination-free conditions that comply with quarantine regulations, allowing for the export and import of plants without spreading diseases or pests.

## Course Contents

### Unit- I:

- Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell),

### Unit- II:

- Stages of micro-propagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture), Organogenesis (callus and direct organ formation),

### Unit- III:

- Somatic embryogenesis, cell suspension cultures,

### Unit- IV:

- Production of secondary metabolites, Somaclonal variation, Cryopreservation

### Practical:

Identification and use of equipment in tissue culture Laboratory, Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques for explants, Preparation of stocks and working solution, Preparation of working medium, Culturing of explants: Seeds, shoot tips and single node, Callus induction, Induction of somatic embryos, regeneration of whole plants from different explants, Hardening procedures.

## **Hi-tech. Horticulture**

### **CO: COURSE OBJECTIVE**

**CO-1 Enhancing Productivity:** To maximize the yield of high-value crops by using advanced cultivation techniques, optimized resource management, and superior plant genetics.

**CO-2 Efficient Resource Utilization:** To promote the efficient use of inputs such as water, nutrients, and energy through technologies like drip irrigation, fertigation, and protected cultivation.

**CO-3 Improved Quality of Produce:** To achieve higher quality standards in terms of size, color, taste, and shelf life by leveraging precision agriculture and controlled environment farming.

**CO-4 Sustainability:** To reduce the environmental footprint of horticultural practices by promoting eco-friendly techniques such as organic farming, integrated pest management (IPM), and renewable energy sources.

**CO-5 Diversification of Crops:** To introduce and promote the cultivation of high-value exotic and off-season crops, expanding the market and income opportunities for farmers.

**CO-6 Reduction in Post-Harvest Losses:** To minimize post-harvest losses by adopting modern storage, packaging, and transportation methods.

**CO-7 Technology Dissemination and Farmer Empowerment:** To transfer advanced technologies to farmers, enhancing their skills and enabling them to adopt profitable and sustainable horticultural practices.

## Course Contents

### Unit- I:

- Introduction&importance;Nurserymanagementandmechanization;micropropagationof horticultural crops;Modernfield preparation and planting methods,

### Unit- II:

- Protectedcultivation:advantages,controlledconditions,methodandtechniques,Micro irrigation systems and its components; EC, pH based fertilizer scheduling,canopymanagement, high densityorcharding,

### Unit- III:

- Components of precision farming: Remote sensing, Geographical Information System(GIS),DifferentialGeo-positioningSystem(DGPS),

### Unit- IV:

- VariableRateapplicator(VRA),applicationofprecisionfarminginhorticulturalcrops(fruit s,vegetablesandornamental crops);mechanizedharvestingofproduce.

### Practical:

Types of polyhouses and shade net houses, Intercultural operations, tools and equipmentsidentification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pHbasedfertilizerscheduling, canopymanagement,visitto hi-techorchard/nursery.

## **Weed Management**

### **CO: COURSE OBJECTIVE**

**CO-1 Understanding Weed Biology and Ecology:** Explain the life cycles, reproduction strategies, and ecological roles of weeds in agricultural and non-agricultural ecosystems.

**CO-2 Identification and Classification of Weeds:** Equip students with the skills to identify common weed species and classify them based on their morphology, lifecycle, and habitat.

**CO-3 Principles of Weed-Crop Competition:** Analyze the impact of weeds on crop growth and yield through competition for resources like light, water, and nutrients.

**CO-4 Weed Control Methods:** Compare and evaluate various weed management strategies, including cultural, mechanical, biological, and chemical control methods.

**CO-5 Integrated Weed Management (IWM):** Design and implement integrated weed management plans that combine multiple control strategies to ensure long-term weed suppression and sustainable agriculture.

**CO-6 Herbicide Use and Resistance Management:** Examine the proper use of herbicides, their mode of action, environmental impact, and strategies to prevent or manage herbicide resistance.

**CO-7 Economic and Environmental Impacts of Weed Management:** Assess the cost-benefit analysis of weed control measures and their implications for environmental sustainability and agricultural productivity.



## Course Contents

### Unit- I:

- Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.

### Unit- II:

- Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.

### Unit- III:

- Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture.

### Unit- IV:

- Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with nonchemical methods of weed management. Herbicide Resistance and its management.

### Practical:

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agro-chemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.

## System Simulation and Agro-advisory

### CO: COURSE OBJECTIVE

**CO-1 Understand System Simulation Basics:** To introduce the fundamentals of system simulation, including types of models (e.g., discrete-event, continuous, hybrid), simulation techniques, and their applications in agricultural systems.

**CO-2 Develop Simulation Models for Agricultural Systems:** To develop and implement simulation models to represent agricultural processes such as crop growth, irrigation, pest management, and climate change impacts.

**CO-3 Analyze and Interpret Simulation Data:** To train students on analyzing simulation results, understanding model outputs, and interpreting data in the context of agricultural decision-making.

**CO-4 Explore the Role of Agro-Advisory Systems:** To provide a deep understanding of agro-advisory systems, their importance, and how they provide actionable insights to farmers for crop management, pest control, irrigation, and fertilization.

**CO-5 Apply Simulation Techniques to Agro-Advisory Tools:** To explore how simulation models can be integrated with agro-advisory systems to provide personalized, data-driven recommendations for farmers.

**CO-6 Assess the Impact of Climate and Environmental Variables:** To understand how environmental variables like weather, climate change, and soil conditions affect agricultural systems, and how to simulate their impacts for better planning and advisories.

**CO-7 Evaluate and Design Decision Support Systems for Agriculture:** To help students evaluate existing decision support systems and design new ones that leverage simulation models to optimize agricultural practices and improve farm productivity and sustainability.

## Course Contents

### Unit- I:

- System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.

### Unit- II:

- Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production-concept and modelling techniques for their estimation.

### Unit- III:

- Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification;

### Unit- IV:

- Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

### Practical:

Preparation of crop weather calendars. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts. Working with statistical and simulation models for crop growth. Potential & achievable production; yield forecasting, insect & disease forecasting models. Simulation with limitations of water and nutrient management options. Sensitivity analysis of varying weather and crop management practices. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast. Feedback from farmers about the agro-advisory.

## **Agricultural Journalism**

### **CO: COURSE OBJECTIVE**

**CO-1 Understand Agricultural Issues and Trends:** To familiarize students with the key issues, challenges, and trends in agriculture, including sustainability, food security, climate change, and technological advancements.

**CO-2 Develop Writing and Reporting Skills:** To teach students how to effectively research, write, and report on agricultural topics, ensuring clarity and accuracy while making complex subjects accessible to diverse audiences.

**CO-3 Foster Multimedia Communication Abilities:** To enable students to use various media formats—such as print, radio, television, and digital platforms—to communicate agricultural stories, including the use of social media for outreach.

**CO-4 Critically Analyze Agricultural Policies and Practices:** To provide students with the skills to critically assess agricultural policies, practices, and their impacts on rural communities, economies, and the environment.

**CO-5 Enhance Ethical and Responsible Journalism:** To instill a strong understanding of journalistic ethics, particularly in the context of reporting on agricultural issues, with a focus on balanced, fair, and transparent reporting.

**CO-6 Cultivate Collaboration with Agricultural Stakeholders:** To prepare students to work closely with farmers, agricultural businesses, government agencies, NGOs, and other stakeholders in the agricultural sector to gather information and enhance their stories.

**CO-7 Promote Advocacy and Public Awareness:** To empower students to use journalism as a tool for advocacy, raising awareness about critical agricultural issues and contributing to informed public discourse on topics such as food production, rural development, and environmental sustainability.

## Course Contents

### Unit- I:

- Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.

### Unit- II:

- Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines.

### Unit- III:

- The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources.

### Unit- IV:

- Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, layouting.

### Practical:

Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading, headline and title writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.

## **School of Ayurveda (KSVAMC&RC)**



## **Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

### **SCHOOL OF AYURVEDA**

#### **Ordinances, Regulations & Syllabus**

For

#### **M.D in Kayachikitsa Three year Programme**

(W.e.f. session 2022-2023)

**Approved and adopted in the year 2022 (Board of Studies; 9<sup>th</sup> Meeting)**

## Programme Educational Objectives (PEOs)

- 1. Mastery in Kayachikitsa:**
    - Develop expertise in Ayurvedic principles and practices of internal medicine, with a focus on understanding the pathophysiology, diagnosis, and treatment of systemic disorders.
  - 2. Holistic Health Care Providers:**
    - Equip graduates to offer holistic treatment integrating Ayurveda's preventive, promotive, and curative aspects in managing chronic and lifestyle-related diseases.
  - 3. Research and Innovation:**
    - Foster skills for conducting advanced research to validate Ayurvedic therapies and develop evidence-based treatment protocols.
  - 4. Leadership in Healthcare:**
    - Prepare graduates to take leadership roles in promoting Ayurvedic medicine in healthcare systems locally and globally.
  - 5. Ethics and Compassion:**
    - Instill a strong sense of ethical practice, cultural sensitivity, and patient-centered care.
- 

## Programme Specific Objectives (PSOs)

- 1. Clinical Excellence in Ayurveda:**
    - Achieve proficiency in diagnosing and managing diseases using Ayurvedic approaches such as Panchakarma, Rasayana, and dietary and lifestyle modifications.
  - 2. Integration with Modern Medicine:**
    - Understand and collaborate with modern medical systems to provide integrative healthcare solutions, recognizing the indications and limitations of both.
  - 3. Focus on Preventive Medicine:**
    - Implement preventive strategies through the Ayurvedic principles of Dinacharya, Ritucharya, and Sadvritta in public health.
  - 4. Specialized Knowledge of Kayachikitsa:**
    - Gain expertise in managing chronic ailments like diabetes, arthritis, gastrointestinal disorders, and neurological conditions using Ayurvedic treatments.
- 

## Programme Outcome Objectives (POOs)

- 1. Comprehensive Ayurvedic Knowledge:**
  - Demonstrate advanced knowledge of classical Ayurvedic texts, including Charaka Samhita, and their application to contemporary health challenges.
- 2. Patient-Centered Practice:**
  - Independently diagnose and manage a wide range of internal medical conditions using Ayurvedic tools and personalized treatment plans.
- 3. Research Competence:**
  - Design and conduct research to evaluate the efficacy of Ayurvedic treatments, contributing to scientific literature and policy-making.
- 4. Collaboration and Communication:**
  - Effectively communicate with patients, caregivers, and multidisciplinary teams to optimize patient outcomes.



**5. Public Health Contribution:**

- Apply Ayurvedic principles to improve community health through awareness, preventive care, and treatment strategies for non-communicable diseases.

**6. Ethical and Professional Responsibility:**

- Practice Ayurveda with a commitment to ethical principles, patient safety, and sustainable healthcare practices.

M.D.-AYURVEDA PRELIMINARY  
10 .KAYACHIKITSA (General Medicine)

PAPER-II

Theory- 100 marks

PART A

50 marks

1. Understanding of fundamental concepts of Kayachikitsa like Vriddhi and Kshaya of Dosha, Dushya, Mala with Amshaamsha Kalpana. Srotodushti, Khavaigunya, Agni, Ama (Saama and Nirama Dosha, Dhatu & Mala). Aavarana, Rogamarga, Ashayapakarsha, Dosha Gati, Kriyakala. Aushadha Sevana Kala, Anupana, Pathya-Apathya and their scientific relevance during health and disease.
2. Detailed knowledge of Roga Pariksha including detailed history taking and systemic examination of patient. Clinical implementation of Dwividha Pariksha, Trividha Pariksha, Chaturvidha Pariksha, Panchavidha Pariksha, Shadvidha Pariksha, Ashtavidha Pariksha, Dashvidha Pariksha Bhavas and Prakriyadi Dashvidha Pariksha.
3. Principles of Kayachikitsa in disease management including Shodhana, Shamana and Naimittika Rasayana.
4. Introduction of the basic principles of Modern medicine, Homeopathy, Unani, Siddha, Tibetan Medicine, Yoga and Naturopathy and their relevance in light of the basic principles of Ayurvedic medicine.

PART B

50 marks

1. Chikitsa Siddhanta of Pranavaha, Annavaha, Udakavaha, Rasadi Dhatuvaha, Malavaha & Manovaha Srotovikara.
2. Emergency medicine: Acute Severe Asthma, pulmonary oedema, myocardial infarction, cerebrovascular accidents, water and electrolyte imbalance, haemorrhage, syncope, seizure, coma, hyperpyrexia, hypertensive encephalopathy.
3. Knowledge of conducting various medical procedures like infusions, tapping, lumbar puncture, Ryle's tube insertion, catheterization, tractions, water seal drainage, Cardio Pulmonary Resuscitation.
4. Basic knowledge of underlying principles of ECG, TMT, echo cardiography, vascular doppler studies, EEG, EMG, X-Ray, USG, CT scan, MRI, PET and their interpretation.
5. Knowledge of common Ayurvedic formulations and preparations used in treatment:  
Churna- Triphala, Sitopaladi, Lavanbhaskara, Hingvashtaka, Avipattikara, Gangadhara, Shaddharana, Sudarshana, Panchasakara, Ajmodadi.  
Kashaya- Dashamula, Rasnasaptaka, Asanadi, Pathyadi, Phalatrikadi, Punarnavashtaka, Gojihadi, Mahamanjishthadi, Drakshadi Kashaya.  
Asavas-Arista- Amritarishta, Kanakasava, Chitrakasava, Saraswatarishta, Ashwagandharishta , Chandanasava.  
Vati- Sanjivani, Chandraprabha, Agnitundi, Chitrakadi, Khadiradi, Vyoshadi, Shankha Vati, Shiva Gutika.

Guggula-Kalpana-Triphalaguggula, Kaishoraguggula, Trayodashangaguggula, Simhanadaguggula, Yogarajaguggula, Gokshuradi guggula, Kanchanaraguggula. Rasaushadhi- Tribhuvanakirti Rasa, Arogyavardhini Rasa, Shwasakuthara Rasa, Rasamanikya Rasa, Smritisagara Rasa, Lakshmililasa Rasa, Sutshekhara Rasa, Pravala Panchamrita Parpati, Hemagarbhapottali Rasa.

Taila- Mahanarayana Taila, Pindataila, Prasarinnyadi Taila, Ksheerabala Taila, Brihat Saindhavadi Taila, Panchaguna Taila, Amritadi Taila, Marichyadi Taila, Mahamasha Taila.

Ghrita- Mahatriphaladi Ghrita, Brahmi Ghrita, Panchtikta Guggulu Ghrita, Sukumara Ghrita, Dadimadya Ghrita, Kantakari Ghrita, Kalyanaka Ghrita.

Lehya- Chyavanaprasha Avaleha, Kushmanda Avaleha, Ashwagandha Avaleha, Agastya Hareetaki Rasayana, Drakshavaleha, Vasavaleha, Amrita-Bhallataka Rasayana.

## PRACTICAL

100 marks

Content:-

Daily hospital duties in OPD, IPD and casualty

Bed-side case taking – 25 patients

Distribution of marks

(practical):

1. Case records of 25 Patients in detail 20 marks  
2. Bedside clinical case taking-

Long case 20 marks

Short case 10 marks

3. Medical procedures/laboratory work 15 marks
4. Instruments and spotting 15 marks
5. Viva voce 20 marks

REFERENCE BOOKS-

Charak Samhita -

Cakrapanidutta commentry Sushrut Samhita

-with all available commentaries. Ashtang

Samgraha –Indu commentary

Ashtang Hridaya –Arundutta and Hemadri commentry

Cikitsadarsha - Pandit Rajesvardutta Shastri

Kayachikitsa - Ramaraksha Pathak

Rog Pariksha Vidhi - Priyavrat Sharma

Panchakarma Vigyan - Haridas

Sridhar Kasture Ayurved Nidan Chikitsa

Siddhanta - Prof. R.H.Singh.

Kayachikitsa Vol. I-IV. - Prof. Ajay

Kumar Davidson's Principles and Practice of Medicine.

API Text Book of Medicine.

Harrison's Text Bok of Medicine.

Cecil Text Book of Medicine.

Relevant texts of concerned subjects.

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## **Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

### **SCHOOL OF AYURVEDA**

### **Ordinances, Regulations & Syllabus**

For

### **M.D in Shalyatantra Three year Programme**

(W.e.f. session 2022-2023)

**Approved and adopted in the year 2022 (Board of Studies; 9<sup>th</sup>  
Meeting)**

## Programme Educational Objectives (PEOs)

1. **Mastery of Shalyatantra:** Graduates will gain a deep understanding of Ayurvedic surgical principles, procedures, and their integration with contemporary surgical practices.
  2. **Research and Development:** Graduates will be equipped to undertake innovative research in Shalyatantra to advance the discipline and improve patient outcomes.
  3. **Holistic Healthcare Leadership:** Graduates will develop leadership qualities to promote the holistic approach of Ayurveda in addressing surgical and para-surgical challenges.
  4. **Professionalism and Ethics:** Emphasis on ethical practices, compassionate care, and adherence to classical Ayurvedic principles in professional life.
  5. **Lifelong Learning:** Graduates will pursue continual learning to adapt to advancements in surgical techniques and healthcare technologies.
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## Programme Specific Objectives (PSOs)

1. **Core Competence in Shalyatantra:**
    - Gain expertise in Ayurvedic surgical techniques like Ksharasutra, Agnikarma, and Raktamokshana.
    - Understand and perform modern surgical interventions with an Ayurvedic perspective.
  2. **Integration with Modern Medicine:**
    - Ability to identify situations where modern surgical procedures are required and work collaboratively with contemporary medical professionals.
  3. **Patient-Centered Approach:**
    - Develop skills to provide individualized care using Shalyatantra principles while addressing patient needs effectively.
  4. **Community and Preventive Health:**
    - Apply Ayurvedic surgical principles in community healthcare, focusing on prevention and minimally invasive approaches.
- 

## Programme Outcome Objectives (POOs)

1. **Comprehensive Knowledge:**
  - Demonstrate detailed knowledge of Shalyatantra texts (e.g., Sushruta Samhita) and their clinical applications.
2. **Clinical Proficiency:**
  - Independently diagnose and treat surgical conditions using Ayurvedic and contemporary methods.
3. **Research Acumen:**
  - Conduct and contribute to scholarly research in Ayurveda, focusing on evidence-based validation of Shalyatantra techniques.
4. **Communication and Collaboration:**
  - Effectively communicate with peers, patients, and multidisciplinary teams to improve healthcare delivery.
5. **Cultural Competency:**
  - Promote and practice Ayurvedic principles in a culturally sensitive manner, addressing diverse patient populations.

**POST GRADUATE PRELIMINARY**  
**13. M.S. (AYU) SHALYA TANTRA – GENERAL SURGERY**

**FUNDAMENTAL PRINCIPLES AND APPLIED ASPECTS OF SHALYA TANTRA**

**PAPER-II**

**THEORY- 100 MARKS**  
**TEACHING HOURS – 100 HRS**

**PART A**

**50 MARKS**

1. Etymology, Definition, Scope and Importance of Shalya Tantra.
2. Study of Sushruta Samhita Sutra Sthana from 1<sup>st</sup> to 29<sup>th</sup> chapter.
3. Study of modern surgical clinical methodology.
4. Applied anatomy, physiology and surgical pathology of common surgical conditions including relevant Ayurvedic aspects.
5. Applied aspect of Shat Kriyakala in the pathogenesis of surgical diseases.
6. Applied aspect of Prakriti in understanding the causes and role of treatment in surgical diseases.
7. Applied aspect of basic principles of Ayurveda in Rogi Pariksha (Trividha, Shadvidha, Ashtavidha and Dashavidha Pariksha).
8. Concept and applied aspect of Sadhya-Asadhya (Prognosis) - Arishtha lakshana.
9. Marma Sharira – Etymological derivation, definition, basic concept of Marma, origin, classification, Pramana. Consequences of Marmaghata and their management.
10. Concept of Shock - Its varieties, etiopathogenesis and management – Cardiopulmonary resuscitation (CPR), Endo-tracheal intubation and Tracheostomy. Drug reactions and Anaphylaxis – Management.
11. Basics of Fluid, Electrolyte, Acid Base Balance and Nutrition
12. Antibiotics, Analgesics, Anti-inflammatory and Emergency drugs in surgical practice.
13. Surgical Emergency conditions and its management.
14. Sushruta's concept of Rakta. Raktasrava – Haemorrhage – Types, Pathophysiology, clinical features and management. Concept of Raktastambhana – Haemostasis. Bloodtransfusion – Indications, blood groups, components, compatibility and complications with management.
15. Medico-legal aspects in Surgery. Knowledge of documentation and record keeping.

**PART B****50 marks**

16. Knowledge of ancient and recent Yantra and Shastra – Surgical instruments and their application in surgical practice.
17. Asepsis and Antisepsis. Sterilisation (Nirjivanukaran) - methods and types.
18. Surgical infections – Sepsis, Cellulitis, Erysepelas, Tetanus, Gas gangrene. Handling and care of HIV and Hepatitis positive patients. Knowledge of conditions like Bacteraemia, Septicaemia, Toxaemia and Pyaemia
19. Sangyahan / Anesthesiology - Types, methods, indications, contraindications, complications and its management.
20. Trividha Karma – Purva, Pradhan and Pashchat Karma. Modern principles of preoperative and post-operative care.
21. Ashtavidha Shastra Karmas.
22. Bandhana Karma – Recent advances.
23. Kshara Karma – Introduction, types, method of various preparations like Kshara, Kshara Varti, Kshara Pichu and applications.
24. Kshara Sutra – Method of preparation, standardization and applications.
25. Agnikarma – Introduction, types and applications.
26. Raktamokshana – Introduction, types and applications.
27. Application of Panchakarma therapy in surgical practice.
28. Scope of Pathya-Apathya in the management of surgical diseases.

**PRACTICAL****100 MARKS****Content:**

1. Hospital duties in OPD, IPD, OT and Casualty.
2. Case record – 50 cases.
3. Surgical cases – Observing/Assisting/Performing- 50 cases.
4. Knowledge of instruments required in surgical practices.
5. Ayurvedic and Modern diagnostic and therapeutic procedures.
6. Fluid therapy and blood transfusion.
7. Contraception and sterilizations.
8. Pre-operative, operative and post operative procedures.
9. Practical training of local Anaesthesia.
10. Interpretation of Imaging techniques.
11. Practical knowledge of Yogya vidhi – Experimental surgery and Simulators.

**Distribution of marks (practical):**

1. Presentation of related Research work like Synopsis and Case record - 20 marks
2. Bedside clinical case taking-
  - Long case - 20 marks
  - Short case - 10 marks
3. Identification of instruments, X-ray etc - 10 marks
4. Demonstration of Surgical and Parasurgical Procedure - 10 marks
5. Viva voce - 30 marks

## REFERENCE BOOKS:

1. Sushruta Samhita
2. Ashtanga Sangraha
3. Ashtanga Hridaya
4. Charaka Samhita
5. The Surgical instruments of the Hindus - Girindranath Mukhopadhyaya
6. Shalya Tantra Samuchchaya - Pandit Ramadesh Sharma
7. Shalya Vigyan (Part 1-2) - Dr. Surendra Kumar Sharma
8. Shalya Samanvaya (Part 1-2) - Vd. Anantaram Sharma
9. Shalya Pradeepika - Dr. Mukund Swaroop Verma
10. Soushruti - Dr. Ram Nath Dwivedi
11. Clinical Shalya Vigyan - Dr. Akhilanand Sharma
12. Bhagna Chikitsa - Dr. Prabhakar Janardhan Deshpande
13. Kshara sutra management in anorectal ailments - Dr. S.K. Sharma, Dr. K.R.Sharma and Dr. Kulwant Singh.
14. A manual on Fistula-in-ano and Ksharasutra Therapy – Dr. Manoranjan Sahu
15. Recent trends in the management of Arshas / Haemorrhoids - Dr. P. Hemantha Kumar
16. Anorectal diseases in Ayurveda - Dr. Sizoria and Dr. Praveen Kumar Chowdary.
17. Adhunik Shalya Chikitsa Siddanta - Dr. Katil Narshingham Udupa
18. Agnikarma Technology Innovation - Dr. P.D. Gupta
19. Shalya Tantra Ke Siddhant - Dr. K.K.Takral
20. Arsha Evum Bhagander Mein sutra Avacharan - Vd. Kanak Prasad Vyas
21. Recent advances in Kshara Sutra - Dr. M. Bhaskar Rao
22. Leech application in Ayurveda - Dr. M. Bhaskar Rao
23. Kshara Sutra - Dr. S.N.Pathak
24. Text book of Shalya Tantra (Ayurvedic Surgery) - Dr. P. Hemantha Kumar
25. Shalya Shalakyta Tantra - Vd. S.G. Joshi
26. Surgical ethics of Ayurveda - Dr. D.N. Pande
27. Anushastra Karma - Dr. D.N. Pande
28. Concept of Vrana is Ayurveda - Dr. Lakshman Singh
29. Significance for Poorva Karma in Surgical Patient - Dr. Lakshman Singh
30. Sangyahan Prakash - Dr. D.N. Pande
31. Marma Science and Principles of Marma Therapy – Dr. Sunil Kumar Joshi
32. Recent trends in the management of Bhagandara / Fistula-in-ano - Dr. P. Hemantha Kumar
33. Principles and Practice of Agnikarma - Dr. Anand Kumar and Dr. Kanchan Shekokar.
34. Shalya Vigyan (Sachitra) - Anantram Sharma
35. Text book of Surgery - Sabistan
36. Operative Surgery – Rob and smith



37. Bailey and Love's Short Practice of Surgery - Norman.S. Williams,  
Charles.V. Mann and R.C.G. Russell
38. Text books of Operative Surgery - Farquharson's
39. Principles of Surgery - Schwartz
40. Emergency Surgery - Hamilton Bailey's
41. Manipal Manual of Surgery - Dr. Rajgopal Shenoy
42. SRB's Manual of Surgery - Sriram Bhat M
43. Surgery of the Anus, Rectum and Colon - John Goligher
44. Surgical pathology - Willing Worth
45. Clinical methods in surgery - S. Das
46. Textbook of Operative Surgery - S. Das
47. A concise Text Book of Surgery - S. Das
48. A manual on Clinical Surgery - S. Das
49. A System of Surgical Diagnosis - T.N. Patel
50. Clinical Anatomy/ Surgical Anatomy - John E.Skandalakis
51. A Practical Guide to Operative Surgery - S. Das
52. Manual of Surgical Instruments - M.M. Kapur
53. Ward Procedures - Patel Mansukh. B
54. Drugs and Equipment for Anaesthesia - Arun kumar
55. Primary Anaesthesia - Maurice King
56. Synopsis of Anaesthesia - Lee
57. Outline of Orthopedics - John Crawford  
Adams and David Hamblen. L
58. Fractures and Joint Injuries - Watson-Jones
59. Outline of Fracture - John Crawford Adams

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## **Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

### **SCHOOL OF AYURVEDA**

#### **Ordinances, Regulations & Syllabus**

For

#### **M.D in Research Methodology Three year Programme**

(W.e.f. session 2023-224)

**Approved and adopted in the year 2023 (Board of Studies; 10<sup>th</sup>  
Meeting)**

## Course Objectives:

1. **Foster Research Literacy:**
  - Introduce students to the principles and framework of scientific research and evidence-based practices.
2. **Research Design and Methodology:**
  - Teach students to select appropriate study designs and methodologies for clinical and academic research.
3. **Data Management and Statistical Analysis:**
  - Provide knowledge and hands-on training in collecting, organizing, and analyzing data using statistical tools.
4. **Critical Thinking and Literature Review:**
  - Develop the ability to critically evaluate research articles, systematic reviews, and meta-analyses.
5. **Ethical Conduct in Research:**
  - Instill a comprehensive understanding of research ethics, including consent processes, patient safety, and publication integrity.
6. **Scientific Communication:**
  - Enhance skills in writing research proposals, manuscripts, and effective presentation of research findings.
7. **Problem-Solving in Research:**
  - Train students to identify gaps in medical knowledge and formulate research questions that address these gaps.

## {ANNEXURE-2}

### M.D./M.S.-AYURVEDA PRELIMINARY PAPER-I RESEARCH METHODOLOGY AND MEDICAL STATISTICS

#### PART-A RESEARCH METHODOLOGY

- 1 Introduction to Research
  - A. Definition of the term research
  - B. Definition of the term anusandhan
  - C. Need of research in the field of Ayurveda
- 2 General guidelines and steps in the research process
  - A. Selection of the research problem
  - B. Literature review: different methods (including computer database) with their advantages and limitations
  - C. Defining research problem and formulation of hypothesis
  - D. Defining general and specific objectives
  - E. Research design: observational and interventional, descriptive and analytical, preclinical and clinical, qualitative and quantitative
  - F. Sample design G. Collection of the data
  - H. Analysis of data.
  - I. Generalization and interpretation, evaluation and assessment of hypothesis.
  - J. Ethical aspects related to human and animal experimentation.
  - K. Information about Institutional Ethics Committee (IEC) and Animal Ethics Committee (AEC) and their functions. Procedure to obtain clearance from respective committees, including filling up of the consent forms and information sheets and publication ethics.
- 3 Preparation of research proposals in different disciplines for submission to funding agencies taking EMR-AYUSH scheme as a model.
4. Scientific writing and publication skills.
  - a. Familiarization with publication guidelines- Journal specific and CONSORT guidelines.
  - b. Different types of referencing and bibliography.
  - c. Thesis/Dissertation: contents and structure
  - d. Research articles structuring: Introduction, Methods, Results and Discussions (IMRAD)
- 5 Classical Methods of Research.

Concept of Pratyakshadi Pramana Pariksha, their types and application for Research in Ayurveda.

Dravya-, Guna-, Karma-Parikshana Paddhati

Aushadhi-yog Parikshana Paddhati

Swastha, Atura Pariksha Paddhati

DashvidhaParikshya Bhava

Tadvidyasambhasha, vadmarga and tantrayukti
- 6 Comparison between methods of research in Ayurveda (Pratigya, Hetu, daharana, Upanaya, Nigaman) and contemporary methods in health sciences.

## 7. Different fields of Research in Ayurveda

Fundamental research on concepts of Ayurveda

- a. Panchamahabhuta and tridosha.
- b. Concepts of rasa, guna, virya, vipak, prabhav and karma
- c. Concept of prakriti-saradi bhava, ojas, srotas, agni, aam and koshta.

## 8. Literary Research-

Introduction to manuscriptology: Definition and scope. Collection, conservation, ataloguing.

Data mining techniques, searching methods for new literature; search of new concepts in the available literature. Methods for searching internal and external evidences about authors, concepts and development of particular body of knowledge.

9. Drug Research (Laboratory-based)- Basic knowledge of the following: Drug sources: plant, animal and mineral. Methods of drug identification. Quality control and standardization aspects: Basic knowledge of Pharmacopoeial standards and parameters as set by Ayurvedic Pharmacopoeia of India. Information on WHO guidelines for standardization of herbal preparations. Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP).

10. Safety aspects: Protocols for assessing acute, sub-acute and chronic toxicity studies. Familiarization with AYUSH guidelines (Rule 170), CDCSO and OECD guidelines.

11. Introduction to latest Trends in Drug Discovery and Drug Development -Brief information on the traditional drug discovery process -Brief information on the latest trends in the Drug Discovery process through employment of rational approach techniques; anti-sense approach, use of micro and macro-arrays, cell culture based assays, use of concepts of systems biology and network physiology -Brief introduction to the process of Drug development

## 12. Clinical research:

Introduction to Clinical Research Methodology identifying the priority areas of Ayurveda

Basic knowledge of the following:-

Observational and Interventional studies

Descriptive & Analytical studies

Longitudinal & Cross sectional studies

Prospective & Retrospectives studies

Cohort studies

Randomized Controlled Trials (RCT) &their types Single-case design, case control studies, ethnographic studies, black box design, cross-over design, factorial design. Errors and bias in research. New concepts in clinical trial- Adaptive clinical trials/ Good clinical practices (GCP) Phases of Clinical studies: 0,1,2,3, and 4. Survey studies - Methodology, types, utility and analysis of Qualitative Research methods. Concepts of in-depth interview and Focus Group Discussion.

13. Pharmacovigilance for ASU drugs. Need, scope and aims & objectives. National Pharmacovigilance Programme for ASU drugs.

14. Introduction to bioinformatics, scope of bioinformatics, role of computers in biology. Introduction to Data base- Pub med, Medlar and Scopus. Accession of databases.

15. Intellectual Property Rights- Different aspect and steps in patenting. Information on Traditional Knowledge Digital Library (TKDL).

**PART-B**

**40 marks**

**MEDICAL STATISTICS**

**Teaching hours: 80**

- 1 Definition of Statistics : Concepts, relevance and general applications of Biostatistics in Ayurveda
- 2 Collection, classification, presentation, analysis and interpretation of data (Definition, utility and methods)
- 3 Scales of Measurements - nominal, ordinal, interval and ratio scales. Types of variables – Continuous, discrete, dependent and independent variables. Type of series – Simple, Continuous and Discrete
- 4 Measures of Central tendency – Mean, Median and Mode.
- 5 Variability: Types and measures of variability – Range, Quartile deviation, Percentile, Mean deviation and Standard deviation
- 6 Probability: Definitions, types and laws of probability,
- 7 Normal distribution: Concept and Properties, Sampling distribution, Standard Error, Confidence Interval and its application in interpretation of results and normal probability curve.
- 8 Fundamentals of testing of hypotheses:  
Null and alternate hypotheses, type I and type 2 errors.  
  
Tests of significance: Parametric and Non-Parametric tests, level of significance and power of the test, 'P' value and its interpretation, statistical significance and clinical significance
- 9 Univariate analysis of categorical data:  
Confidence interval of incidence and prevalence, Odds ratio, relative risk and Risk difference, and their confidence intervals
- 10 Parametric tests: 'Z' test, Student's 't' test: paired and unpaired, 'F' test, Analysis of variance (ANOVA) test, repeated measures analysis of variance
- 11 Non parametric methods: Chi-square test, Fisher's exact test, McNemar's test, Wilcoxon test, Mann-Whitney U test, Kruskal – Wallis with relevant post hoc tests (Dunn)
- 12 Correlation and regression analysis:  
Concept, properties, computation and applications of correlation, Simple linear correlation, Karl Pearson's correlation co-efficient, Spearman's rank correlation. Regression- simple and multiple.
- 13 Sampling and Sample size computation for Ayurvedic research: Population and sample. Advantages of sampling, Random (Probability) and non random (Nonprobability) sampling. Merits of random sampling. Random sampling methods- simple random, stratified, systematic, cluster and multiphase sampling. Concept, logic and requirement of sample size computation, computation of sample size for comparing two means, two proportions, estimating mean and proportions.
- 14 Vital statistics and Demography: computation and applications - Rate, Ratio, Proportion, Mortality and fertility rates, Attack rate and hospital-related statistics
- 15 Familiarization with the use of Statistical software like SPSS/Graph Pad

**PRACTICAL**

**100 marks**

**I. RESEARCH METHODOLOGY**

**Teaching hours 120**

**PRACTICAL NAME**

- 1      **Pharmaceutical Chemistry**  
Familiarization and demonstration of common lab instruments for carrying out analysis as per API
- 2      **Awareness of Chromatographic Techniques** Demonstration or Video clips of following:
  - Thin-layer chromatography (TLC).
  - Column chromatography (CC).
  - Flash chromatography (FC)
  - High-performance thin-layer chromatography (HPTLC)
  - High Performance (Pressure) Liquid Chromatography (HPLC)
  - Gas Chromatography (GC, GLC)
- 4      **Pharmacognosy** Familiarization and Demonstration of different techniques related to:- Drug administration techniques- oral and parenteral. Blood collection by orbital plexuses puncturing. Techniques of anesthesia and euthanasia. Information about different types of laboratory animals used in experimental research Drug identification as per API including organoleptic evaluation
- 5      **Pharmacology and toxicology**  
Familiarization and demonstration of techniques related to pharmacology and toxicology
- 6      **Biochemistry (Clinical)**  
Familiarization and demonstration of techniques related to basic instruments used in a clinical biochemistry laboratory – semi and fully automated clinical analyzers, electrolyte analyzer, ELISA- techniques, nephelometry.  
  
Demonstration of blood sugar estimation, lipid profiles, kidney function test, liver function test.  
  
HbA1, cystatin and microalbumin estimation by nephelometry or other suitable techniques. Interpretation of the results obtained in the light of the data on normal values.
- 7      **Clinical Pathology**  
Familiarization and demonstration of techniques related to basic and advanced instruments used in a basic clinical pathology lab. Auto cell counter, urine analyzer, ESR, microscopic examination of urine.
- 8      **Imaging Sciences**  
Familiarization and demonstration of techniques related to the imaging techniques. Video film demonstration of CT-Scan, MRI-scan and PET-scan.
- 9      **Clinical protocol development**

## II. MEDICAL STATISTICS

Practical hours:20

Statistical exercise of examples from Topic number 4, 5, 8-12, 14, 15. Records to be prepared.

Distribution of marks (practical):

- |  |            |
|--|------------|
| 1. Instrumental spotting test                            | – 20 marks |
| 2. Clinical protocol writing exercise on a given problem | – 20 marks |
| 3. Records:  |            |
| 4. Research methodology                                  | -10 Mark   |
| 5. Medical statistics                                    | -10 marks  |
| 6. Viva- Voce  | -40 Marks  |

### REFERENCE BOOKS:

#### Pharmacognosy:

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2. Drug Survey by Mayaram Uniyal
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Pharmaceutical chemistry, quality control and drug standardization:

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13. Sharma BK. Instrumental Methods of Chemical Analysis by, Goel Publishing House.
13. Srivastav VK and Shrivastav KK. Introduction to Chromatography (Theory and Practice)
14. Stahl E., Thin Layer Chromatography - A Laboratory Handbook, Springer Verlag, Berlin.
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95. Sundar Rao, Jesudian Richard - An Introduction to Biostatistics.
96. Suhas Kumar Shetty- Medical statistics made easy

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## **Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

### **SCHOOL OF AYURVEDA**

#### **Ordinances, Regulations & Syllabus**

For

#### **M.D in Ayurveda Samhita And Siddhanta Three year Programme**

(W.e.f. session 2023-24)

**Approved and adopted in the year 2023 (Board of Studies; 10<sup>th</sup>  
Meeting)**

## **Programme Objectives:**

1. **Understanding Ayurvedic Foundations:**
    - Provide a deep understanding of the classical texts (Samhitas) and their core principles (Siddhanta) as the foundation of Ayurvedic knowledge.
  2. **Holistic Learning Approach:**
    - Emphasize the integration of theory and practice, linking traditional wisdom with contemporary healthcare needs.
  3. **Skill Development in Textual Analysis:**
    - Train students in reading, interpreting, and applying the teachings of classical Ayurvedic texts.
  4. **Promotion of Research:**
    - Develop research aptitude in Samhita and Siddhanta to validate and innovate within the Ayurvedic framework.
  5. **Ethics and Professionalism:**
    - Inculcate the ethical principles of Ayurveda and foster the professional development of scholars.
- 

## **Specific Programme Objectives:**

1. **Mastery of Samhita Literature:**
    - Achieve proficiency in major Ayurvedic texts such as Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya.
  2. **Application of Siddhanta:**
    - Equip students to apply Ayurvedic principles like Tridosha, Panchamahabhuta, and Prakriti in clinical and non-clinical contexts.
  3. **Preservation of Ayurvedic Wisdom:**
    - Encourage the preservation, documentation, and propagation of traditional Ayurvedic knowledge.
  4. **Critical Analysis and Commentary:**
    - Train students in comparative studies of different commentaries and interpretations of the Samhitas.
  5. **Adaptation to Modern Needs:**
    - Integrate classical Ayurvedic knowledge with modern scientific methodologies to address contemporary health challenges.
- 

## **Programme Outcomes:**

1. **Deep Understanding of Ayurvedic Texts:**

Develop expertise in interpreting and contextualizing classical Ayurvedic literature.

2. **Practical Application of Theoretical Knowledge:**
  - Use the principles of Samhita and Siddhanta in clinical diagnosis, treatment, and health promotion.
3. **Competence in Research:**
  - Conduct scholarly research to validate Ayurvedic concepts and develop innovative applications.
4. **Critical Thinking and Analysis:**
  - Analyze traditional Ayurvedic theories in light of modern scientific advancements.
5. **Ethical and Holistic Practice:**
  - Practice Ayurveda in a manner that reflects ethical, sustainable, and holistic healthcare principles.
6. **Promotion and Propagation:**
  - Serve as ambassadors of Ayurveda by contributing to the global dissemination and acceptance of its principles.
7. **Capacity for Lifelong Learning:**
  - Engage in continuous learning to stay updated with evolving knowledge and practices in Ayurveda and healthcare.
8. **Leadership in Ayurveda:**
  - Demonstrate leadership in academic, clinical, and research domains related to Samhita and Siddhanta.



**M.D.-AYURVEDA PRELIMINARY1. AYURVED SAMHITA & SIDDHANTA**  
**(Ayurvedic Compendia & Basic Principles)**

PAPER-II

THEORY- 100 marks

PART-A

Practical- Viva-Voce-100  
50 marks

1. Learning and Teaching methodology available in Samhita- Tantrayukti, Tantraguna, Tantradosha, Tachchilya, Vadamarga, Kalpana, Arthashraya, TrividhaGyanopaya, teaching of Pada, Paada, Shloka, Vakya, Vakyartha, meaning and scope of different Sthana and Chatushka of Brihatrayee.
2. Manuscriptology - Collection, conservation, cataloguing, Critical editing through collation, receion (A critical revision of a text incorporating the most plausible elements found in varying sources), emendation (changes for improvement) and textual criticism (critical analysis) of manuscripts. Publication of edited manuscripts.
3. Concept of Bijachatustaya (Purush, Vyadhi, Kriyakaal, Aushadha according to Sushrut Samhita).
4. Introduction and Application of Nyaya (Maxims) - Like Shilaputrak Nyaya, Kapinjaladhikaran Nyaya, Ghunakshara Nyaya, Gobalivarda Nyaya, NaprishtahGuravoVadanti Nyaya,

Shringagrahika Nyaya, ChhatrinoGacchhanti Nyaya, Shatapatrabhedana Nyaya, Suchikatah Nyaya.

5. Importance and utility of Samhita in present era.
6. Importance of ethics and principles of ideal living as mentioned in Samhita in the present era in relation to life style disorders.
7. Interpretation and co-relation of basic principles with contemporary sciences.

PART-B

50

marks

1. Definition of Siddhanta, types and applied examples in Ayurveda.
2. Ayu and its components as described in Samhita.
3. Principles of Karana-Karyavada, its utility in advancement of research in Ayurveda.
4. Theory of Evolution of Universe (SrishtiUtpatti), its process according to Ayurveda and Darshana.
5. Importance and utility of Triskandha (Hetu, Linga, Aushadh) and their need in teaching, research and clinical practice.
6. Applied aspects of various fundamental principles: Tridosha, Triguna, Purusha and Atmanirupana, Shatpadartha, Ahara-Vihara. Scope and importance of Pariksha (Pramana).
7. Importance of knowledge of SharirPrakriti and ManasPrakriti.
8. Comparative study of Principles of Ayurveda and Shad Darshanas.

REFERENCE BOOKS:-

- 1 Charak Samhita Chakrapani commentary

2	Sushrut Samhita	Dalhana Commentary
3	AshtangaSamgraha	Indu commentary
4	AshtangaHridaya	Arundutta and Hemadri commentary
5	VaisheshikaDarshan	PrashastapadaBhasya
6	Nyaya Darshan	VatsyayanBhasyaPatanjala
7	Yoga Darshan	Vyas Bhasya
8	Vedantsara	
9	SarvadarshanSamgraha	
10	BhartiyaDarshan	BaldevUpadhayaya
11	Ayurved Darshanam	Acharya Rajkumar Jain



## **Shobhit University, Gangoh**

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### **SCHOOL OF AYURVEDA**

#### **Ordinances, Regulations & Syllabus**

For

#### **M.D in Rachna Sharir Three year Programme**

(W.e.f. session 2023-224)

**Approved and adopted in the year 2023 (Board of Studies;  
10<sup>th</sup> Meeting)**

## **Programme Educational Objectives (PEOs)**

**PEO 1 In-Depth Anatomical Knowledge:** Graduates will acquire a comprehensive understanding of human anatomy, including structural and functional aspects relevant to both Ayurvedic and modern medical practices.

**PEO 2 Application of Anatomical Principles:** Graduates will be able to apply anatomical knowledge to clinical situations, enhancing diagnostic accuracy and treatment efficacy in Ayurvedic practice.

**PEO 3 Research and Innovation:** Graduates will engage in research related to anatomical studies, contributing to the body of knowledge in Rachna Sharira and promoting evidence-based practices in Ayurveda.

**PEO 4 Holistic Perspective:** Graduates will develop a holistic view of anatomy, integrating physical structures with functional and energetic concepts in Ayurveda, thereby enhancing patient care.

**PEO 5 Interdisciplinary Collaboration:** Graduates will be prepared to collaborate with professionals from various healthcare disciplines, facilitating a comprehensive approach to patient health that respects both Ayurvedic and conventional perspectives.

## **Programme Specific Objectives (PSO's)**

**PSO 1 Anatomical Proficiency:** Graduates will demonstrate mastery of human anatomy through detailed knowledge of anatomical structures, relationships, and functions relevant to Ayurvedic medicine.

**PSO 2 Dissection and Examination Skills:** Graduates will acquire practical skills in dissection and examination techniques, enabling them to accurately identify anatomical structures in both cadaveric and clinical settings.

**PSO 3 Integration of Ayurvedic Concepts:** Graduates will integrate Ayurvedic anatomical concepts, such as the Srotas (channels) and Dhatus (tissues), with modern anatomical knowledge to enhance their understanding of health and disease.

**PSO 4 Research Methodology:** Graduates will be equipped to conduct research in anatomical studies, exploring the relationship between anatomical structures and Ayurvedic practices to contribute to evidence-based Ayurveda.

**PSO 5 Application to Clinical Practice:** Graduates will apply their anatomical knowledge in clinical scenarios, improving diagnosis, treatment planning, and patient management in Ayurvedic settings.

**PSO 6 Educational Skills:** Graduates will be prepared to educate students and healthcare professionals about the importance of anatomical knowledge in Ayurveda, fostering a deeper understanding of the subject.

### **Programme Outcome Objectives (POO's)**

**POO 1 Comprehensive Anatomical Knowledge:** Graduates will demonstrate a thorough understanding of human anatomy, including detailed knowledge of anatomical structures and their functional relationships within the context of Ayurveda.

**POO 2 Practical Dissection Skills:** Graduates will exhibit proficiency in dissection techniques and anatomical examinations, enabling accurate identification and assessment of anatomical structures.

**POO 3 Integration of Ayurvedic and Modern Anatomy:** Graduates will effectively integrate Ayurvedic concepts of anatomy, such as the understanding of Dhatus and Srotas, with modern anatomical knowledge to enhance clinical practice.

**POO 4 Research and Critical Thinking:** Graduates will engage in research activities that advance the field of Rachna Sharira, applying critical thinking to evaluate and contribute to anatomical studies and their implications in Ayurveda.

**POO 5 Clinical Application:** Graduates will apply their anatomical knowledge to clinical practice, improving diagnostic accuracy and treatment outcomes for patients in Ayurvedic settings.

**POO 6 Interdisciplinary Collaboration:** Graduates will demonstrate the ability to work collaboratively with other healthcare professionals, contributing to a holistic approach to patient care that values both Ayurvedic and modern medical perspectives.

**POO 7 Ethical Practice and Professionalism:** Graduates will uphold high standards of ethics and professionalism in their practice, ensuring patient safety, confidentiality, and respectful interaction with colleagues and patients.

### ***Course Structure***

**PAPER-II**

**Theory 100 marks**

**PART-A**

**50 marks**

1. Basic principles of Sharira, Purushavichaya, RashiPurusha, Karma Purusha (Shad DhatujPurusha), ChaturvimshatiPurusha, EkDhatuPurusha. Relevant principles described in the Sharirasthan of Sushrut Samhita, Charak Samhita, AshtangSangrah and Ashtang Hridaya.
2. Basic principles of GarbhaSharira in Ayurveda: Definitions of Garbha, ShukraShonitaSiddhanta, Dauhrida, MatrijadiGarbhotpattikar bhava.
3. Types of tissues, histological study of liver, spleen, uterus, kidney, endocrine glands, mammary gland, skin, tongue, lungs, bronchi, bones, muscles, cartilages and nervous tissue.

**PART-B**

**50 marks**

1. ParibhashaSharira (Anatomical terminology)
2. PramanaSharira – Anguli and Anjali Pramana, SamapramanaSharira, Ayama – Vistara and their prognostic values.
3. Fundamental aspects of Asthi, Sandhi, PeshiSharir.
4. Fundamental aspects of Sira, Dhamani, Srotas – Definitions, Siravedha, AvedhyaSira. Fundamental aspect of SrotomoolaSthana.
5. Fundamental aspects of Kosktha and Koskthang: Hridaya, Yakrit, Vrikka, phuphphusa, Aantra, Pleeha, Adhivrikkagranthi, Basti, Paurushagranthi, Amashaya, Agnyashaya and Vrishana.
6. Fundamental aspects of UttamangiyaSharir – Introduction to Nervous system - development, divisions, neuron–structure, types, functional anatomy.
7. Mritashodhan (as per Sushruta) and MritaSamrakshana (preservation method of human cadaver).

**PRACTICAL**

**100 marks**

**Contents:**

1. Practical study of bones
2. Practical study of organs
3. Practical study of surface and radiological anatomy.
4. ShavaVichhedana – detailed dissection of the whole body.
5. Practical study of location of Marma
6. Demonstration of histology slides (10 slides)

**Distribution of marks (Practical)**

- |                    |            |
|--------------------|------------|
| 1. Spotting        | - 20 Marks |
| 2. Surface Anatomy | - 20 Marks |
| 3. Dissection      | - 30 Marks |

- |    |  |            |
|----|--|------------|
| 4. | Imaging Anatomy – Basic Principles and Application | - 10 Marks |
| 5. | Viva-Voce  | - 20 Marks |

REFERENCE BOOKS:

- |     |  |         |
|-----|--|---------|
| 6.  | Relevant matters of Brihatrayee and Laghutrayee                      |         |
| 7.  | PratyakshaShariram<br>GananathSen                                    | -       |
| 8.  | AbhinavaShariram<br>Damodar Sharma Gaur                              | -       |
| 9.  | ParishadyamSabdarthaShariram<br>Damodara Sharma Gaur                 | -       |
| 10. | BrihatShariram<br>Varier   | - P S   |
| 11. | Shiva Samhita  |         |
| 12. | Gray's Anatomy<br>Latest Edition                                     | -       |
| 13. | Human Anatomy<br>Chaurasia   | - B D   |
| 14. | Cunnigham's Companion to Manual of Practical Anatomy.Vol I, II & III |         |
| 15. | Developing Human<br>L Moore &Persaud                                 | - Keith |
| 16. | Clinically oriented Anatomy<br>Keith L Moore                         | -       |
| 17. | Clinically oriented Neuro Anatomy<br>Richard Snell                   | -       |
| 18. | Surface and Radiological Anatomy<br>Halim                            | -       |
| 19. | Grant's Methods of Anatomy   | -Grant  |
| 20. | Grant's dissector  | -Grant  |
| 21. | Human Embryology<br>Singh  | -I. B.  |
| 22. | Ayuervediya Human Anatomy<br>M. Kanthi                               | - G.    |



## **Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

### **SCHOOL OF AYURVEDA**

#### **Ordinances, Regulations & Syllabus**

For

**M.D in Kriya Sharir Three year Programme** (W.e.f. session  
2023-224)

**Approved and adopted in the year 2023 (Board of Studies;  
10<sup>th</sup> Meeting)**



## **Programme Educational Objectives (PEOs)**

**PED 1 Holistic Understanding:** Graduates will develop a comprehensive understanding of the principles of Kriya, including its philosophical, physiological, and psychological aspects, enabling them to integrate these concepts into therapeutic practices.

**PED 2 Clinical Application:** Graduates will be equipped to apply Kriya techniques in clinical settings, effectively addressing a range of health issues and promoting overall well-being for diverse patient populations.

**PED 3 Research and Evidence-Based Practice:** Graduates will engage in research that contributes to the scientific validation of Kriya practices, fostering a culture of evidence-based treatment within the field.

**PED 4 Professional Ethics and Leadership:** Graduates will demonstrate ethical practice and leadership in healthcare, advocating for holistic health approaches and contributing to the advancement of Kriya therapy.

**PED 5 Lifelong Learning and Adaptability:** Graduates will commit to lifelong learning, staying updated with advancements in yoga therapy and related fields, and adapting their practices to meet evolving health challenges.

## **Programme Specific Objectives (PSO's)**

**PSO 1 Kriya Techniques Proficiency:** Graduates will master a range of Kriya techniques, including breath control, meditation, and body postures, applying them effectively to promote physical and mental health.

**PSO 2 Therapeutic Application:** Graduates will be equipped to design and implement personalized Kriya therapy plans for patients, addressing specific health concerns and enhancing overall well-being.

**PSO 3 Assessment Skills:** Graduates will develop strong assessment skills to evaluate the physical and psychological health of individuals, integrating Kriya principles in their diagnostic approaches.

**PSO 4 Research and Evidence-Based Practice:** Graduates will engage in research related to Kriya practices, contributing to the body of evidence supporting their effectiveness in various therapeutic contexts.

**PSO 5 Patient Education and Communication:** Graduates will be skilled in educating patients about Kriya practices, fostering understanding and adherence to therapeutic regimens through effective communication strategies.

**PSO 6 Interdisciplinary Collaboration:** Graduates will be prepared to work collaboratively with other healthcare professionals, integrating Kriya with conventional medical practices to provide holistic care.

### **Programme Outcome Objectives (POO's)**

**POO 1 Expertise in Kriya Practices:** Graduates will demonstrate comprehensive knowledge and practical skills in Kriya techniques, applying them effectively for therapeutic and wellness purposes.

**POO 2 Holistic Patient Care:** Graduates will provide holistic care by integrating Kriya principles with conventional medical practices, addressing both physical and mental health needs of patients.

**POO 3 Clinical Assessment and Diagnosis:** Graduates will be skilled in conducting thorough assessments, accurately diagnosing conditions, and developing personalized Kriya-based treatment plans.

**POO 4 Research and Application:** Graduates will engage in research activities that advance the understanding and efficacy of Kriya therapies, applying evidence-based practices in clinical settings.

**POO 5 Patient Communication and Education:** Graduates will effectively communicate with patients and families, promoting understanding of Kriya practices and encouraging adherence to therapeutic interventions.

**POO 6 Professionalism and Ethics:** Graduates will uphold high standards of professionalism and ethics in their practice, ensuring patient safety and confidentiality while advocating for holistic health approaches.

**POO 7 Lifelong Learning and Adaptation:** Graduates will commit to lifelong learning, remaining current with advancements in Kriya and integrative health practices to adapt to evolving healthcare needs.

### **Course Structure**

### ***Ordinance and Regulations***

M.D.-AYURVEDA PRELIMINARY

3.KRIYA SHARIR

PAPER-II

Theory 100 Marks

PART-A

50 marks

1. Theory of Loka-PurushaSamya
2. Theory of Panchamahabhuta
3. Physiological aspects of Samanya – Visheshasiddhanta
4. Concepts of Tridosha and Triguna
5. Concept of Dhatu
6. Concept of Mala
7. Description of Ojas
8. Process of AharaParinama including Aharaparinamakara Bhava and AstaAharaVidhiVisesayatana
9. Physiological importance of Agni, its classification and functions
10. Dhatuposana theories
11. Concepts of Atma, Manas and Indriya.
12. Concepts of Prakriti and Ashtavidha Sara.
13. Concept of Srotas

**PART-B**

**50 marks**

Description of essential and relevant understandings related to contemporary physiology, both general physiology and systemic physiology.

1. Essentials of cell physiology – organization of cell.
2. Membrane physiology- transport across cell membrane, action potentials and resting membrane potentials.
3. Homeostasis- negative and positive feedback mechanisms.
4. Genetic code, its expression and regulation of gene expression.
5. Essentials of cardiovascular physiology- cardiac cycle, regulation of heart rate and blood pressure.
6. Essentials of respiratory physiology- regulation of respiration-chemical and neural, gaseous exchange, transportation of gases.
7. Gastrointestinal physiology- various digestive juices and their actions, gastrointestinal hormones, enteric nervous system.
8. Nervous system physiology- ANS, somatic nervous system, reflexes, general and special sensations, higher mental functions, functions of brain, brainstem and spinal cord.

9. Blood: Blood cells-RBCs, WBCs, platelets, plasma proteins and immunity.
10. Muscle physiology: properties and mechanisms of contraction of skeletal, cardiac and smooth muscles.
11. Physiology of excretion- mechanism of urine formation, micturition.
12. Endocrine physiology: Classification of hormones, hormones secreted by pituitary, thyroid, parathyroid, adrenal glands, pineal, pancreas and their functions.

Study of male and female reproductive system: functions of reproductive hormones.

## PRACTICAL

100 marks

Contents:

Ayurvedic practicals

Assessment of Prakriti

Assessment of Sara

PramanaPariksha

Hematology

Hemoglobin estimation

Total RBC count

Total WBC count

Differential leukocyte count

Packed cell volume (PCV)

ESR

Bleeding time

Clotting time

Blood grouping and Rh typing

Urine examination -

Physical examination- Specific gravity and reaction of urine

Chemical examination

Albumin test

Sugar test

Ketone bodies

Bile salts and pigments

Distribution of marks (Practical)

1.	Laboratory Practical	- 20
2.	Human Experiment	- 15
3.	Spotting	- 15
4.	PrakritiSaradipariksha	- 20
5.	Practical Record	- 10
6.	Viva-voce	- 20

REFERENCE BOOKS:

1.	AyurvediyaKriyasharir	- Ranjit Rai Desai
2.	Kayachikitsa Parichaya	- C. Dwarkanath
3.	Prakrit Agni Vigyan	- C. Dwarkanath
4.	SharirKriyaVigyan	- Shiv Charan Dhyani
5.	AbhinavaSharirKriyaVigyana	- Acharya Priyavrata Sharma
6.	DoshaDhatu Mala Vigyana	- Shankar Gangadhar Vaidya
7.	PrakritaDoshaVigyana	- Acharya Niranjana Dev
8.	TridoshaVigyana	- Shri Upendranath Das
9.	ShariraTatvaDarshana	- HirlekarShastri
10.	Prakrita Agni Vigyana	- Niranjana Dev
11.	DehaDhatvagniVigyana	- Vd. Pt. HaridattShastri
12.	SharirKriyaVigyana (Part 1-2)	- Acharya Purnchandra Jain
13.	SharirKriyaVigyana	- Shri Moreswar Dutta Vd.
14.	ShariraKriyaVijnana (Part 1-2)	- NandiniDhargalkar
15.	DoshaDhatu Mala Vigyana	- Basant Kumar Shrimal
16.	AbhinavaSharirKriyaVigyana	- Dr. Shiv Kumar Gaur
17.	PragyogikKriyaSharir	- Acharya P.C. Jain
18.	Kaya ChikitsaParichaya	- Dr. C. Dwarkanath
19.	Concept of Agni	- Vd. Bhagwan Das
20.	PurushVichaya	- Acharya V.J. Thakar
21.	KriyaSharir	- Prof. Yogesh Chandra Mishra
22.	SharirKriyaVigyana	- Prof. Jayaram Yadav & Dr.

Sunil Verma

23. Basic Principles of Kriya-Sharir (A treatise on Ayurvedic Physiology)  
by -Dr. Srikant Kumar Panda

24. SharirKriya – Part I & II - Dr. Ranade, Dr. Deshpande & Dr.  
Chobhe

25. Human Physiology in Ayurveda -  
DrKishorPatwardhan

26. SharirkriyaVignyan Practical Hand Book - Dr.Ranade, Dr.Chobhe, Dr.  
Deshpande

27. SharirKriya Part 1&2 - Dr.R.R.Deshapande,  
Dr.Wavhal
28. Textbook of Physiology -  
Gyton& Hall
29. Review of medical physiology -  
William Ganong
30. Essentials Of Medical Physiology -  
Sembulingam, K.
31. Concise Medical Physiology -  
Chaudhari, Sujit. K.
32. Fundamental of Anatomy & Physiology -  
Martini
33. Principals of Anatomy & Physiology -  
Tortora& Grabowski
34. Human Physiology -  
Richards, Pocock
35. Samson Wrights Applied Physiology, Keele, Neil, joels
36. Brainstem Control of Wakefulness And Sleep -  
Steriade, Mirce
37. An Introduction to Human Physiology -  
Green, J.h.
38. Ancient Indian Medicine -  
Kutumbiah P.
39. Biographical History of Indian Medicine -  
Srikanthamurthy KR
40. Ayurveda KriyaSharira - Yogesh  
Chandra Mishra
41. Textbook of Medical Physiology -  
InduKhurana
42. Tridosha Theory -  
SubrahmanyaShastri
43. Statistics in Medicine  
- K. Syamalan

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## **Shobhit University, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

### **SCHOOL OF AYURVEDA**

#### **Ordinances, Regulations & Syllabus**

For

#### **M.D in Prasuti Tantra Evam Stree Roga And Three year Programme**

(W.e.f. session 2023-224)

**Approved and adopted in the year 2023 (Board of Studies;  
10<sup>th</sup> Meeting)**



## **Programme Educational Objectives (PEOs)**

**PEO 1 Comprehensive Knowledge:** Graduates will acquire in-depth knowledge of Ayurvedic principles and practices related to obstetrics and gynecology, enabling them to manage maternal and child health effectively.

**PEO 2 Clinical Proficiency:** Graduates will develop advanced surgical skills and clinical competencies necessary for performing obstetric and gynecological procedures, ensuring safe and effective patient care.

**PEO 3 Research and Evidence-Based Practice:** Graduates will engage in research activities that contribute to the body of knowledge in Prasuti Tantra, promoting evidence-based practices in Ayurvedic obstetrics and gynecology.

**PEO 4 Holistic Patient Management:** Graduates will demonstrate the ability to provide holistic care to women throughout their reproductive life, addressing physical, mental, and emotional health needs.

**PEO 5 Interdisciplinary Collaboration:** Graduates will be prepared to collaborate with healthcare professionals from various disciplines, integrating Ayurvedic approaches with conventional practices to enhance maternal and child health outcomes.

## **Programme Specific Objectives (PSO's)**

**PSO 1 Surgical Skills Mastery:** Graduates will develop advanced surgical skills in performing obstetric and gynecological procedures, including cesarean sections, laparoscopic surgeries, and other relevant interventions.

**PSO 2 Comprehensive Patient Assessment:** Graduates will acquire the ability to conduct thorough assessments of pregnant women and gynecological patients, utilizing Ayurvedic diagnostic techniques alongside modern medical evaluations.

**PSO 3 Management of Complications:** Graduates will be equipped to manage obstetric and gynecological emergencies and complications, ensuring prompt and effective care to improve patient outcomes.

**PSO 4 Integrative Treatment Plans:** Graduates will formulate and implement individualized treatment plans that combine Ayurvedic therapies and practices with conventional medical approaches for comprehensive care.

**PSO 5 Research and Critical Analysis:** Graduates will engage in research projects focused on Prasuti Tantra, contributing to the advancement of knowledge and practices in Ayurvedic obstetrics and gynecology.

**PSO 6 Patient Education and Counseling:** Graduates will effectively educate and counsel patients regarding reproductive health, prenatal care, and postnatal wellness, promoting informed decision-making and self-care.

### **Programme Outcome Objectives (POO's)**

**POO 1 Clinical Competence:** Graduates will demonstrate advanced clinical skills in obstetrics and gynecology, effectively diagnosing and managing a wide range of conditions related to maternal and child health.

**POO 2 Surgical Proficiency:** Graduates will exhibit proficiency in performing complex surgical procedures specific to obstetrics and gynecology, ensuring high standards of patient care and safety.

**POO 3 Holistic Patient Care:** Graduates will provide holistic care that integrates Ayurvedic principles with modern medical practices, addressing the physical, emotional, and psychological needs of patients.

**POO 4 Research Contribution:** Graduates will engage in and contribute to research in Prasuti Tantra, critically evaluating and applying findings to enhance clinical practice and patient outcomes.

**POO 5 Interdisciplinary Collaboration:** Graduates will effectively collaborate with healthcare professionals across various disciplines, fostering a team approach to comprehensive maternal and child health care.

**POO 6 Patient Communication and Education:** Graduates will demonstrate effective communication skills, educating patients and families about reproductive health, treatment options, and preventive care.

**POO 7 Ethics and Professionalism:** Graduates will uphold ethical standards and professionalism in all aspects of practice, ensuring patient safety, confidentiality, and respect for diverse cultural backgrounds.

## **Course Structure**

**M.S.AYURVEDA PRELIMINARY 14. PRASUTI AVUM STRI ROGA (Gynecology & obstetrics)**

PAPER-II

Theory- 100 marks

PART A

50 marks

1. Concept of Tridosha, Dhatu, Upadhatu, Agni, PanchaMahabhuta in relation to Prasuti and StriRoga.
2. Concept of Artava and Shukra.
3. Concept of Rasa, Guna, Veerya, Vipak and Karma of Dravya used in Prasuti and StriRoga.
4. Action and adverse drug reaction related to commonly used plants and Rasa Aushadhi in Prasuti and StriRoga.
5. Concept of Pathya- Apathya in relation to Prasuti and StriRoga.
6. Concept of Garbhadhan and Garbha.
7. Concept of Vrana and Vranadushti.
8. Concept of special therapies of Ayurved used in Prasuti and StriRoga.
9. Concept of Ashtavidha Shastra Karma, Yantra&shastra used in Prasuti and StriRoga

PRACTI CAL

100 marks

1. Applied anatomy and physiology of genito-urinary system, abdomen, pelvis, pelvic floor, anterior abdominal wall, inguinal ligament, inguinal canal, vulva, rectum and anal canal. 2. Abnormal development, structure and function of female and male urogenital systems
2. Development, structure and function of placenta, umbilical cord and amniotic fluid.
3. Physiological and neuro-endocrinal changes during puberty, adolescence and menstruation.
4. Introduction of hormones related with gynaecology and obstetrics. Ovulation, fertilization, climacteric and menopause. Biophysical and biochemical changes in uterus and cervix during pregnancy and labour.
5. Pre-natal, Natal and Post natal counseling and examination.
6. Pharmacological study of drugs used in gynaecology and obstetrics.
7. Knowledge of diagnostic techniques used in gynaecology and obstetrics.
8. Basic Knowledge of pathological and biochemical investigation used in gynaecology and obstetrics.
9. Ethics, law and Acts Related to gynaecology and obstetrics – laws of abortion and adoption.
10. Knowledge of contraception and sterilization procedures.
11. Pre-operative and post operative care in gynaecology and obstetrics.

## PRACTICAL

100 marks

### Contents:

- i. Hospital duties in OPD, IPD, labor room, OT and casualty 2. History taking and counseling - 25 cases.
  - ii. Labor cases - observation/performing - 10 cases
2. Knowledge of instruments required in gynaecology and obstetric practices.
3. Ayurvedic diagnostic and therapeutic procedures.
4. Fluid therapy and blood transfusion.
5. Contraception and sterilizations.
6. Pre-operative, operative and post operative procedures.
  - i. Distribution of marks (Practical)
7. Case records of Patients in Detail (25 Cases) - 20 Marks
8. Bedside clinical case taking
  - i. Long case - 20 Marks
  - ii. Short case - 10 Marks
9. Procedures - 15 Marks
10. Identification of instruments, X-ray etc& Spotting - 15 Marks
11. Viva - voce - 20 Marks

### REFERENCE BOOKS:

1. Related matter from all thasamhitas and their commentaries. 2. Prasutitantraevumstreeroga by profTewari P V
2. Concepts of gynecology Dr Nirmala G Joshi.
3. Prasuti Tantra Prof. M. Dwivedi
4. Streerogavigyan - Dr VNK Usha 6. NavyaprasutiVigyanDr Pooja Bharadwaja
5. Text book of gynaecology-Berek and Novak.
6. Text book of obstetrics- Williums
7. Text book of obstetrics- D C Dutta
8. Text book of gynaecology - D C Dutta 11. Gabbe's normal and problem pregnancies.
9. Human embryology by Saddler.
  12. Jeffcoat's principles of gynaecology 14. Telinde's gynaecological surgery.



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**ShobhitUniversity, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

**SCHOOL OF AYURVEDA**

**Ordinances,Regulations & Syllabus**

For

**BAMS FIVE AND HALF YEARS PROGRAMME**

(W.e.f.session2021-2022)

**COURSE CURRICULUM FOR FIRST PROFESSIONAL BAMS  
(PRESCRIBED BY NCISM)**



**SAMHITA ADHYAYAN-1**

(SUBJECT CODE- AyUG-SA1)

**STUDY OF AYURVEDA CLASSICAL TEXT**

(Applicable from 2021-22 batch onwards for 5 years or until further notification by NCISM, whichever is earlier)



BOARD OF AYURVEDA

NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE NEW  
DELHI-110058



Samhita

NCISM

# I professional Ayurvedacharya (BAMS)

Subject Code: AyUG-SA1

## Samhita Adhyayan 1

Summary

Total number of Teaching : 400			
<b>Lecture (LH) - Theory</b>		<b>140</b>	<b>140 (LH)</b>
Paper I	140		
<b>Non-Lecture (NLH) – Theory</b>		<b>260</b>	<b>260 (NLH)</b>
Paper I	260		

Examination (Papers & Mark Distribution)					
Item	Theory Component Marks	Practical Component Marks			
		Practical	Viva	Elective	IA
Paper I	100	--	75	10 (Set-FC)	15
Sub-Total	100	100			
Total marks	200				

## **PREFACE**

The main purpose of Samhita teaching is to enable the students to read, understand and practice the Samhitas. Samhita is nothing but an ancient Practical Manual of Ayurveda. Samhita teaching and learning process need to be practically oriented for a better understanding of the subject. It is the need of time to make some addition in the current teaching and learning process of Samhita to make it more relevant, practical, and contemporary. New teaching technology tools will certainly be helpful in the effective delivery of knowledge of Samhita. As per the revised regulation, the nomenclature of the subject is **Samhita Adhyayana-I**.

The subject includes Ashtanga Hridayam Sutrasthana 1 to 15 chapters and Charaka Samhita Sutrasthana 1 to 12 chapters as a part of Samhita Adhyayana-I for First Professional BAMS course. In this revision, NCISM has tried its best to take Samhita teaching beyond the four walls of the classroom and connected it with today's living of people and society. For effective content delivery and to create interest in the subject of Samhita, it becomes evident to teach Samhita with practical demonstrations.

Samhita Path is the first step and most effective method of Samhita teaching adopted and practiced by our ancient acharyas. In order to facilitate practice the ancient Samhita learning, twice the non-lecture class of the total classes is exclusively reserved for Samhita learning activity. To make baseline uniformity in the process of learning, teaching methodology guidelines are provided which shall be followed while teaching the chapters of both the Samhitas. Students learn various principles of Ayurveda in Samhitas. Terminologies make the task initially difficult. Hence to make the Samhita learning more interesting, various education technology tools are included in the curriculum at various places understanding the need of the topic. Activity-based learning will enable the internalization of the concepts and will build a strong platform while learning other subjects of Ayurved.

As explained in Samhitas things learned in shastra(Science) and experience practically both when happens together will enhance the knowledge. It will further lead to application in practice.



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## Course Code and Name of Course

	Course code	Name of Course
	<b>AyUG-SA1</b>	<b>Samhita Adhyayan 1</b>

## AyUG SA1 Course

**Table 1- Course learning outcomes and matched PO.**

<b>SR1</b>	<b>A1</b>	<b>B1</b>
<b>CO No</b>	<b>Course learning Outcomes (CO) AyUG SA1</b> <b>At the end of the course AyUG-SA1, the students should be able to-</b>	<b>Course learning Outcomes matched with program learning outcomes.</b>
<b>CO1</b>	Distinguish the different <i>Samhitas</i> , their importance and methodology and familiarize with the tools of <i>Samhita Adhyayan</i> . (eg: <i>tantrayukti</i> )	PO2, PO9
<b>CO2</b>	Interpret and apply the <i>sutras</i> from the <i>Samhitas</i> .	PO1
<b>CO3</b>	Apply and evaluate the <i>Tridosha</i> , <i>Saptadhatu</i> and <i>Mala</i> principles (theory).	PO1, PO3, PO5
<b>CO4</b>	Practice and prescribe <i>Dincharya</i> (daily regimen), <i>Ritucharya</i> (seasonal regimen) and dietary principles for preservation of health.	PO2, PO7, PO8
<b>CO5</b>	Explore and distinguish different types of food, food groups and medicinal <i>dravyas</i> mentioned in <i>Samhitas</i> .	PO1, PO2
<b>CO6</b>	Identify various etiopathological factors and predict different treatment principles	PO1, PO5
<b>CO7</b>	Recognize and explain the fundamentals behind various therapeutics ( <i>Shodhan</i> and allied) and parasurgical therapies.	PO2, PO5
<b>CO8</b>	Develop a code of behavior and show mature behaviour in particular to the scientific deliberations.	PO 6, PO 9

**Table 2 : Contents of Course AyUG-SA1**

Sr No	A2 List of Topics AyUG-SA1	B2 Term	C2 Marks	D2 Lecture	E2 Non-Lecture
1.	Introduction to Samhita- i. Definition of Samhita and its types and nomenclature. (Samhita- forms, nomenclature, commentary, types etc.) ii. Brief Introduction of Samhitas (Bruhatrayee), their commentaries and commentators ( Preceptors, authors, redactors, commentators ) iii. Tantrayukti, Tantraguna and Tantradosha iv. RachanaShaili & BhashaShaili (Composition and Language style) of Bruhatrayee. v. Anubandha Chatushtya vi. Ashta-Prashna vii. Trividha Jnyanopaya	1	(Indicated in Viva)	15	09
<b>Ashtang Hriday Samhita - Sutrasthan (1-15 Adhyaya) -</b>			50 marks		
2.	AH Su.1. Ayushkamiya Adhyaya- i. Ashtang Hridaya parichaya (Introduction to Ashtang Hridaya) ii. Dosha-dhatu-mala parichaya (Introduction to dosha, dhatus and mala) iii. Agni- koshta swarup (Concept of digestive fire and bowel habits) iv. Rasa, virya, vipaka prabhav guna parichaya (Introduction to rasa, virya, vipaka, prabhav and guna) v. Rog-aarogya swarup (Concept of health and disease) vi. Roga-aatur parikshan (Assessment of disease and diseased) vii. Desha and kaala parichaya (Introduction to habitat and time ) viii. Chikitsa bheda (Types of treatment) ix. Pada chatushtaya Swaropam (Concepts of four factors of treatment) x. Vyadhi sadhyasadhyatva (Types of prognosis)	1		08	03

	xi. Recitation of important shlokas				
3.	AH Su.2. Dinacharya Adhyaya- i. Dinacharya vihaar (Importance of various regimen in Dinacharya) ii. Shuddhi Niyam (Personal hygiene) iii. Dharmapalan evam sadvrutta palan iv. Recitation of important shloka	1		05	04
4.	AH Su.3. Rutucarya Adhyaya- i. Shadrutu (Classification of seasons according to Uttarayan and Dakshinayan) ii. Rutucharya (detailed regimen of the six seasons) iii. Rutusandhi (inter-seasonal period) iv. Recitation of important shlokas	1		05	04
5.	AH Su.4. Roganutpadaniya Adhyaya- i. Adharaneeya vega and chikitsa (symptoms arising due to suppression of natural urges and their treatment) ii. Dharneeya vega (Concept of urges which hav eto be suppressed) iii. Shodhan chikitsa (Importance of purification treatments) iv. Hita-aahar-vihar sevan (Importance of following healthy lifestyle) v. Recitation of important shlokas	I		05	04
6.	AH Su.5. Dravadravya Vijnaniya Adhyaya- i. Jala Varga (Water from different sources, various states of water) ii. Dugdha Varga (Milk and milk products) iii. Ikshu Varga (Sugarcane and its products) iv. Madhu varnana (Properties of honey) v. Tail Varga (Oils of various sources) vi. Madya Varga (Types of alcoholic beverages) vii. Mutra Varnana (Types of urine) viii. Recitation of important shlokas	I		05	04
7.	AH Su.6. Annaswaroopa Vijnaneeya Adhyaya- i. Shuka- DhanyanamSamanya Gunah (Properties of various types of cereals)	II		05	03

	<ul style="list-style-type: none"> <li>ii. Shimbi- Dhanyananam Samanya Gunah (Properties of various types of Pulses)</li> <li>iii. Mamsasya Samanya Gunah (Properties of meat of various animals )</li> <li>iv. Shakayoh Samanya Gunah (Properties of various types of vegetables)</li> <li>v. Phalayoh Samanya Gunah (Properties of various types of Fruits)</li> <li>vi. Kritanna varganam Samanya Gunah (Properties of various types of cooked food)</li> <li>vii. Aushadhanam Samanya Gunah (Properties of various types of medicinal herbs)</li> </ul>				
8.	<p>AH Su.7. Annaraksha Adhyaya-</p> <ul style="list-style-type: none"> <li>i. Rajnikate- Vaidyasthiti ( Important place of Vaidya in Kings palace)</li> <li>ii. Savishanna Lakshanam (Properties of poisoned food)</li> <li>iii. Savishanna Pariksha (Examination of food contaminated with poison)</li> <li>iv. Savishanna-Lakshana- Aushadha ( Signs of food poisoning and its treatment)</li> <li>v. Viruddha Aahar (Incompatible food and food practices)</li> <li>vi. Satmikaran Krama (Method of adaptation of wholesome food habits and to taper unwholesome food habits)</li> <li>vii. Aahar-Shayan-Abrahmacharya – Trayopasthambha (Three accessory pillars of Health)</li> <li>viii. Recitation of important shlokas</li> </ul>	II		04	03
9.	<p>AH Su.8. Matrashitiya Adhyaya-</p> <ul style="list-style-type: none"> <li>i. AaharMatra (appropriate quantity of food)</li> <li>ii. Heen-matra, ati-matra bhojan dosha (Demerits of excess and less quantity of food)</li> <li>iii. Alasak, Visuchika (Etiopathogenesis and management principles of Vishuchika and Alasak)</li> <li>iv. Apararpan chikitsa</li> </ul>	II		05	04

	<ul style="list-style-type: none"> <li>v. Types of Ajeerna (indigestion) and its causes</li> <li>vi. Bhojan-samyak yog (Ideal regimen and time for taking food)</li> <li>vii. KukshiVibhag (Imaginary parts of the stomach)</li> <li>viii. Details of Anupan (Liquid consumed along with or after food)</li> <li>ix. Recitation of important shlokas</li> </ul>				
10	<p>AH Su.9. Dravyaadi Vijnaniya Adhyaya-</p> <ul style="list-style-type: none"> <li>i. Dravya shreshthtva(Predominance of Dravya)</li> <li>ii. Dravyasya panchbhautikatvam (Prevalence of Panchamahabhutas in dravyas)</li> <li>iii. Panchbhautik dravyanaam guna(Characteristics of PanchabhautikDravyas)</li> <li>iv. Principles of dravyas viz Veerya-Vipaka- Prabhava</li> <li>v. Recitation of important shlokas</li> </ul>	II		04	04
11	<p>AH Su.10. Rasabhedhiya Adhyaya-</p> <ul style="list-style-type: none"> <li>i. Shadrasanaam utpatti (Origin of Shadrasa)</li> <li>ii. Shadrasa parichaya (Identity of Six Rasas)</li> <li>iii. Shadrasa karma, guna, atiyoga lakshana (Functions, properties and presentation of excessive intake of Six Rasas.)</li> <li>iv. Recitation of important shlokas</li> </ul>	II		05	04
12	<p>AH Su.11. Doshadi Vijnaniya Adhyaya-</p> <ul style="list-style-type: none"> <li>i. Importance of dosha dhatu mala</li> <li>ii. Dosha dhatu mala prakruta and vaikruta karma (normal and abnormal functions)</li> <li>iii. Dosha dhatu mala ashraya- ashrayi bhava (relation between dosha and dhatus)</li> <li>iv. Samanya chikitsa siddhanta for dosha dhatu mala vrudhhi kshaya (treatment principles)</li> <li>v. Agni (Digestive fire)</li> <li>vi. General pathophysiology for origin of diseases</li> <li>vii. Ojus (Essence of dhatus)</li> </ul>	III		08	05

	viii. Vriddhi-kshaya bshesaja ix. Recitation of important shlokas				
13	AH Su.12. Doshabhedhiya Adhyaya- i. Dosha and dosha bheda (Dosha and their types) ii. Dosha chaya, prakopa, prasham karanani (Causes of dosha accumulation, aggregation and alleviation) iii. Trividhakarana (three causative factors of disease) iv. Trividha Roga marga (three pathways of disease) v. Aatura parikshbhaav (assessment methods) vi. Recitation of important shlokas	III		08	05
14	AH Su.13. Doshopakramaniya Adhyaya- i. Tridosha- upakrama (Treatment principles of vitiated doshas) ii. Shuddha-ashuddha chikitsa lakshana (Accurate and inaccurate treatment) iii. Dosha gati (movement of doshas inside the body) iv. Concept of aama v. Dasha aushadha-kaala (ten types of times for administering medicines) vi. Recitation of important shlokas vii. Research Updates – Langhan : Fasting and autophagy induction – how cell recycle and renew their content, a process called autophagy.	III		07	06
15	AH Su.14. Dvididhopakramaniya Adhyaya- i. Concept of Langhan and Brihan therapies (Treatment procedures for making the body thin and for nourishment) ii. Concept of Shodhan and shaman therapies (Purification and palliative treatments) iii. Concept of Atistaulya and atikarshya (Obesity and emaciation) iv. Recitation of important shlokas	III		05	05

16	AH Su.15. Shodhanadigana Sangraha Adhyaya- i. Groups of dravyas according to specific action ii. Groups of dravyas according to major ingredient as well as action	III	02	04
Charak Samhita – Sutrasthan (1-12 Adhyaya):		50 marks		
17	Ch S Su 1. Deerghanjiviteeya Adhyaya- i. Ayurvedavataranam (Genealogy of Ayurveda) ii. Arogsya chaturvarge pradhanam karanam iii. Trisutra Ayurveda iv. Details of Shat padartha v. Ayurvedasya lakshanam tatha prayojan vi. Ayusho lakshanam paryayashcha vii. Samanyavisheshayorlakhanam viii. Tridanda ix. Vyadhinam trividho hetusamgrah x. Vyadhinam ashraya tatha Arogsya karanam xi. Atmano lakshanam xii. Details about Sharira and manas dosha xiii. Sadhyaasadhyata vikara chikitsa xiv. Rasa varnanam xv. Dravya bheda xvi. Aushadhinam nama-rupa-upyog gyan xvii. Bhishagbubhushoh kartavyam xviii. Yuktasya bhaishajyasya lakshanam xix. Bhishaktamasya lakshanam xx. Recitation of important shlokas	1	07	02
18	Ch S Su 2. Apamarga Tanduliya Adhyaya- i. Shiro Virechana Dravya & Main Indications ii. Vamana Dravya & Main Indications iii. Virechana Dravya & Main Indications iv. Asthapana Dravya & Main Indications	II	02	03



	<ul style="list-style-type: none"> <li>v. Anuvasana Dravya &amp; Main Indications</li> <li>vi. Ashtavimshathi Yavagu</li> <li>vii. Panchakarma Mahatwa &amp; Vaidya Guna</li> <li>viii. Recitation of important shlokas</li> </ul>				
19	<p>Ch S Su 3. Aragvadhiya Adhyaya-</p> <ul style="list-style-type: none"> <li>i. Dwa Trimshath Churna Pradeha &amp; Main Indications</li> </ul>	II		01	03
20	<p>Ch S Su 4. Shadvirechana-shatashritiya Adhyaya-</p> <ul style="list-style-type: none"> <li>i. Shadvirechan aashrya</li> <li>ii. Panchkashaya yoni</li> <li>iii. Panchvidh kashaya kalpana</li> <li>iv. Panch kashaya shatani</li> </ul>	II		03	04
21	<p>Ch S Su 5. Matrashiteeya Adhyaya-</p> <ul style="list-style-type: none"> <li>i. MatravatAhara</li> <li>ii. Nature of Ahara (Guru, Laghu)</li> <li>iii. AharaMatra</li> <li>iv. MatravatAharaPhala</li> <li>v. AharaSevanaVidhana on the bases of its nature</li> <li>vi. Swasthavrutta</li> <li>vii. Anjana</li> <li>viii. Dhumapana</li> <li>ix. Nasya</li> <li>x. Dantadhavana</li> <li>xi. Jivhanirlekhana</li> <li>xii. Gandusha</li> <li>xiii. Abyanga</li> <li>xiv. Parimarjana</li> <li>xv. VastraGandhaMalyadiDharana</li> <li>xvi. Shouchavidhi</li> <li>xvii. Kshoura Karma</li> <li>xviii. PadatraDharana</li> <li>xix. ChatraDharana</li> <li>xx. Important Shlokas for recitation</li> <li>xxi. Research Updates: Role of Dinacharya to maintain circadian rhythm Role of therapeutic message for cell rejuvenation Mechanism of satiation and proper quantity of food (Sauhitya Matra)</li> </ul>	II		03	05

22	<p>Ch S Su 6. Tasyashiteeya Adhyaya-</p> <ol style="list-style-type: none"> <li>i. Classification Samvastara</li> <li>ii. Visarga Kala</li> <li>iii. Adana kal;a</li> <li>iv. Shadrutuvivechana and Charya</li> <li>v. Hamsodaka</li> <li>vi. Saatmya</li> <li>vii. Important shlokas for recitation</li> <li>viii. Research Updates: What causes the season: Summer and winter solistice- Equinoxes- Rotation of earth around sun.</li> </ol>	II		04	04
23	<p>Ch S Su 7. Naveganadharaniya Adhyaya-</p> <ol style="list-style-type: none"> <li>i. Adharneeya-Dharneeya vega lakshan, chikitsa</li> <li>ii. Vyayam (Details regarding exercise)</li> <li>iii. Ahita sevan evam varjya vidhi</li> <li>iv. Deha prakruti (Body constitution)</li> <li>v. Agantuja evam Pradnyaapradh janya vyadhi evam chikitsa</li> <li>vi. Impotent Shlokas for recitation</li> <li>vii. Research Updates: Corelation of genomic variation with the classification of Prakriti</li> </ol>	II		04	04
24	<p>Ch S Su 8. Indriyopakramaniya Adhyaya-</p> <ol style="list-style-type: none"> <li>i. Enumeration of Indriya, Dravya, Adhishthana, Artha, Buddhi</li> <li>ii. Manas Lakshana</li> <li>iii. Ekatvam of Manas</li> <li>iv. Sattvikatva, Rajasatva and Tamasatva of Manas</li> <li>v. Indriya PanchaPanchaka</li> <li>vi. Adhyatma Dravya Guna Sangraha</li> <li>vii. Mahabhuta – Indriya sambandh</li> <li>viii. Prakriti – Vikriti hetu</li> <li>ix. SadvrittaAnushthana</li> <li>x. Hetuchatushtaya</li> <li>xi. AnuktaSadvritta</li> <li>xii. Important Shlokas for Recitation</li> <li>xiii. Research updates: Mental health and gut microbiota.</li> </ol>	II		04	03
25	<p>Ch S Su 9. Khuddakachatushpada Adhyaya-</p> <ol style="list-style-type: none"> <li>i. Chikitsa Chatushpada</li> <li>ii. Roga-Arogya Lakshana</li> </ol>	II		03	03

	<ul style="list-style-type: none"> <li>iii. Chikitsa Lakshana</li> <li>iv. Vaidya, Dravya (Bheshaja), Paricharaka, Aatura guna</li> <li>v. Vaidya pradhanatva</li> <li>vi. Adnya chikitsak dosha</li> <li>vii. Sadvaidya lakshana</li> <li>viii. Vaidya kartavya</li> <li>ix. Vaidya Vritti</li> <li>x. Recitation of important Shlokas</li> <li>xi. Research Updates: Medical ethics-principles Soft Skill development for medical students Emotional Intelligence as a crucial component in medical education</li> </ul>				
26	<p>Ch S Su 10. Mahachatushpada Adhyaya-</p> <ul style="list-style-type: none"> <li>i. Catuspaada-bheshajam alam aarogyaayeti (aatreya-krta)</li> <li>ii. Bheshaja-abheshajayo tulyatva pratipaadana – (maitreya-krta)</li> <li>iii. Its conclusion by Atreya</li> <li>iv. Pareekshya-kaarino hi kusalaa bhavanthi</li> <li>v. Cikitsaa sootram</li> <li>vi. Cikitsaayaam yasolaabhe kaaranam</li> <li>vii. Asaadhyaroga-cikitsaayaam haani</li> <li>viii. Further division of saadhya-asaadhyata</li> <li>ix. Sukha-saadhya lakshanam</li> <li>x. Krcchra-saadhya lakshanam</li> <li>xi. Yaapya lakshanam</li> <li>xii. Pratyakhyeya lakshanam</li> <li>xiii. Benefit of knowledge of prognosis</li> <li>xiv. The versatile usage of the term 'mithyaa-buddhi'</li> <li>xv. Recitation of important shlokas</li> </ul>	II		03	03
27	<p>Ch S Su 11. Tisraishaniya Adhyaya-</p> <ul style="list-style-type: none"> <li>i. TrividhaEshana (Three Desires of life)</li> <li>ii. Paralokaeshana</li> <li>iii. Chaturvidhapariksha</li> <li>iv. Punarjanma siddhi by Chaturvidhapramanas</li> <li>v. Trayopasthambha</li> <li>vi. Trividhabala</li> </ul>	III		06	04

	vii. Trividhaayatana viii. Atiyoga, Heenayoga and Mithya yoga of artha, karma and kaala ix. Trividharoga x. Treatment for manasavyadhi xi. Trividharogamarga xii. Trividhavidya xiii. Trividhaoushadha xiv. Ashtatrika xv. Important Shloka for Recitation				
28	Ch S Su 12. Vatakalakaliya Adhyaya- i. Vata guna ii. Views of various Acharyas on Vata dosha Guna avum Karma iii. Vayu prakop-prasham karan iv. Akupita, kupita vayu karma v. Vata Dosha – Clinical application vi. Akupita-kupita pitta karma vii. Akupita- kupita kapha karma viii. Atreya's exploration on Tridosha ix. Important shloka for recitation	III		04	05 + 15 (for yearly competitions)
<ul style="list-style-type: none"> <li>Note- In this column distribution of 130 activity is given. Remaining 130 is for Samhita Pathan.</li> </ul>					

**Table 3: Learning objectives (Theory) of Course AyUG-SA1**

AyUG-SA1 Learning Objective									
A3 Course outcome	B3 Learning Objective  (At the end of the session, the students should be able to)	C3 Domain/s ub	D3 Must to know/ desirabl e to know/Ni ce to know	E3 Level Does/ Shows how/ Knows how/ Know	F3 T-L method	G3 Assessment	H3 Formati ve /summat ive	I3 Te rm	J3 Integra tion
<b>Topic 1- Introduction To Samhitas: Time</b> (Lecture:-15 ; Non lecture:-09 hours)									
CO1	Explain the term Samhita	Cognitive/ Comprehe nsion	Must know	Knows	Lecture	Written or Viva	F & S	I	
CO1	Identify Bruhatrayee	Cognitive/ Recall	Must know	Knows	Lecturer	Written or Viva	F & S	I	
CO1	Discuss the various Samhitas and Commentaries in brief	Cognitive/ Comprehe nsion	Must know	Knows	Lecturer / Group Discussion	Written or Viva	F & S	I	
CO1	Discuss the various preceptors, aut hours, redactors and commentators in brief	Cognitive/ Comprehe nsion	Must know	Knows	Lecturer	Written or Viva	F & S	I	
CO1	Apply various Tantrayukties like Adhikaran, Yoga, Padarth, Uddesh, Nirdesh, Vaakyashesh, Prayojan, Upadesh, arthapatti, Ekant,	Cognitive/ Applicatio n	Must know	Knows how	Lecturer/ Group discussion	Viva	Formativ e	I	

	Anumat, Vyakhyan, Samshay, Atitavekshan, Anagatavekshan, Swasadnya, Samucchaya, Nidarshan, Nirvachan, Niyog.								
CO1	Describe various Tantraguna	Cognitive/Comprehension	Must know	Knows how	Lecturer	Written or Viva	Formative and Summative	I	
CO1	Describe various Tantradasha	Cognitive/Comprehension	Must know	Knows	Lecturer	Written or Viva	Formative and Summative	I	
CO1	Describe rachanashaili (composition style) and bhashashaili (language style) of Samhitas	Cognitive/Comprehension	Must know	Knows how	Lecturer / Discussion	Written or Viva	F & S	I	<u>Ayurved Itih as</u>
CO1	Discuss about pattern (method) of writing of classical texts	Cognitive / Comprehension	Must know	Knows how	Lecturer	Puzzle	Formative	I	<u>Ayurved Itih as</u>
CO1	State different types of styles of language of classical text	Cognitive/Recall	Must know	Knows	Lecturer Audio-Visual aids	Viva	Formative and summative	I	
CO1	Interpret Anubandha chatushtya with examples	Cognitive/Problem solving	Must know	Knows how	Lecturer / Class discussion	Enquiry Based Learning	Formative	I	

CO1	Interpret Ashta Prashna with example	Cognitive/ Problem solving	Must know	Knows how	Lecturer/ Demonstration	Enquiry Based Learning	Formative	I	
<b>Topic 2- Ashtang Hriday Samhita Sutrasthan Chapter-1- Ayushkamiya Adhyaya: Time (Lecture:- 08 ; Non lecture- 03 hours)</b>									
CO1	Discuss the hierarchy of Ayurvedotpatti (descend of Ayurveda)	Cognitive /Recall	Must know	Know	Lecture	Written or Viva	F & S	I	
CO1	Explain the significance of Ashtanga Hrudaya	Cognitive /Recall	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO1	Enlist the eight branches of Ayurveda	Cognitive/ Recall	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO3	Discuss the concept of dosha with respect to qualities (guna), location in body and time period (kaala)	Cognitive/ comprehension	Must know	Knows how	Lecture and Group Discussion	Written & Viva	F & S	I	
CO3	Discuss role and superiority of dosha in manifestation of diseases	Cognitive/ comprehension	Must know	Knows how	Lecture/ Group discussion	Written & Viva	F & S	I	
CO3	Identify the dosha sthanas	Cognitive/ comprehension	Must know	Knows how	Discussion	Model Making (Working Model)	Formative	I	
CO3	Enlist the saptadhatus and mala.	Cognitive/ Recall	Must know	Know	Lecture	Written & Viva	F & S	I	
CO4	Explain the concept of Samsarga (combination of 2 dosha) & Sannipata	Cognitive/ Comprehension	Must know	Knows how	Lecture	Written & Viva	F & S	I	

	(combination of 3 dosha)								
CO4	Elucidate concept of Prakruti (body constitution)	Cognitive/Comprehension	Must know	Knows how	Lecture/Discussion	Written & Viva	F & S	I	
CO6	Explain the three types of digestive fire (agni)	Cognitive/Comprehension	Must know	know How	Lecture/Demonstration in healthy volunteers.	Written or Viva	F & S	I	
CO6	Describe the three types of Koshtha	Cognitive/Comprehension	Must know	Knows how	Lecture/Demonstration in healthy volunteers.	Written or Viva	F & S	I	
CO5	Explain the effect of rasas on tridosha	Cognitive/Comprehension	Must know	Knows how	Lecture/ Group discussion	Written & Viva	F & S	I	
CO5	Describe the two types of potencies (Dwividha Virya)	Cognitive/Comprehension	Must know	Knows how	Lecture/ Group discussion	Written & Viva	F & S	I	
CO5	Describe the three types of Vipaka	Cognitive/Comprehension	Must know	Knows how	Lecture/ Group discussion	Written & Viva	F & S	I	
CO5	Explain the three types of dravya on the basis of Prabhav	Cognitive/Comprehension	Must know	Knows how	Lecture/ Group discussion	Written & Viva	F & S	I	
CO5	Explain the concept of Vruddhi & Kshaya (increase and decrease)	Cognitive/Comprehension	Must know	Knows how	Lecture/ Group discussion	Written & Viva	F & S	I	



CO6	Discuss the causative factors of health and disease	Cognitive/comprehensions	Must know	Know how	Lecture/group discussion	Puzzle / Viva	Formative and summative	I	
CO6	Define health (aarogya) and disease stage(roga)	Cognitive/Recall	Must know	Know	Lecture	Written & Viva	Formative and summative	I	
CO6	Explain prakruta (normal) and vikruta (abnormal) conditions	Cognitive/comprehensions	Must know	Knows how	Lecture	Written & Viva	Formative and summative	I	
CO6	Explain the types of diseases (Roga)	Cognitive/Comprehension	Must know	knows How	Lecture	Written or Viva	F & S	I	
CO6	Explain the concept of Roga Adhishthana (abode of diseases)	Cognitive/Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO6	Enumerate Manas dosha	Cognitive/Recall	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO6, CO8	Discuss the methods of assessment of patient	Cognitive/Comprehension	Must know	Knows How	Lecture	Written or Viva	F & S	I	
CO8	Explain the methods of examination of disease	Cognitive/Comprehension	Must know	Knows how	Lecture/OPD clinics	Written & Viva	F & S	I	
CO6	Explain the three types of habitats(desha)	Cognitive/Comprehension	Must know	Knows how	Lecture/Multimedia aids	Written or Viva	F & S	I	

CO6	Explain the two types of Bheshaja Kala	Cognitive / Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO6	Explain the Classification the treatment modules (Aushadha )	Cognitive / Comprehension	Must know	Know How	Lecture	Written or Viva	F & S	I	
CO6	Explain the treatment module for mental diseases (Mano Dosh Aushadham)	Cognitive / Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO6, CO8	Elaborate chikitsa chatuspada (4 factors in treatment)	Cognitive / Comprehension	Must know	Know How	Lecture/ Demonstration in hospital	Written or Viva	F & S	I	
CO6	Explain the types of prognosis of disease	Cognitive/ Comprehension	Must know	Know How	Lecture/ Demonstration on patients / Multimedia aids	Written or Viva	F & S	I	
CO6	Explain Concept of anupakramaneeya Atura Lakshana	Cognitive/ Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO1	Enlist the chapters of Sutra Sthana	Cognitive/ Comprehension	Must Know	Knows	Self-learning	Written or Viva	F & S	I	
CO1	Enlist all Sthana and Adhyayas of Ashtang Hridaya and Uttara Tantra	Cognitive/ Recall	Nice to Know	Knows	Self-learning	Written or Viva	F & S	I	
CO2	Recite the shloka from 1 to 35	Cognitive/ Recall	Must Know	Show	Self-learning	Viva	F & S	I	
CO1	Identify Adhikaran, Yoga, Padarth, Uddesh,	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	I	

	Anagatavekshan Tantrayukti in this chapter.								
<b>Topic -3. Ashtang Hriday Samhita Sutrasthan Chapter-2- Dinacharya Adhyaya Time (Lecture:- 05 Non lecture- 04 hours)</b>									
CO4	Explain the need of waking up before sunrise	Cognitive/ Comprehe nsion	Must know	Know how	Lecture	Written & Viva	F & S	I	
CO4	Explain the importance of Shaucha Vidhi	Cognitive/ Comprehe nsion	Must know	Knows how	Lecture	Written & Viva	F & S	I	
CO4	Explain the importance and contraindications of brushing (Dantadhavana)	Cognitive/ Comprehe nsion	Must know	Knows how	Lecture/ Multimedia aids	Written & Viva	F & S	I	
CO4	Identify the herbs used for Dantadhavan	Cognitive/ Applicatio n	Must know	Shows how	Herbal garden visit	Written or Viva Group Activity (For identifications of Currently using tooth paste. Herbal pastes. Types of pastes )	F & S	I	Dravya guna dept
CO4	Distinguish Sauveeranjana and Rasanjan	Cognitive/ Comprehe nsion	Must know	Know how	Lecture/Demonstratio n	Written or Viva Debate (Students will search benefits and harms supported by current literature. Dabate in class)	F & S	I	Visit to Rasash astra dept for Identifi cation of drugs

CO4	Discuss contraindications of betel leaf consumption (Tambula)	Cognitive/ Application	Must know	Know how	Lecture/ Debate on benefits and harms of Betel leaf consumption. supported by current literature.	Written or Viva	F & S	I	
CO4	Elaborate the concept of Abhyanga along with contraindications	Cognitive/ Comprehension	Must know	Know How	Lecture/ /Multimedia aids	Written & Viva	F & S	I	Panchk arma dept
CO4	Discuss the importance, contraindications of exercise	Cognitive/ Application	Must know	Knows How	Lecture/ Multimedia aids	Written & Viva	F & S	I	
CO4	Discuss the rules regarding exercise and adverse effects of excessive exercise	Cognitive/ Application	Must know	Knows how	Group Discussion Debate: Types of Exercise. e.g Arobiuc and anaerobic etc. supported by current literature discussions on Concept.	Written & Viva	F & S	I	
CO4	Explain the benefits of powder massage (udvartan)	Cognitive/ Comprehension	Must know	Know how	Lecture/demonstration ECE	Written & Viva	F & S	I	Panchk arma dept
CO4	Elucidate the benefits and contraindications of bathing (snana)	Cognitive/ Comprehension	Must know	Knows how	Lecture/group discussion Literature search and Discussion by students.	Written & Viva	F & S	I	
CO4	Explain the time of having food.	Cognitive/ Comprehension	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO4	Explain rules regarding natural	Cognitive/ Comprehension	Must know	Know how	Lecture	Written or Viva	F & S	I	

	urges.	nsion							
CO4	Explain the importance of righteousness (Dharmapalan)	Cognitive/Comprehension	Must know	Know how	Flipped Classroom Group Activity: self identification of Mistake they are doing Plan to rectify and reassessment after duration.(6 months)	Written or Viva	F & S	I	
CO4	Enumerate the types of bad deeds(Dasha Vidha Papakarma)	Cognitive/Recall	Must know	Know How	Flipped Classroom	Written or Viva	F & S	I	
CO4, CO8	Explain the concept of good principles and conduct (Sadvrutta)	Cognitive	Must know	Knows how	Flipped Classroom	Written or Viva	F & S	I	
CO4	Explain the principles of personal hygiene (shuddhi)	Cognitive/Comprehension	Must know	Knows how	Flipped Classroom	Written or Viva	F & S	I	
CO2	Recite the shlokas from 1 to 48	Cognitive/Recall	Must know	Show	Self-learning	MCQ/viva/quiz	F & S	I	
CO8	Assess and observe the Dincharya Principles.	Skill	Must know	Does	Proforma based assessment in healthy volunteers/ patients.	Work book- Viva	F & S	I	
CO8	Justify the importance of Dincharya	Cognitive/Application	Must know	Does	Application of Principles in own life	Viva	F & S	I	
CO1	Identify Upadesh, Ekant, Prayojan Tantrayukties in this chapter.	Cognitive/Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	I	

**Topic – 4. Ashtang Hriday Samhita – Sutrasthan Chapter 3- Rutucarya Adhyaya-Time (Lecture:- 05 ; Non lecture 04 hours)**

CO4	Explain the six seasons and the months in which they fall	Cognitive/Comprehension	Must know	Knows	Lecture/group discussions/Multimedia aids	Written & Viva	F & S	I	
CO4	Elicudate the status of strength (bala) in Uttarayana and Dakshinayana	Cognitive/Recall	Must know	Knows How	Lecture/group discussions/Multimedia aids	Written & Viva	F & S	I	
CO4	Explain the relation between strength (bala)& seasons	Cognitive/Comprehension	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO4	Discuss the climatic conditions, health status(bala, agni, dosha), appropriate food and regimen for Hemant rutu.	Cognitive/Application	Must know	Knows How	Lecture/group discussions/Multimedia aids	Written or Viva	F & S	I	
CO4	Discuss the climatic conditions, health status (bala, agni, dosha), appropriate food and regimen for Shishira rutu.	Cognitive/Application	Must know	Knows How	Lecture/group discussions/Multimedia aids	Written & Viva	F & S	I	
CO4	Discuss the climatic conditions, health status (bala, agni, dosha), appropriate food and regimen for Shishira rutu.	Cognitive/Application	Must know	Knows How	Lecture/group discussions/Multimedia aids	Written or Viva	F & S	I	
	Discuss the climatic conditions, health status (bala, agni,	Cognitive/Application	Must know	Knows How	Lecture/group discussions/Multimedia aids	Written & Viva	F & S	I	

	dosha), appropriate food and regimen for Greeshma rutu.								
CO4	Discuss the climatic conditions, health status (bala, agni, dosha), appropriate food and regimen for Varsha rutu.	Cognitive/ Application	Must know	Knows How	Lecture/group discussions/Multimedia aids	Written & Viva	F & S	I	
CO4	Discuss the climatic conditions, health status (bala, agni, dosha), appropriate food and regimen for Sharad rutu.	Cognitive/ Application	Must know	Knows How	Lecture/group discussions/Multimedia aids	Written & Viva	F & S	I	
CO8	Justify the importance of Rutucharya	Affective	Must Know	Does	Group discussions	Viva	F & S	I	
CO4	Describe the special instructions pertaining diet (rasa, guna) and seasons	Cognitive/ Comprehension	Must know	Knows How	Lecture/group discussions/Multimedia aids	Written & Viva	F & S	I	
CO4	Identify the significance of Rutusandhi	Cognitive/ Comprehension	Must know	Knows How	Lecture	Written or Viva	F & S	I	
CO2	Recite the shloks - 1 to 6, 55-58	Cognitive/ Recall	Must Know	Show	Self learning	Written/viva/quiz	F & S	I	
CO4	Apply the Principles of Rutucharya in practice	Skill	Must Know	Does	Proforma based assessment of healthy individuals or patients	Viva	F & S	I	
CO1	Identify Prayojan, Swasdnaya, Apadesh Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	I	

**Topic -5 Ashtang Hriday Samhita – Sutrasthan- Chapter 4. Roganutpadaniya Adhyaya--Time (Lecture:- 05 ; Non lecture 04 hours)**

CO6	Enlist the adharaneeya vega (natural urges not to be suppressed by force)	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of adhovata (flatus) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of purisha (fecal matter/ defecation) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of mootra (urine) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of udgaar (belching) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of kshvathu (sneezing) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of trushna (thirst) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	



CO6	Specify the diseases due to suppression of kshudha (hunger) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written/viva	F & S	I	
CO6	Specify the diseases due to suppression of nidra (sleep) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of kaasa (cough) and its treatment	Cognitive/ Recall	Must know	Knows	Lecture	Written & Viva	F & S	I	
CO6	Enumerate the diseases due to suppression of shrama shwasa and its treatment	Cognitive/ Recall	Must know	Knows	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of jumbha (yawning) and its treatment	Cognitive/ Recall	Must know	Knows	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of ashru (tears) and its treatment	Cognitive/ Recall	Must know	Knows	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of vaman(vomiting) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Specify the diseases due to suppression of shukra (semen) and its treatment	Cognitive/ Recall	Must know	Knows How	Lecture	Written & Viva	F & S	I	

CO6	Describe the incurable condition of Vegadharan	Cognitive/Comprehension	Must know	Knows How	Lecture	Written or Viva	F & S	I	
CO6	Explain vegdharan as the root cause for many diseases and its common treatment	Cognitive/Comprehension	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Explain the dharaneeya vega (urges to be controlled)	Cognitive/Comprehension	Must know	Knows How	Lecture/ Group discussion	Written or Viva	F & S	I	
CO8	Justify the importance of adharneeya and dharneeya vega to maintain health	Cognitive/ Application	Must know	Does	Group discussions	Group discussions/ Class activities	F & S	I	
CO6	Explain importance of Shodhana chikitsa (purification techniques)	Cognitive/Comprehension	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Explain the importance of Brumhana after Shodhana chikitsa	Cognitive/Comprehension	Must know	Knows How	Lecture	Written & Viva	F & S	I	
CO6	Explain the concept of Aagantu roga (traumatic diseases) and its treatment	Cognitive/Comprehension	Must know	Knows How	Lecture	Written or Viva	F & S	I	
CO6	Discuss the concept of rutu-shodhana (elimination of doshas according to seasons)	Cognitive/ Application	Must know	Knows How	Lecture/Group Discussion	Written & Viva	F & S	I	

CO6 CO8	Describe the importance of healthy diet and regimen.	Cognitive/Comprehension	Must know	Knows How	Lecture/Group discussion	Written & Viva	F & S	I	
CO6	Comply with health rules regarding vedgharan and hita-aahar-vihar.	Cognitive/Comprehension	Must know	Shows		Group discussion/Class activities	F & S	I	
CO2	Recite the shlokas from number 1 to 22, 24-31, 35	Cognitive/Recall	Must know	Show	Self-learning	Written/viva/quiz	F & S	I	
CO3, CO6	Assess the sign and symptoms caused due to suppression of Adharaneeya Vegas.	Skill	Must Know	Show how	Proforma based assessment in healthy volunteers/patients.	Problem based assessment	Formative	I	
CO1	Identify Uddesh, Nirdesh, Tantrayukties in this chapter.	Cognitive/Application	Must know	Knows how	Lecturer/Group discussion	Viva	F & S	I	

**Topic -6 Ashtang Hriday Samhita – Sutrasthan- Chapter 05 Dravadravya Vijnaniya Adhyaya--Time (Lecture:- 05 ; Non lecture 04 hours)**

CO5	Differentiate between Gangambu (rain water) and Samudrambu (sea water)	Cognitive/Comprehension	Desirable	Knows	Lecture discussion	Written or Viva	Formative	I	
CO5	Describe attributes of water from different sources	Cognitive/Comprehension	Nice to know	Knows	Lecture discussion	Written or Viva	Formative	I	
CO5	Explain the utilities of different states of water (avoiding of drinking water, hot water (ushnambu), cold water	Cognitive/Comprehension	Must know	Knows how	Lecture discussion	Written or Viva	F & S	I	

	(sheetambu), Boiled and cold water (kwathita-sheetambu)								
CO5	Write the qualities of Narikelodakam (coconut water)	Cognitive/ Recall	Must know	Knows	Discussion	Written or Viva	F & S	I	
CO5	Discuss the properties of ksheeram (milk), Dadhi (curd), Takra (mastu), navaneetam (white butter), Ghritam	Cognitive/ Comprehension	Must know	Knows how	Lecture discussion	Written or Viva	F & S	I	
CO5	List Properties of milk (ksheeras) of different sources.	Cognitive/ Recall	Nice to know	Knows	Lecture	Written or Viva	Formative	I	
CO5	Differentiate the properties of ama (unboiled) and shruta (boiled) ksheeram (milk)	Cognitive/ Comprehension	Must know	Knows	Lecture	Written or Viva	F & S	I	
CO5	Explain the rules for curd consumption	Cognitive/ Comprehension	Must know	Know how	Lecture discussion	Written or Viva	F & S	I	
CO5	Write the properties of various milk preparations	Cognitive/ Recall	Nice to know	Know	Lecture discussion	Written or Viva	Formative	I	
CO5	Identify the properties and uses of sugarcane and its products	Cognitive/ Recall	Nice to know	Know	Lecture discussion	Written or Viva	F & S	I	
CO5	Enlist the properties of honey and Identify the various guidelines related to use of honey	Cognitive/ Recall	Must know	Knows how	Lecture discussion	Written or Viva	F & S	I	
CO5	Write the properties of tilaitailam (Sesame oil)	Cognitive/ Recall	Must know	Know	Lecture discussion	Written or Viva	F & S	I	

CO5	Identify the characteristics of different oils	Cognitive/Comprehension	Nice to know	Know	Lecture discussion	Written or Viva	Formative	I	
CO5	Classify various types of madyas (wines)	Cognitive/Comprehension	Nice to know	Know	Lecture discussion	Written or Viva	Formative	I	
	explain the properties of Shukta, Dhanyamlam, sauveeraka, tushodaka etc.,	Cognitive/Comprehension	Nice to know	Know	Lecture discussion	Written or Viva	Formative	I	
CO5	Describe the properties and uses of various types of urine	Cognitive/Comprehension	Nice to know	Know	Lecture discussion	Written or Viva	Formative	I	
CO2	Recite the shlokas- 1,16-17, 20,29-32, 51,52,56	Cognitive/Recall	Must know	Show	Self-learning	Written or Viva	F & S	I	
CO5	Classify some common dravyas like milk, ghee, sugar, jaggery etc according to their varga (group) and qualities	Skill	Must know	Show how	class Discussion	Viva/ class activities	F & S	I	
CO1	Identify Vaakyashesh, Samucchaya, Yog Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	I	

**Topic -7 Ashtang Hriday Samhita – Sutrasthan- Chapter 6. Annaswaroopa Vijnaneeya Adhyaya- Time (Lecture:- 05 ; Non lecture 03 hours)**

CO5	To classify the shukadhanya (cereals)	Cognitive/Recall	Must know	Know	Lecture	Written or Viva	F & S	II	Dravyaguna
CO5	Enumerate the qualities of each shukadhanya (cereals)	Cognitive/Recall	Desire to know	Know	Lecture	Written or Viva	Formative	II	Dravyaguna
CO5	Classify the shimbidhanya (pulses)	Cognitive/Recall	Must know	Know	Lecture	Written or Viva	F & S	II	Dravyaguna

CO5	Enumerate the qualities of each shimbi dhanya (pulses)	Cognitive/ Recall	Desire to know	Know	Lecture discussion	Written or Viva	Formative	II	Dravyaguna
CO5	Enumerate the qualities of various types of mamsa (meat)	Cognitive/ Recall	Nice to know	Knows	Lecture discussion	Written or Viva	Formative	II	
CO5	Enumerate the qualities of various types of shaka	Cognitive/ Recall	Must know	Knows	Lecture discussion	Written or Viva	Formative and summative	II	Dravyaguna
CO5	Enumerate the qualities of various types of fruits	Cognitive/ Recall	Desire to know	Knows	Lecture discussion	Written or Viva	Formative	II	Dravyaguna
CO5	Enumerate the qualities of various types of krtannavarga (cooked food)	Cognitive/ Recall	Must to know	Know	Lecture discussion	Written or Viva	Formative and summative	II	Bhaishajy akalpana
CO5	Enumerate the qualities of various types of medicinal dravyas (herbs)	Cognitive/ Recall	Must know	Knows	Lecture discussion	Written or Viva	F & S	II	Dravyaguna
CO5	Classify certain common dravyas according to varga and functions	Skill	Must know	Show how	Group activities	Viva	F & S	II	
CO1	Identify Samucchaya, Prayojan, Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	
<b>Topic -8 Ashtang Hriday Samhita – Sutrasthan- Chapter 7. Annaraksha Adhyaya- Time (Lecture:- 04 ; Non lecture 03 hours)</b>									
CO8	Describe the role of Rajavaidya (Noble Physiian)	Cognitive/ Comprehension	Nice to know	Know	Discussion	Written or Viva	Formative	II	

CO6	Identify the characteristics adulterated food stuffs	Cognitive/Comprehension	Nice to know	Knows	Discussion	Written or Viva	Formative	II	Agadatant ra
CO6	Describe the symptoms caused by poisoned or adulterated food	Cognitive/Comprehension	Desire to know	Know	Discussion	Written or Viva	Formative	II	Agadatant ra
CO6	Discuss the treatment module for poisoning	Cognitive/Comprehension	Desire to know	Know how	Discussion	Written or Viva	Formative	II	Agadatant ra
CO6	Define virudhahara (incompatible foods) with examples	Cognitive/Recall	Must know	Know	Lecture discussion	Written & Viva	F & S	II	
CO6	Discuss the treatment methods for virudhahara (incompatible foods)	Cognitive/Comprehension	Must know	Know how	Lecture discussion	Written & Viva	F & S	II	
CO6	Follow the principles regarding viruddh aahar	Cognitive/Application	Must know	Know how	Discussion	Class Activities	Formative	II	
CO4	Explain the process of satmikaran (accustomization)	Cognitive/Comprehension	Must know	Know how	Lecture discussion	Written & Viva	F & S	II	
CO4	Explain the three accessory pillars of life (diet, sleep and non-celibacy)	Cognitive/Comprehension	Must know	Know how	Lecture discussion	Written & Viva	Formative	II	
CO4	Explicate the significance of judicious sleep	Cognitive/Comprehension	Must know	Know how	Discussion	Written & Viva	F & S	II	
CO2	Recite the shloka- 45, 48, 50, 53-55	Cognitive/Recall	Must know	Shows	Self-learning	Written or Viva	F & S	II	
CO1	Identify Nidarshan, Samucchay, Prayojan,	Cognitive/Application	Must know	Knows how	Lecturer/Group discussion	Viva	F & S	II	

	swasadnya Tantrayukties in this chapter.								
<b>Topic -9 Ashtang Hriday Samhita – Sutrasthan- Chapter 8. Annaraksha Adhyaya- Time (Lecture:- 05 ; Non lecture 04 hours)</b>									
CO4	Explain the importance of matra (proper quantity of food) for maintenance of health	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO4	Describe how to quantify food	Cognitive/Comprehension	Must know	Knows	Lecture	Written or Viva	F & S	II	
CO4	Determine the adverse effects of heena matra (inadequate quantity of food) and atimatra (excess quantity of food) ahara	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO6	Discuss the etiopathogenesis, symptoms and treatment principles of Alasaka and Visuchika.	Cognitive/Application	Must know	Knows how	Lecture/PBL	Written or Viva	F & S	II	
CO6	Classify between various types of Apatarpan therapies	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO6	Classify various types of ajeerna	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO6, CO4	Enlist unwholesome food items	Cognitive/Recall	Must know	Knows	Group discussion	Written or Viva	F & S	II	
CO4	Identify various unhealthy food habits	Cognitive/Comprehension	Must know	Knows	Group discussion	Written or Viva	F & S	II	



CO4	Recommend ideal regimen for consumption of food (aaharvidhi)	Cognitive/Comprehension	Must know	Knows how	Discussion	Written or Viva	F & S	II	
CO4	Differentiate between the food items recommended and non-recommended for daily use	Cognitive/Comprehension	Must know	Knows	Lecture Group Activity.	Written or Viva	F & S	II	
CO4	Advise the right order of food items in a meal	Cognitive/Application	Must know	Does	Discussion/activities	Viva/ proforma activity	F & S	II	
CO4	Select anupanas (after drink) based on ahara and aushadha	Cognitive/Comprehension	Must know	Knows how	Lecture/Discussion	Written or Viva	F & S	II	
CO4	Identify the conditions where Anupan is contraindicated	Cognitive/Comprehension	Desire to know	Knows	Lecture/Discussion	Written or Viva	F & S	II	
CO4	Advise the right time of food consumption (Aahar Kala)	Cognitive/Application	Must know	Shows	Lecture/Discussion/activities	Written or Viva	F & S	II	
CO2	Recite the shlokas-1-3, 6,7, 17, 19, 20,21, 25-30, 33-34	Cognitive/Recall	Must know	Shows	Self-learning	Written or Viva	F & S	II	
CO4	Justify the various principles of diet regarding quantity and time	Cognitive/Application	Must know	Does	Discussion/activities	Viva/activities	Formative/Summative	II	
CO1	Identify Prayojan, Upadesh, Padartha, Yog, Swasnya Tantrayukties in this chapter.	Cognitive/Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	

**Topic -10 Ashtang Hriday Samhita – Sutrasthan- Chapter 9.** Dravyaadi Vijnaniya Adhyaya-**Time** (Lecture:- 04 ; Non lecture 04 hours)

CO5	Justify the predominance of Dravya	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO5	Elaborate the prevalence of Panchamahabhutas in Dravyas	Cognitive/Comprehension	Must know	Knows how		Written or Viva	F & S	II	
CO5	Differentiate between Rasa and Anurasa (primary taste and secondary taste)	Cognitive/Comprehension	Must know	Knows	Lecture	Written or Viva	F & S	II	
CO5	Analyse the characteristics of Panchabhautik dravyas	Cognitive/Application	Must know	Shows	Lecture	Written or Viva	F & S	II	
CO5	Recognise the aushadatva (medicinal value) of all substances	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO5	Demonstrate the importance of Panchabhautikdravyas in restoration and continuation of health.	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO5	Explain the importance of Mahabhutas and drug action	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO5	Define Veerya and Vipaka	Cognitive/Recall	Must know	Knows	Lecture	Written or Viva	F & S	II	
CO5	Discuss the types and the various opinions related with Veerya.	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO5	Explain Vipaka and its types.	Cognitive/Comprehension	Must know	Knows	Lecture	Written or Viva	F & S	II	

CO5	Discuss the hierarchy of active principles of Dravya (matter)	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO5	Define Prabhava	Cognitive/Recall	Must know	Knows	Lecture	Written or Viva	F & S	II	
CO5	Recall the exemplified functions of various active principles	Cognitive/Recall	Must know	Knows	Lecture	Written or Viva	F & S	II	
CO5	Describe the Saman pratyayarabdha and Vichitra-praty-arabdha Dravyas.	Cognitive/Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	II	
CO2	Recite the shlokas – 1,2,3, 4,10, 12, 13, 20,26,27,28	Cognitive/Recall	Must know	Knows	Self-learning	Written , Viva/quiz	F & S	II	
CO1	Identify Swasdnya, Nirvachan Tantrayukties in this chapter.	Cognitive/Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	

**Topic -11 Ashtang Hriday Samhita – Sutrasthan- Chapter 10. Rasabhedhiya Adhyaya- Time (Lecture:- 05 ; Non lecture 04 hours)**

CO2	Describe the formation of rasa from mahabhoota	Cognitive/Comprehension	Must know	Know	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	II	Dravyaguna
CO2	Identify the examples and exceptions of the six rasa	Cognitive/Comprehension	Must know	Know	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	II	Dravyaguna
CO2	Explain the features of six rasa with examples and exceptions	Cognitive/Comprehension	Must know	Knows how	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	II	
CO2	Explain the functions of six rasa	Cognitive/Comprehension	Must know	Knows how	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	II	

CO2	Describe the symptoms due to excess use (atiyog) of the six rasa	Cognitive/Comprehension	Must know	Knows how	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	II	
CO2	Analyze the tartamatva of rasas (hierarchy of rasa on the basis of characteristics)	Cognitive/Application	Must know	Knows how	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	II	Dravyaguna
CO2	Enlist the 63 types of permutation and combination of rasa	Cognitive/Recall	Nice to know	Know how	Lecturer Audio-Visual aids	Written or Viva	F & S	II	Dravyaguna
CO2	Classify the dravyas according to the rasa skand (group)	Skill	Must know	Know how	Discussion/activities based proformas	Viva/Activities	F & S	II	
CO2	Recite the shloks-1-21, 33-38	Cognitive/Recall	Must know	Knows	Self-learning	Written or Viva	F & S	II	
CO1	Identify Uddesh, Niradesh, Apavarga Tantrayukties in this chapter.	Cognitive/Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	
<b><u>Topic -12 Ashtang Hriday Samhita – Sutrasthan- Chapter 11. Doshadi Vijnaniya Adhyaya- Time (Lecture:- 08 ; Non lecture 05 hours)</u></b>									
CO3	Discuss the importance of dosha dhatu mala	Cognitive/Application	Must know	Know how	Lecturer Audio-Visual aids	Written & Viva	Formative or Summative	III	
CO3	Explain dosha dhatu mala prakruta karma (normal functions)	Cognitive/Comprehension	Must know	Knows how	Lecturer Audio-Visual aids	Written & Viva	Formative or Summative	III	

CO3	Identify the normal functions of dosha, dhatu and mala	Skill	Must know	Show How	Activity based proformas	Viva/ through various Activities	Formative or Summative	III	
CO3	Explain dosha dhatu mala vaikruta (vrudha and ksheena ) karma (abnormal functions)	Cognitive/ Comprehen sion	Must know	Knows how	Lecturer Audio- Visual aids	Written & Viva	Formative or Summative	III	
CO3	Identify the effects due to vrudhi (increase) or kshaya (decrease) of dosha,dhatu and mala	Skill	Must know	Show How	Activity based proformas	Viva/ through various Activities	Formative or Summative	III	
CO3	Explain the relation between dosha and dhatu.	Cognitive/ Comprehen sion	Must know	Know how	Lecturer Audio- Visual aids	Written & Viva	Formative or Summative	III	
CO5	Explain the treatment principles for vitiated dosha, dhatu and mala	Cognitive/ Comprehen sion	Must know	Know how	Lecturer Audio- Visual aids	Written & Viva	Formative or Summative	III	
CO3	Elucidate the concept of agni	Cognitive/ Comprehen sion	Must know	Know how	Lecturer Audio- Visual aids	Written & Viva	Formative or Summative	III	
CO3	Discuss Superiority of Jatharagni	Cognitive/ Applicatio n	Must know	Know how	Lecture, Discussion	Written & Viva	Formative or Summative	III	
CO3	Assess the status of Agni.	Skill	Must know	Shows	Activities	Viva/Activites	Formative or Summative	III	
CO6	Explain the general pathophysiology for origin of Diseases	Cognitive/ Comprehen sion	Must know	Know how	Lecturer Audio- Visual aids	Written or Viva	Formative or Summative	III	

CO3 CO6	Explain the concept of Ojas	Cognitive/Comprehension	Must know	Know how	Lecture, Discussion	Written or Viva	Formative or Summative	III	
CO3 CO6	Explain aetiological factors for Ojakshaya	Cognitive/Comprehension	Must know	Know how	Lecturer	Written or Viva	Formative or Summative	III	
CO3 CO6	Explain Ojakshaya Lakshana	Cognitive/Comprehension	Must know	Know how	Lecture, Discussion	Written or Viva	Formative or Summative	III	
CO3 CO6	Identify Ojakshaya Lakshana	Skill	Must know	Show how	Lecturer Audio-Visual aids	Viva/activities	Formative or Summative	III	
CO5	Discuss general diet principles for vridhhi and kshaya (vitiated doshas)	Cognitive/ Application	Must know	Show How	Activity based proformas	Viva/ planned activities	Formative or Summative	III	
CO2	Recite shlokas from 1 to 45	Cognitive	Must Know	Knows	Self-learning	Written or Viva	Formative or Summative	III	
CO1	Identify Samucchaya, Adhikaran, Vakyashesh Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	III	
<b>Topic -13 Ashtang Hriday Samhita – Sutrasthan- Chapter 12. Doshabhedhiya Adhyaya- Time (Lecture:- 08 ; Non lecture 05 hours)</b>									
CO3	Enumerate the seats of vata, pitta and kapha doshas	Cognitive/ Recall	Must know	Knows	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	III	
CO3	Enlist types of vata, pitta and kapha dosha.	Cognitive/ Recall	Must know	Knows	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	III	
CO3	Describe the specific seats and functions of types of vata, pitta and kapha doshas.	Cognitive/ Recall	Must know	Knows	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	III	

CO3	Discuss the importance of types of vata, pitta and kapha doshas.	Cognitive/ Application	Must know	Knows how	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	III	
CO3	Identify the different types of dosha according to location and functions	Skill	Must know	Knows how	Proforma based activities	Written or Viva	Formative or Summative	III	
CO3	Elucidate the concept of Chaya (accumulation), Prakopa (aggravation) and Prashama (alleviation) of vata, pitta and kapha doshas.	Cognitive/ Comprehension	Must know	Knows how	Lecturer Audio-Visual aids	Written or Viva	Formative or Summative	III	
CO3	Discuss the impact of seasonal variation in accumulation and aggravation of vata, pitta and kapha doshas.	Cognitive/ Application	Must know	Knows how	Lecturer Audio-Visual aids/Discussion	Written or Viva	Formative or Summative	III	
CO3	Discuss the superiority of dosha in manifestation of diseases	Cognitive/ Application	Must know	Know how	Lecturer Audio-Visual aids/Discussion	Written or Viva	Formative or Summative	III	
CO3	Identify general aetiological factors responsible for manifestation of diseases	Cognitive/ Application	Must know	Know how	Lecturer/ Discussion	Written or Viva	Formative or Summative	III	
CO3	Describe Trividha Roga marga (pathways of diseases)	Cognitive/ Comprehension	Must know	Knows	Lecturer	Written or Viva	Formative or Summative	III	
CO3	Enlist various disorders of Trividha Roga marga (pathways of diseases)	Cognitive/ Recall	Must know	Knows	Lecturer/	Written or Viva	Formative or Summative	III	

CO3	Recognise the importance of concept of Trividha Roga marga in diagnosis and prognosis of diseases.	Cognitive/ Application	Must know	Knows how	Discussion	Written or Viva	Formative or Summative	III	
CO3	Enumerate the symptoms of aggravated Vata-Pitta – Kapha dosha	Cognitive/ Recall	Must know	knows	Lecture, Discussion	Written or Viva	Formative or Summative	III	
CO3	Identify the prakopa lakshana of dosha in various diseases	Skill	Must know	Show How	Discussion, Group activities	Written or Viva	Formative or Summative	III	
CO3	Explain the concept of unnamed diseases	Cognitive/ Comprehension	Must know	Knows how	Lecture, Discussion	Written or Viva	Formative or Summative	III	
CO3	Define svatantra and partantra vyadhi (primary and secondary diseases)	Cognitive/ Recall	Must know	Know	Lecture	Written or Viva	Formative or Summative	III	
CO3	Enumerate the types of assessment methods	Cognitive/ Recall	Must know	Know	Lecture, Discussion	Written or Viva	Formative or Summative	III	
CO3	Demonstrate the types of assessment methods.	Skill	Must know	Shows how.	Group Activities	Viva	Formative	III	
CO3	Explain the concept of Guru Vyadhit and LaghuVyadhit (gravity of disease and contrary presentation)	Cognitive/ Comprehension	Must know	Knows how	Lecture, Discussion	Written or Viva	Formative or Summative	III	
CO3	Enlist the 63 types of Permutation and combination of dosha	Cognitive/ Recall	Nice to know	Knows	Lecture	Written or Viva	Formative or Summative	III	
CO2	Recite the shlokas 1-72	Cognitive/ Recall	Must know	Shows	Self-learning	Written, Viva/Quiz	F & S	III	



CO1	Identify Apadesh, Samucchaya Tantrayukties in this chapter Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	III	
<b>Topic -14 Ashtang Hriday Samhita – Sutrasthan- Chapter 13 Doshopakramaniya Adhyaya-Time (Lecture:- 07 ; Non lecture 06 hours)</b>									
CO3	Explain the therapeutic procedures and specific management of vata, pitta and kapha dosha	Cognitive/ Comprehension	Must know	Knows how	Lecture	Written or Viva	F & S	III	
CO6	Explain the seasonal regimen to be adopted in various combinations of vitiated Doshas	Cognitive/ Comprehension	Must know	Knows	Lecture/Group Discussions	Written or Viva	F & S	III	
CO6	Discuss the importance of treatment of doshas in accumulation stage	Cognitive/ Application	Must know	Knows how	Lecture/Group Discussions	Written or Viva	F & S	III	
CO6	Differentiate the accurate and inaccurate therapeutic procedures.	Cognitive/ Comprehension	Must know	Knows how	Lecture/Group Discussions	Written or Viva	F & S	III	
CO6	Elaborate the factors responsible for movement of doshas from koshta to shakha and shakha to koshta.	Cognitive/ Comprehension	Must to know	Knows how	Lecture	Written or Viva	F & S	III	
CO6	Elaborate the concept of tiryag-gatadosha (migration to other abodes) and its treatment principle.	Cognitive/ Comprehension	Must to know	Knows how	Lecture	Written or Viva	F & S	III	
CO6	Describe the line of treatment for SthaniDosha (native) and AagantuDosha (immigrant)	Cognitive/ Comprehension	Must to know	Knows how	Lecture	Written or Viva	F & S	III	

CO6	Explain the concept of Aama.	Cognitive/Comprehension	Must to know	Knows how	Lecture	Written or Viva	F & S	III	
CO6	Enumerate the symptoms of saam and niraam doshas.	Cognitive	Must to know	Knows	Lecture	Written or Viva	F & S	III	
CO6	Elaborate the symptoms of saamadasha and their treatment	Cognitive	Must to know	Knows	Lecture	Written or Viva	F & S	III	
CO6	Analyze the 10 types of aushadha sevan kaal (Time, Method and indications of administration of medicine).	Cognitive/ Application	Must to know	Knows how	Lecture/Discussion	Written or Viva	F & S	III	
CO2	Recite the shlokas-1-41	Cognitive/ Recall	Must know	Shows	Self-learning	Written or Viva	F & S	III	
CO1	Identify Swasadnya, Nidarshan, Uddesh, Nirdesh Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	III	
<b>Topic -15 Ashtang Hriday Samhita – Sutrasthan- Chapter 14 Dvidividhopakramaniya Adhyaya-Time (Lecture:- 05 ; Non lecture 05 hours)</b>									
CO6	Elaborate the concept of two types of therapies - Langhan and Brihan	Cognitive/ Comprehension	Must know	Know how	Lecture	Written or Viva	F & S	III	
CO6	Describe the indications, methods, benefits of Brihan and symptoms of excess Brihan	Cognitive/ Comprehension	Must know	Know how	Lecture/Discussion	Written or Viva	F & S	III	
CO6	Explain the indications, methods, benefits of Langhan and symptoms of excess Langhan	Cognitive/ Comprehension	Must know	Know how	Lecture/ Discussion	Written or Viva	F & S	III	

CO6	Describe the indications of shodhan and shaman therapies	Cognitive/Comprehension	Must know	Know how	Lecture	Written or Viva	F & S	III	
CO6	Elaborate the concept of Atisthauya with the treatment module	Cognitive/Comprehension	Must know	Know how	Lecture	Written or Viva	F & S	III	
CO6	Elaborate the concept of Atikarshya with the treatment module	Cognitive/Comprehension	Must know	Know how	Lecture	Written or Viva	F & S	III	
CO2	Recite the shlokas – 1 to 7, 31 to 36	Cognitive/Recall	Must know	Shows	Self-learning	Written or Viva	F & S	III	
CO1	Identify Nirvachan, Samucchay, Nidarshan Tantrayukties in this chapter.	Cognitive/Application	Must know	Knows how	Lecturer/Group discussion	Viva	F & S	III	
<b>Topic -16 Ashtang Hriday Samhita – Sutrasthan- Chapter 15, Shodhanadigana Sangraha Adhyaya- Time (Lecture:- 02 ; Non lecture 04 hours)</b>									
CO7	Select the vaman, virechan, niruha, nasya gana according to their functions	Cognitive/Comprehension	Nice to know	Knows how	Lecture/Multimedia aids	Viva	Formative	III	Dravyaguna
CO7	Define the dravyas with their ingredients and actions.	Cognitive/Recall	Nice to know	Know	Lecture/Multimedia aids	Viva	Formative	III	
CO7	Identify the dravyas frequently used in treatments	Skill	Nice to know	Shows	Herbal garden visit	Viva	Formative	III	
<b>Topic-17. Charak Samhita Sutrasthan Chapter 1. Dirghamjivitiyam Adhyaya; Time (Lecture:- 07 ; Non lecture 02 hours)</b>									
CO1	Discuss the Ayurvedavatanam (Genealogy of Ayurveda)	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO8	Discuss the chaturvarga and its main factor for achieving it	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	

CO6	Discuss about the trisutra of Ayurveda (three principles of health and disease)	Cognitive	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO2	Discuss the about the six padarthas (six basic principles)	Cognitive	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO1	Discuss the characteristics of Ayurveda	Cognitive	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO2	Discuss the characteristics of Ayu (life) and its synonyms	Skill	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO2	Discuss the characteristics of samanya (similarity) and visha (difference/uniqueness)	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO2	Discuss about the Tridanda (tripod of life)	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO2	Discuss the classification and characteristics of the dravyas (basic elements)	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO2	Discuss the classification and characteristics of the gunas	Cognitive	Must know	Show How	Lecture	Written or Viva	F & S	I	
CO2	Define karma (actions)	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO2	Explain samavaya (inseparable concomitance)	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO1	Explain the aims of Ayurveda	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	

CO6	Explain the three causative factors of disease	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO6	Explain the abode of vyadhi and arogya	Cognitive	Must know	Show how	Lecture	Written or Viva	F & S	I	
CO2	Discuss the characteristics of Atma	Cognitive	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO6	Explain the sharira and manasa doshas	Cognitive	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO6	Discuss the treatment of sharira and manasa doshas	Cognitive	Must know	knows How	Lecture	Written or Viva	F & S	I	
CO3	Discuss the gunas of vayu and its treatment	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO3	Discuss the gunas of pitta and its treatment	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO3	Discuss the gunas of shleshma and its treatment	Cognitive	Must know	Knows How	Lecture	Written or Viva	F & S	I	
CO6	Discuss about the treatment for sadhya and asadhya vikara (curable and incurable disease)	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO2	Explain the rasa	Cognitive	Must know	Knows how	Lecture	Written or Viva	F & S	I	
CO2	Classify the dravya based on their effects on body and their origin	Cognitive	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO7	Enumerate the dravya based on the useful parts (upayuktanga)	Cognitive	Desirable to know	Know how	Lecture/Mul timedia aids	Written or Viva	F & S	I	
CO7	Discuss about the identification of drugs by name, form and its action	Cognitive	Must know	Know how	Lecture/Mul timedia aids	Written or Viva	F & S	I	

CO8	Discuss about the duties for one aspires to be a physician.	Cognitive	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO7	Discuss about the best drug	Cognitive	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO8	Discuss about the best physician endowed with all good qualities	Cognitive	Must know	Know how	Lecture	Written or Viva	F & S	I	
CO2	Recite the shlokas 15, 24,28,29, 31, 41, 42, 44-67, 134,135	Cognitive/ Recall	Must know	Shows	Swadhyaya (self learning)	Written or Viva	F & S	I	
CO1	Identify Uddesha, Niradesh Tantrayukties in this chapter	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	I	

**Topic-18. Charak Samhita Sutrasthan Chapter 2. Apamarga Tanduliya Adhyaya; Time (Lecture:- 02 ; Non lecture 03 hours)**

CO7	Enumerate few Shiro Virechana Dravya & Main Indications	Cognitive	Desirable to know	Knows	Lecture/Audiovisual aids/ Herbal garden visit	Written or Viva	F & S	II	Dravyaguna
CO7	Enumerate few Vamana Dravya & Main Indications	Cognitive	Desirable to know	Knows	Lecture/Audiovisual aids/ Herbal garden visit	Written or Viva	F & S	II	Dravyaguna
CO7	Enumerate few Virechana Dravya & Main Indications	Cognitive	Desirable know	Knows	Lecture/Audiovisual aids/ Herbal garden visit	Written or Viva	F & S	II	Dravyaguna
CO7	Enumerate few Asthapana Basti Dravya & Main Indications	Cognitive	Desirable to know	Knows	Lecture/Audiovisual aids/ Herbal garden visit	Written or Viva	F & S	II	Dravyaguna

CO7	Enumerate few Anuvasana Basti Dravya & Main Indications	Cognitive	Desirable to know	Knows	Lecture/Audiovisual aids/ Herbal garden visit	Written or Viva	F & S	II	Dravyaguna
CO7	Enumerate the names & Main Indications of 28 Types of Yavagu	Cognitive	Desirable to Know	Knows	Lecture/Audiovisual aids	Written or Viva	F & S	II	Rasshastra-bhaishjya dept
CO7	Explain the Importance Of Panchakarma	Cognitive	Must know	Knows	Lectures	Written or Viva	F & S	II	Panchkarma
CO7	Explain the features of Vaidya	Cognitive	Must know	Knows	Lecture/Group Discussion	Written or Viva	F & S	II	
CO7	Recite Shlokas 15,16,36	Cognitive/Recall	Must know	Shows	Self-learning	Written or Viva	F & S	II	
CO7	Identify the dravyas on the basis of actions	Psychomotor	Must know	Shows	Herbal garden visit	Viva	Summative	II	Dravyaguna
CO1	Identify Upadesh, Samucchaya Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	
<b>Topic-19. Charak Samhita Sutrasthan Chapter 3. Aragvadhya Adhyaya-Time (Lecture:- 01 ; Non lecture 03 hours)</b>									
CO7	Mention Thirty Two Churna Pradeha & Main Indications	Cognitive	Desirable to know	Knows	Lectures/Multimedia aids	Written or Viva	Formative	II	Ras-bhaishjya/ Kayachikitsa
<b>Topic-20. Charak Samhita Sutrasthan Chapter 4. Shadvirechana-shatashritiya Adhyaya-Time (Lecture:- 03 ; Non lecture 04 hours)</b>									
CO7	List the six abodes of purgatives	Cognitive/Recall	Must know	Know	Discussion	Written or Viva	F & S	II	Dravyaguna
CO7	Enlist the five tastes for medicinal preparation	Cognitive/Recall	Must know	Know	Lecture, discussion	Written or Viva	F & S	II	Rasashastra &

									bhaishajya Kalpana
CO7	Define the five types of medicinal preparations/ forms	Cognitive/ Recall	Must know	Know	Lecture / Multimedia aids	Written or Viva	F & S	II	Ras-bhaishjya
CO7	Enlist the 50 groups of medicines as per their actions	Cognitive/ Recall	Desirable to know	Know	Lecture	Written or Viva	F & S	II	Dravya guna
CO7	Limitations for description of medicinal drugs in Samhita	Cognitive/ Comprehension	Nice to know	Know how	Lecture	Written or Viva	Formative	II	
CO1	Identify Swasadnya , Samucchaya, Yog Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	

**Topic-21. Charak Samhita Sutrasthan Chapter-05 Matrashiteeya Adhyaya\_ Time (Lecture:- 03 ; Non lecture 05 hours)**

CO5	Explain Matravat Ahara	Cognitive/ Recall	Must know	Know	Lecturer, Audio-Visual aids, Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a
CO5	Define and enlist Nature of Ahara (Guru, Laghu)	Cognitive/ Recall	Must know	Knows how	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a
CO5	Explain the significance of MatravatAharaPhala	Cognitive/ Recall	Must know	Know how	Lecturer, Audio-Visual aids, Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a
CO5	Discuss role of AharaSevanaVidhana on the bases of its nature	Cognitive/ Comprehension	Must know	Know how	Lecturer Audio-Visual aids	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a



					Group Discussion				
CO2	Define Swasthavrutta	Cognitive/ Recall	Must know	Knows	Lecturer Audio-Visual aids Group Discussion	.Viva	<b>Formative and Summative</b>	II	Swastarutt a
CO6	Explain Anjana	Cognitive/ Comprehension	Must know	Know	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a
CO6	Explain Dhumapana	Cognitive/ Comprehension	Must know	Knows how	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a, Shalakya , Panchakar ma
CO6	Explain Nasya	Cognitive/ Comprehension	Must know	Knows how	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a, Shalakya , Panchakar ma
CO6	Explain Dantadhavana	Cognitive/ Comprehension	Must know	know How	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a,
CO6	Explain Jivhanirlekhana	Cognitive/ Comprehension	Must know	know How	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a,
CO6	Explain Gandusha	Cognitive/ Comprehension	Must know	Knows how	Lecturer Audio-Visual aids	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a,

					Group Discussion				
CO6	Explain Abhyanga with types	Cognitive/Comprehension	Must know	Knows how	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a, Panchakarma
CO6	Describe Parimarjana	Cognitive/Comprehension	Must know	Knows how	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a,
CO4	Describe the VastraGandhaMalyadiDhara	Cognitive/Comprehension	Must know	Knows how	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a,
CO4	Explain the concept of Shouchavidhi	Cognitive/Comprehension	Must know	Knows how	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a,
CO4	Discuss the Kshoura Karma	Cognitive/Comprehension	Must know	Know how	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a,
CO4	Define PadatraDharan with importance	Cognitive/Recall	Must know	Know how	Lecturer Audio-Visual aids Group Discussion	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a,
CO4	Explain the ChatraDharana	Cognitive/Recall	Must know	knows How	Lecturer Audio-Visual aids	Written or Viva	<b>Formative and Summative</b>	II	Swastarutt a,

					Group Discussion				
CO4	Justify the importance of the procedures mentioned as dincharya	Cognitive/ Application	Must know	Shows how	Group Discussion	Group Discussion/ Project work	<b>Formative and Summative</b>	II	
CO2	Recite the shlokas 4, 12-13, 34-35, 56-57,68-69, 81-83, 103	Cognitive/ Recall	Must know	Shows	Swadhyaya (self learning)	Viva	F & S	II	
CO1	Identify Upadesh, Padarth,, Nidarshan Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	
CO4	Research Updates: Role of Dinacharya to maintain circadian rhythm Role of therapeutic message for cell rejuevination  Mechanism of satiation and proper quantity of food (Sauhitya Matra)	Cognitive	Nice to know	Knows how	Lecture; Audio-vidual aids	Group discussion	-	II	
<b>Topic-22. Charak Samhita Sutrasthan Chapter-6. Tasyashiteeya Adhyaya-Time</b> (Lecture:- 04 ; Non lecture 04 hours)									
CO2	Discuss the importance of Classification of Samvastara	Cognitive/ Comprehsion	Must know	Knows how	Lecture Audio-Visual aids Group Discussion	Written or Viva	Formative and Summative	II	
CO2	Explain the significance of Visarga Kala	Cognitive/ Comprehsion	Must know	Know how	Lecture Audio-Visual aids Group Discussion	Written or Viva	Formative and Summative	II	

CO2	Explain the significance of Adana kala	Cognitive/ Recall	Must know	Know how	Lecture Audio-Visual aids Group Discussion	Written or Viva	Formative and Summative	II	
CO4	Explain the nature of climate in Shadrutu	Cognitive/ Recall	Must know	Know how	Lecture Audio-Visual aids Group Discussion	Written or Viva	Formative and Summative	II	
CO4	Explain Sevaniya and Nishiddh Ahara Vihara in Shadrutu	Cognitive/ Recall	Must know	Know how	Lecture Audio-Visual aids Group Discussion	Written or Viva	Formative and Summative	II	
CO4	Define and explain the properties of Hamsodaka	Cognitive/ Recall	Must know	Knows	Lecture Audio-Visual aids Group Discussion	Written or Viva	Formative and Summative	II	
CO4	Justify the regimen mentioned as per seasons	Cognitive/ Application	Must know	Show how	Group Discussion	Group Discussion/ Project work/viva	Formative and Summative	II	
CO2	Describe Saatmya and its types	Cognitive/ Recall	Must know	Knows	Lecture Audio-Visual aids Group Discussion	Written or Viva	Formative and Summative	II	
CO2	Recite Shloka number 18, 21, 29, 35, 45, 49, 50	Cognitive/ Recall	Must know	Knows	Swadhyaya -Self learning	Written or Viva	Formative and Summative	II	
CO1	Identify Uddesh- Nirdesh , swasadnya Tantrayukties in this chapter..	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	

CO4	Research Updates: What causes the season: Summer and winter solistice- Equinoxes- Rotation of earth around sun.	Cognitive/ Applicatio n	Nice to know	Knows	Lecture, Audio- vidual aids	Group discussion	-	II	
<b>Topic-23. Charak Samhita Sutrasthan Chapter-7. Naveganadharaniya Adhyaya-Time (Lecture:- 04 ; Non lecture 04 hours)</b>									
CO4	Enumerate Adharaniya and Dharaniya Vega	Cognitive/ Recall	Must to know	know	lecture/ Group discussion/	Written or Viva	F & S	II	
CO4 CO6	Describe symptoms and treatment pattern of Adharaniya Vega	Cognitive	Must to know	Know how	lecture/ Group discussion /quiz	Written or Viva	F & S	II	
CO4	Cite symptoms and treatment pattern of Dharaniya Vega	Cognitive	Must to know	Know how	lecture/ quiz/Group discussion	Written or Viva	F & S	II	
CO4	Quote the contraindicated actions of mind, speech and body.	Cognitive	Must to know	Know	lecture/ quiz/Group discussion	Written or Viva	F & S	II	
CO4	Describe concept, effects and benefits of exercise	Cognitive	Must to know	Know how	lecture/ recitation/ quiz/Audiov isual aids	Written or Viva	F & S	II	Swasthav ritta
CO4	describe symptoms due to excessive exercise	Cognitive	Must to know	Know	lecture/ Group discussion/ quiz/Audiov isual aids	Written or Viva	F & S	II	Swasthav ritta
CO4	Describe the action which should be avoided in excess	Cognitive	Must to know	Know how	lecture/ Group discussion /quiz	Written or Viva	F & S	II	

CO4	Describe pattern of Ahita Krama tyaga	Cognitive	Must to know	Know how	lecture/ Group discussion/ quiz	Written or Viva	F & S	II	
CO4	Classify deha prakruti	Cognitive	Must to know	Know	lecture/ Group discussion/ quiz	Written or Viva	F & S	II	
CO6	Describe Aagantuj vyadhis (exogenous diseases)	Cognitive	Must to know	Know	lecture/ Group discussion/ quiz	Written or Viva	F & S	II	Nidan
CO6	Describe Pradnyaparadhaj vyadhi	Cognitive	Must to know	Know	lecture/ Group discussion/ quiz	Written or Viva	F & S	II	Nidan
CO4	State Vikar Anutpatti Vidhi (Preventive measures of diseases)	Cognitive	Must to know	Know how	lecture/ Group discussion/ quiz	Written or Viva	F & S	II	
CO6	describe treatment of Aagantuj (exogenous) and Manas (psychological)diseases	Cognitive	Must to know	Know how	lecture/ Group discussion/ quiz	Written or Viva	F & S	II	
CO4	Describe shodhan treatment as per season	Cognitive	Must to know	Know how	lecture/ Group discussion/ quiz	Written or Viva	F & S	II	Panchkar ma
CO4	Describe Aapta and anapta purush	Cognitive	Must to know	Know	lecture/ Group discussion/ quiz	Written or Viva	F & S	II	
CO4	Describe the rules of eating curd	Cognitive	Must to know	Know how	lecture/ Group	Written or Viva	F & S	II	

					discussion/ quiz				
CO2	Recite shloka number 27, 28, 29, 30, 31, 39, 40, 55, 60.	Cognitive	Must to know	Know how	lecture/ Group discussion/ quiz	Written or Viva	F & S	II	
CO1	Identify Arthapatti , Nirvachan, Vyakhyan Tantrayukties in this chapter.	Cognitive/ Applicatio n	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	
CO4	Research Updates: Corelation of genomic variation with the classification of Prakriti	Cognitive/ Recall	Desire to know	Know	lecture/ Audio- vidual aids	Group discussion	-	II	

**Topic-24. Charak Samhita Sutrasthan Chapter-8. Indriyopakramaniya Adhyaya- Time (Lecture:- 04 ; Non lecture 03 hours)**

CO2	Enumerate Indriya/ Dravya/Adhishthana/ Artha/ Buddhi	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO4	Write the characteristics of Mana	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO4	Justify the ektvam of Manas	Cognitive/ Comprehe nsion	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO4	State that Sattvikatva, Rajasatva and Tamasatva of Manas	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO4	Tabulate Indriya PanchaPanchaka	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO4	Quote Adhyatma Dravya Guna Sangraha	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	

CO4	State the predominant Mahabhuta in each Indriya	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	II	
CO4	Know the role of Indriya and Mana in Prakriti and Vikriti	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	II	
CO4	Discuss the Causes and Benefits of Sadvritta Anushthana	Cognitive/ Comprehension	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	II	
CO4	Elaborate the Do's and Don'ts in Sadvritta	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids/ Group Discussion	Written or Viva	Formative & Summative	II	
CO4	Explain Hetuchatushtaya	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	II	
CO4	State the guideline for Anukta Sadvritta	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	II	
CO2	Recite the shloka number 7-13, 34	Cognitive/ Recall	Must know	Shows	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	II	
CO1	Identify Upadesh , Samucchaya, Yog Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	Formative & Summative	II	
CO4	Research updates: Mental health and gut microbiota.	Cognitive/ Application	Nice to know	Know	Lectures/ Audio-Visual Aids	Group discussion	-	II	
<b>Topic-2CO Charak Samhita Sutrasthan Chapter-9. Khuddakachatushpada Adhyaya- Time (Lecture:- 03 ; Non lecture 03 hours)</b>									
CO8	Cite Chikitsa Chatushpada (four components of healthcare)	Cognitive	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	II	



CO8	Define Roga-Arogya (disease-health)	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	Define Chikitsa (treatment)	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	List the Qualities of Vaidya (physician)	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	List the Qualities of Dravya (medicine)	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	List the Qualities of Paricharaka (nursing staff)	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	List the Qualities of Aatura (patient)	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	State the iimportance of Vaidya in the 4 components of healthcare	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	Write the Complications due to ignorant physician	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	Describe the Sadvaidya Qualities (good physician)	Cognitive/ Comprehe nsion	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	Write the duties of the physician	Cognitive/ Comprehe nsion	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	
CO8	List Four types of Vaidya vritti (attitude of the physician)	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	II	

CO8	Recite the shloka number 3,4,5,18,20,21, 24,25,26	Cognitive/ Recall	Must know	Shows	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	II	
CO8	Discuss the qualities and duties of a good physician	Cognitive/ Application	Must know	Shows how		Written or Viva	Formative	II	
CO1	Identify Uddesh, Nirdeśh, Nidarshan Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	
CO8	Research Updates: Medical ethics-principles Soft Skill development for medical students Emotional Intelligence as a crucial component in medical education	Cognitive	Nice to know	Knows	Lecture / Audio-Visual aids	Group discussion	-	II	

**Topic-26. Charak Samhita Sutrasthan Chapter-10. Mahachatushpada Adhyaya- Time (Lecture:- 03 ; Non lecture 03 hours)**

CO6	Substantiation of Chatushpada- bhashajam alam aarogyaayeti (aatreya-kṛta), Bhashaja-abhashajayo tulyatva pratipaadana – (maitreya-kṛta), Its conclusion by Atreya,	Cognitive/ Recall	Desirable to know	Knows	Lecture with substantiation of the point by mentioning contemporary examples	Written & Viva	F & S	II	
CO6	Explain the Cikitsaa sootram- Cikitsaayaam yasolaabhe kaaranam,	Cognitive/ Recall	Desirable to know	Knows	Lecture with substantiation of the point by mentioning	Written or Viva	F & S	II	

					contemporar y examples				
CO6	Asaadhyaroga- cikitsaayaam haani,	Cognitive/ Recall	Desirable to know	Knows	Lecture with substantiatio n of the point by mentioning contemporar y examples	Written or Viva	F & S	II	
CO6	Describe the upamaana pramaana	Cognitive/ Recall	Desirable to know	Knows	Lecture with substantiatio n of the point by mentioning contemporar y examples	Written or Viva	F & S	II	
CO6	Enumerate and analyse the further classification of saadhya-asaadhyata	Cognitive/ Recall	Must know	Knows	Lecture with live demonstrati on in OP	Written or Viva	F & S	II	
CO6	Identify, judge and discuss Sukha-saadhya lakshanam, Krcchra- saadhya lakshanam, Yaapya lakshanam and Pratyaakhyeya lakshanam	Cognitive/ Recall	Must know	Knows how	Lectures and clinical demonstrati on	Viva / written Problem based assessment	F & S	II	
CO6	Apply and interpret the benefit of knowledge of prognosis	Cognitive/ Recall	Must know	Knows	Lectures	Written or Viva	F & S	II	
CO6	Analyse the term mithyaa- buddhi and accept responsibility to not end up as a mithyaa-buddhi at	Cognitive/ Recall	Must know	Knows	Lectures	Written or Viva Discussions	F	II	

	any point of time of the profession								
CO6	Recite Shloka number 14 to 20	Cognitive/ Recall	Must know	Knows	Lecture, swaadhyaya	Viva	F & S	II	
CO1	Identify Nirnaya, Swasdnya, Sanshaya, Ekant Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	II	
<b>Topic-27. Charak Samhita Sutrasthan Chapter-11. Tisraishaniya Adhyaya- Time (Lecture:- 06 ; Non lecture 05 hours)</b>									
CO4	Explain the significance of the three desires for prana (life) and dhana(means of life).	Cognitive/ Recall	Must know	Know how	Lectures/ Audio- Visual Aids	Written & Viva	Formative & Summative	III	
CO4	Discuss the concept of paraloka	Cognitive/ Recall	Must know	Know how	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	III	
CO4	Discuss different opinions on the concept of punarjanma (re-birth)	Cognitive/ Recall	Must know	Know how	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	III	
CO2	Define characteristics of Aapta	Cognitive/ Recall	Must know	Know	Lectures/ Audio- Visual Aids	Written or Viva	Formative & Summative	III	
CO2	Define pratyaksha, anumana and yuktipramana with example	Cognitive/ Recall	Must know	Know how	Lectures/ Audio- Visual Aids	Lectures/ Audio- Visual Aids	Formative & Summative	III	

CO2	Justify punarjanma by using aaptopadesha, pratyaksha, Anumana and yuktipramana	Cognitive/ Application	Must know	Know how	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO4	Explain the importance of thrayopasthamba (sub-pillars of life).	Cognitive/ Application	Must know	Know how	Lectures/ Audio-Visual Aids	Written-MCQ/ SAQ/ LAQ & Viva	Formative & Summative	III	
CO4	Discuss the three types of bala (strength) and its importance.	Cognitive/ Application	Must know	Know how	Lectures/ Audio-Visual Aids	Written & Viva	Formative & Summative	III	
CO6	Describe the three causes of disease.	Cognitive/ Application	Must know	Know	Lectures/ Audio-Visual Aids	Written & Viva	Formative & Summative	III	
CO6	Identify the symptoms due to excessive, less and improper use of sense organs	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO6	Identify the symptoms due to excessive, less and improper verbal, psychic and physical actions.	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO6	Define Prajnaparadha	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	

CO6	Identify the signs of excess, less and improper kaala (season)	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO6	Define nija, agantu and manasa roga.	Cognitive/ Recall	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO6	Discuss general treatment protocol for manasavyadhi (psychological disorders)	Cognitive/ Comprehension	Must know	Know how	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO6	Discuss the three disease pathways	Cognitive/ Comprehension	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO8	Classify the three types of physicians	Cognitive/ Comprehension	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO6	Describe daivavyapashraya, yuktivyapashraya and satvavajayachikitsa	Cognitive/ Comprehension	Must know	Know how	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO6	Describe antahaparimarjana, bahiparimarjana, shastrapr anidhanachikitsa.	Cognitive/ Comprehension	Must know	Know how	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	

CO2	Discuss importance of ashta trika.	Cognitive/ Application	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO2	Recitation of Shloka number 18,19,20,21,22,23,24, 25, 47.	Skill	Must know	Know	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO1	Identify Swasadnyaa, samucchaya , Samshaya, Nirvachan Tantrayukties in this chapter.	Cognitive/ Application	Must know	Knows how	Lecturer/ Group discussion	Viva	F & S	III	

**Topic-28. Charak Samhita Sutrasthan Chapter-12. Vatakalakaliya Adhyaya-Time (Lecture:- 04; Non lecture 05 hours)**

CO4	explore the various properties of vata	Cognitive/ Recall	Must know	Knows how	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO4	Discuss the opinions of various aacharyas on different aspects of Vata dosha	Cognitive/ Recall	Must Know	Knows	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO4	Explore various factors responsible for aggravation and and pacification of vata dosha	Cognitive/ Recall	Must know	Knows how	Lectures/ Audio-Visual Aids/Group Discussion	Written or Viva	Formative & Summative	III	
CO4	enumerate prakrita and vikrita karma of vata	Cognitive/ Recall	Must know	Knows how	Lectures/ Audio-Visual Aids/ Group Discussion	Written or Viva	Formative & Summative	III	
CO4	Explain the clinical application of Vata Guna	Cognitive/ Recall	Desirable to know	Knows how	Lectures/ Audio-Visual Aids	Written or Viva	Formative & Summative	III	

CO4	Describe the action of normal and aggravated Pitta	Cognitive/Comprehension	Must know	Knows how	Lectures/Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO4	Describe the action of normal and aggravated Kapha	Cognitive/Comprehension	Must know	Knows how	Lectures/Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO4	Describe atreya's exploration on Tridosha and its importance	Cognitive/Comprehension	Must know	Knows how	Lectures/Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO4	Recite the shlokas-8,11,12	Cognitive/Recall	Must know	Shows	Lectures/Audio-Visual Aids	Written or Viva	Formative & Summative	III	
CO1	Identify Padartha, Vyakhyan, Anumat Tantrayukties in this chapter	Cognitive/Application	Must know	Knows how	Lecturer/Group discussion	Viva	Formative & Summative	III	

**Table 4 : Practical/ Activities for AyUG - SA 1**

Term wise distribution of allotted time				
Term	Total teaching (400 hrs)	Lecture (140 hrs)	Non Lecture (260hrs)	
			Samhita Pathan (130 hrs)	Activities- In class/ Hospital (130 hrs)
I	130 hrs.	50 hrs.	50	30
II	140 hrs.	50 hrs.	40	50
III	130 hrs.	40 hrs.	40	50



**Table 5: Non Lecture Activities Course AyUG-SA1**

Non Lecture activities- (Samhita Pathan / In Class Activities &amp; Hospital Based activities)

: 260 hrs

SN	Name of Practical	Term	
1.	Samhita Pathan	I, II, III	Total 130 in all three terms. (Term I-50 hrs; Term II - 40hrs; Term III - 40hrs)
	In Class Activities/ Case Based Activities/ Field Activities		
2.	1. Introduction to Samhita Problem based learning : Application of Tantrayukti for chapter number 1, 2 of Ashtang Hridaya and chapter 1 <sup>st</sup> of charak Samhita.	I	5 hrs.
	Group Activity Interpret Anubandha Chatushtya with examples Interpret Ashta Prashna with example	I	4 hrs
	Ashtang Hriday Samhita - Sutrasthan (1-5Adhyaya)		
3.	AH Su 1. Ayushkamiya Adhyaya Commentary Based activity- Fetch the meaning of important terms on the basis of commentary. (Any 30 important words). Make your own dictionary.	I	3 hrs
4.	AH Su 2. Dinacharya Adhyaya- Survey Activity: Application of concepts-  Dincharya and its application:  Proforma based assessment in healthy volunteers/ patients. Daily routine shall be recorded on the basis of predesigned proforma and then shall discuss.  Communication Skill introduction. Survey Role play.	I	4 hrs

5.	AH Su 3. Rutucarya Adhyaya- Application of concepts- Ritucharya and application -  Proforma based assessment in healthy individuals or patients.	<u>I</u>	4 hrs
6.	AH Su 4. Roganutpadaniya Adhyaya- Case Based Activity/Learning- Assess the sign and symptoms of given case on the basis of learning of Adharaneeya Vegas and find out the probable causative factors on the basis of principles taught.	<u>I</u>	4 hrs
7.	AH Su 5. Dravadravya Vijnaniya Adhyaya Group Activity-(Group presentation)- Utility of Dravyas:- Allocate the Dravadravya Vargas among student groups. Every group will Justify (represent) the practical utility of dravyas allotted to them.	<u>I</u>	4 hrs
8.	6. Annaswaroopo Vijnaneeya Adhyaya- Group presentation- Justify the utility of this chapter in present era- Every group will illustrate the utility of their assigned Aahara Dravya Varga (Discuss practically available dravyas)	<b>II</b>	3 hrs
9.	7. Annaraksha Adhyaya- Discussion- Explore the present dietary habits- Explore the Various diet combinations used in present society (by four family/ Relatives/ neighborhood) on the basis of principles learned for viruddhahar. Discuss them in class.  Trayopastambha -Importance of Nidra- Flipped classroom- Share the prerecorded videos/ other material with students before class. On the basis of these have discussion.	<b>II</b>	4 hrs
10.	8. Matrashitiya Adhyaya- Case Based learning- Determine adverse effects of heena matra	<b>II</b>	4 hrs

	<p>(inadequate quantity of food) and atimatra (excess quantity of food) ahara:- (Video clip of patient suffering from a type of Ajeerna can be shared in class and then group wise discussion on the concept.)</p> <p>Group Activity- Differentiate between the food items recommended and non-recommended for daily use:- Cross refer the previous chapters and demonstrate the rationale behind the wholesome or unwholesome nature of these enlisted Dravyas referring their qualities.</p>		
11.	<p>9. Dravyaadi Vijnaniya Adhyaya- Application of concepts- Enlist the dravyas according to Rasa, Veerya, Vipaka, Prabhav. (Can refer chapter 5,6,10 of Ashtang Hriday and Chapter 2, 3, 4 of Charak Samhita). Apply the concepts learned in present chapter to understand the action of Dravyas.</p>	<b>II</b>	4 hrs
12.	<p>10. Rasabhedhiya Adhyaya- Case based learning- Prepare proforma enlisting the sign and symptoms of excess consumption of six Rasas and regular diet pattern. Assess the predominance of Rasa consumption in patients or healthy volunteers. Then Correlate with the case findings.</p>	<b>II</b>	4 hrs
13.	<p>11. Doshadi Vijnaniya Adhyaya- Case Based learning-(CBL)- Assess the patient for Vriddhi and Kshaya Lakshanas of Dosha-Dhatu-Mala, based on predesigned proforma. Discuss these case findings later in class.</p>	<b>III</b>	5 hrs
14.	<p>12. Doshabhedhiya Adhyaya- Model making Activity- Working models on Dosha Sthanas or Subtypes of Doshas, Chaya, Prakop and Prashama of Doshas: PBL/CBL</p>	<b>III</b>	5 hrs

	Give one problem/case based on Samanya Dosh Nidan. Student will identify possible causative factors responsible for vitiation of Doshas in given problem.		
15.	<p>13. Doshopakramaniya Adhyaya- Case Based learning-(CBL)- Group activity- Observe the signs and symptoms of Ama in any five patients (Group wise) and present and discuss it in class.</p> <p>Seminar Presentation-</p> <ol style="list-style-type: none"> <li>Understand Aushadha Kaal in relation with suntypes of Vata Dosha.</li> <li>Recognize the principles applicable during treatment of Saam Dosha and Dushyas.</li> </ol>	<b>III</b>	6 hrs
16.	<p>14. Dvividhopakramaniya Adhyaya-</p> <p>Case based learning- Find out the causative factors of Atishualya in present era (On the basis of predesigned proforma) CBL Share video clip of any patient suffering from Atikarshya- On the basis of previous learning discuss the contributing factors responsible for malnourishment. (Explore Dhatu Sneha Parampara in present context).</p>	<b>III</b>	5 hrs
17.	<p>15. Shodhanadigana Sangraha Adhyaya- Group Presentation- Divide the various Aushadha Vargas among students and a group will represent each varga and related practical information.</p>	<b>III</b>	4 hrs
	Charak Samhita – Sutrasthan (1-12 Adhyaya )		
18.	<p>CS Su 1. Deerghanjiviteeya Adhyaya-</p> <p>Compilation work: (based on commentry)</p> <ul style="list-style-type: none"> <li>Student has to write 20 terminologies with meanings referring Chakrapani commentary. Then after these terms shall be discussed in class.</li> </ul>	<b>I</b>	2

19.	CS Su 2. Apamarga Tanduliya Adhyaya- Visit to Dravyaguna Department- Identify the dravyas on the basis of different karmas	<b>II</b>	3 hrs
20.	CS Su 3. Aragvadhiya Adhyaya- Group Discussion- Probable mode of action of drugs applied externally? In which form they will more absorbable? (May take help of published literature; discuss linking with Ayurveda fundamentals.)  Practical demonstrations in Panchakarma unit on patients.  Workshop/ demonstration of preparation of different lepas useful in different conditions.	<b>II</b>	3 hrs
21.	CS Su 4. Shadvirechana-shatahritiya Adhyaya- Practical Demonstration: Visit to Dravyaguna Department and demonstration of various Mahakashay and its uses (Integration with Dravyaguna department)	<b>II</b>	4 hrs
22.	CS Su 5. Matrashiteeya Adhyaya- Visit to Panchakarma Unit of Hospital – Demonstration of abhyanga, mardana,udvartana and other procedures to be followed in daily routine (Integration with Panchakarma Department)  Group Project :  Gather information about nutritive values of Nitya Sevaniya Dravyas. Assess their classical properties. Discuss why these dravyas are specially advised for regular consumption.	<b>II</b>	5 hrs
23.	CS Su 6. Tasyashiteeya Adhyaya- Documentation- Festival and rutu- Documenting the changes in the food habits and	<b>II</b>	4 hrs

	<p>lifestyle as per the rutu with the parents and elders and also discussing on relevance of rutucharya concept with Indian festivals.</p> <p>Short Essay writing /Poster making- Does and don'ts to be followed according to various seasons ( Refer both the Samhitas for this activity)</p>		
24.	<p>CS Su 7. Naveganadharaniya Adhyaya:-</p> <p>Vedio clip making Activity- Educating people about harms of vega dharana by social media campaigns</p> <p>Group Discussion- Finding reasons for vega dharana in present day lifestyle.</p>	<b>II</b>	4 hrs
25.	<p>CS Su 8. Indriyopakramaniya Adhyaya- Group Presentation- Sadvrutta – Interpreting relevance of different sadvrutta in present scenario. Developing new sadvruttas as per today's lifestyle referring classics.</p>	<b>II</b>	3 hrs
26.	<p>CS Su 9. Khuddakachatushpada Adhyaya- Doctor Patient communication introduction, Role play. Feedback collection of chikitsa chatushpada Group activity- Collect Feedback on qualities of Vaidya from rogi and upasthata. Collect Feedback on qualities of rogi from vaidya and upasthatha Collect Feedback on qualities of upasthatha from rogi and Vaidya Collect feedback on qualities of dravya from the experts of dravyaguna and rasa shastra</p>	<b>II</b>	3 hrs
27.	<p>CS Su 10. Mahachatushpada Adhyaya- Developing proforma for sadhya asadhya vyadhi lakshanas-</p>	<b>II</b>	3 hrs

	Guide students on how to prepare a proforma to assess any available parameters.		
28.	CS Su 11. Tisraishaniya Adhyaya- Debate :- Punarjanma siddhant as per different thoughts. Debate on punarjanma with different references as per classics and contemporary understanding.	<b>III</b>	5 hrs
29.	CS Su 12. Vatakalakaliya Adhyaya- Role Play (Enact sambhasha parishad) – Distribute the characters of the rishis given in chapter. And guide them with the script. Arrange a forum where these students will be doing sambhasha parishad on vata kala-akala.  Decode the sutras- Students in groups will use different tools like infographics/ animation/ ppts to illustrate the normal functions of Vata Dosha explained in present chapter. (Refer Chakrapani commentary thoroughly to understand the meaning of Sanskrit shlokas). Introduction to Group Dynamics. Communication skills for Group Discussions.	<b>III</b>	5 hrs
30.	Shloka Recitation Competition- At the end of the year/ every term such competition shall organized by department.	<b>III</b>	5 hrs
31.	Ayurveda Quiz- On the basis of assigned syllabus.	<b>III</b>	5 hrs
32.	Poster making Competition / SA writing completion / Making video clips for general people to make awareness about Ayurved living.	<b>III</b>	5 hrs

**Table 6: Assessment Summary****6 A - Number of Papers and Marks Distribution**

S.No.	Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand Total
				Practical/Clinical	Viva	Electives	IA	Sub Total	
1.	AyUG-SA1	1	100	-	75	10 (Set-FC)	15	100	200

**6 B - Scheme of Assessment (formative and Summative)**

SR.NO.		PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
			First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
1	AyUG-SA1	First	3 PA & First TT	3 PA & Second TT	3 PA & UE
		PA: Periodical Assessment; TT: Term Test; UE: University Examinations			

**6 C - Calculation Method for Internal assessment Marks (15 Marks)**

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A	B	C	D	E	F	G	H
		1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 15 Marks (D/15*15)	Term Test (Marks converted to 15) (15 Marks)	Sub Total _/30 Marks
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert to 15 marks.							

**6 D - Evaluation Methods for Periodical Assessment**

S. No.	Evaluation Methods
1.	Activities Indicated in Table 3 - Column G3 as per Indicated I, II or III term in column I3.
2.	Practical / Clinical Performance



3.	Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
4.	Open Book Test (Problem Based)
5.	Summary Writing (Research Papers/ Samhitas)
6.	Class Presentations; Work Book Maintenance
7.	Problem Based Assignment
8.	Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)
9.	Extra-curricular Activities, (Social Work, Public Awareness, Surveillance Activities, Sports or Other Activities which may be decided by the department).
10.	Small Project

## 6 E - Paper Layout

### I PROFESSIONAL BAMS EXAMINATIONS AyUG-

#### SA1

Time: 3 Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

TOTAL MARKS 100

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ)	20	1	20
Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Long answer questions (LAQ)	4	10	40
				100

## 6 F - Distribution of Theory Exam

AyUG-SA1		D Type of Questions "Yes" can be asked. "No" should not be asked.				
	A List of Topics	B Term	C Marks	MCQ (1 Mark)	SAQ (5 Marks)	LAQ (10 Marks)
1.	Introduction to Samhita-	1		No	/NO	NO
<b>Ashtang Hriday Samhita - Sutrasthan (1-15 Adhyaya) 50 marks</b>						
2.	AH Su.1. Ayushkamiya Adhyaya	1	50	YES	YES	YES

3.	AH Su.2. Dinacharya Adhyaya	I	50	YES	YES	YES	
4.	AH Su.3. Rutucarya Adhyaya	I		YES	YES	YES	
5.	AH Su.4. Roganutpadaniya Adhyaya	I		YES	YES	YES	
6.	AH Su.5. Dravadravya Vijnaniya Adhyaya	I		NO	YES	NO	
7.	AH Su.6. Annaswaroopa Vijnaneeya Adhyaya	II		NO	YES	NO	
8.	AH Su.7. Annaraksha Adhyaya	II		NO	YES	NO	
9.	AH Su.8. Matrashitiya Adhyaya	II		YES	YES	YES	
10.	AH Su.9. Dravyaadi Vijnaniya Adhyaya	II		YES	YES	YES	
11.	AH Su.10.Rasabhedhiya Adhyaya	II		YES	YES	YES	
12.	AH Su.11.Doshadi Vijnaniya Adhyaya	III		YES	YES	YES	
13.	AH Su.12.Doshabhedhiya Adhyaya	III		YES	YES	YES	
14.	AH Su.13.Doshopakramaniya Adhyaya	III		YES	YES	YES	
15.	AH Su.14.Dvividhopakramaniya Adhyaya	III		YES	YES	YES	
16.	AH Su.15.Shodhanadigana Sangraha Adhyaya	III		NO	NO	NO	
<b>Charak Samhita – Sutrasthan (1-12 Adhyaya):</b>							
17.	CS S 1. Deerghanjiviteeya Adhyaya-	I		50	YES	YES	YES
18.	CS S 2. Apamarga Tanduliya Adhyaya-	II	NO		YES	NO	
19.	CS S 3. Aragvadhiya Adhyaya-	II	NO		YES	NO	
20.	CS S 4. Shadvirechana-shatashritiya Adhyaya-	II	NO		YES	NO	
21.	CS S 5. Matrashiteeya Adhyaya-	II	YES		YES	YES	
22.	CS S 6. Tasyashiteeya Adhyaya-	II	YES		YES	YES	
23.	CS S 7. Naveganadharaniya Adhyaya-	II	YES		YES	YES	
24.	CS S 8. Indriyopakramaniya Adhyaya-	II	YES		YES	YES	
25.	CS S 9. Khuddakachatuspada Adhyaya-	II	YES		YES	YES	
26.	S 10. Mahachatuspada Adhyaya-	II	YES		YES	YES	
27.	S 11. Tisraishaniya Adhyaya-	III	YES		YES	YES	
28.	S 12. Vatakalakaliya Adhyaya-	III	YES		YES	YES	

### 6 G - Question paper blue print

A Question Sr. No	B Type of Question	C Question Paper Format 50 marks AH/S 50 Marks CS/S
.Q1	Multiple choice Questions	1. Topic number 2 (A.H.Su.Ch.1)

	<p><b>(MCQ)</b></p> <p>20 Questions</p> <p>1 mark each</p> <p>All compulsory</p> <p>From Must know part 15 MCQ</p> <p>From Desirable to know 3 MCQ</p> <p>From Nice to know 2 MCQ</p>	<ol style="list-style-type: none"> <li>2. Topic number 3 (A.H.Su.Ch.2)</li> <li>3. Topic number 4 (A.H.Su.Ch.3)</li> <li>4. Topic number 5 (A.H.Su.Ch.4)</li> <li>5. Topic number 9 (A.H.Su.Ch.8)</li> <li>6. Topic number 10 (A.H.Su.Ch.9)</li> <li>7. Topic number 11 (A.H.Su.Ch.10)</li> <li>8. Topic number 12 (A.H.Su.Ch.11)</li> <li>9. Topic number 13 (A.H.Su.Ch.12)</li> <li>10. Topic number 14 (A.H.Su.Ch.13)</li> <li>11. Topic number 15 (A.H.Su.Ch.14)</li> <li>12. Topic number 17 (C.S.Su.Ch.1)</li> <li>13. Topic number 21 (C.S.Su.Ch.5)</li> <li>14. Topic number 22 (C.S.Su.Ch.6)</li> <li>15. Topic number 23 (C.S.Su.Ch.7)</li> <li>16. Topic number 24 (C.S.Su.Ch.8)</li> <li>17. Topic number 25 (C.S.Su.Ch.9)</li> <li>18. Topic number 26 (C.S.Su.Ch.10)</li> <li>19. Topic number 27 (C.S.Su.Ch.11)</li> <li>20. Topic number 28 (C.S.Su.Ch.12)</li> </ol>
Q2	<p><b>Short answer Questions (SAQ)</b></p> <p>Eight Questions</p> <p>5 Marks Each</p> <p>All compulsory</p> <p>Must know 7,</p> <p>Desirable to know 1</p> <p>No Questions on Nice to know</p>	<ol style="list-style-type: none"> <li>1. Topic no. 2 (A.H.Su.Ch.1) / Topic no. 25 (C.S.Su.Ch.9)/ Topic number 26 (C.S.Su.Ch.10)</li> <li>2. Topic no. 3(A.H.Su.Ch.2) / Topic no. 9(A.H.Su.Ch.8) / Topic no. 21(C.S.Su.Ch.5) / Topic no. 24 (C.S.Su.Ch.8)</li> <li>3. Topic no. 4 (A.H.Su.Ch.3) / Topic no. 22 (C.S.Su.Ch.6) / Topic no. 5 (A.H.Su.Ch.4) / Topic no. 23 (C.S.Su.Ch.7)/</li> <li>4. Topic no. 12 (A.H.Su.Ch.11) / Topic no. 13 (A.H.Su.Ch.12)/ Topic no.28 (C.S.Su.Ch.12)</li> <li>5. Topic no. 17 (C.S.Su.Ch.1)</li> <li>6. Topic no. 6 (A.H.Su.Ch.5)/ Topic no.7 (A.H.Su.Ch.6)/ Topic no.18 (C.S.Su.Ch.2)/ Topic no.19 (C.S.Su.Ch.3) / Topic no.20 (C.S.Su.Ch.04) / Topic no.16 (A.H.Su.Ch.15)</li> <li>7. Topic no.8 (A.H.Su.Ch.7) /Topic no. 10 (A.H.Su.Ch.9) / Topic no.11 (A.H.Su.Ch.10)/</li> <li>8. Topic no. 14 (A.H.Su.Ch.13) Topic no.15 (A.H.Su.Ch.14)/ Topic no. 27 (C.S.Su.Ch.11)</li> </ol>
Q3	<p><b>Long answer Questions (LAQ)</b></p> <p>Four Questions</p> <p>10 marks each</p> <p>All compulsory</p>	<ol style="list-style-type: none"> <li>1. Topic no. 2 (A.H.Su.Ch.1) / Topic no. 17 (C.S.Su.Ch.1)/ Topic no. 25 (C.S.Su.Ch.9)/ Topic number 26 (C.S.Su.Ch.10)</li> <li>2. Topic no.3(A.H.Su.Ch.2) / Topic no. 4 (A.H.Su.Ch.3)/ Topic no. 21(C.S.Su.Ch.5) / Topic no. 22 (C.S.Su.Ch.6)</li> </ol>

	All questions on Must to know. No Questions on Nice to know and Desirable to know	3. Topic no. 12 (A.H.Su.Ch.11) / Topic no. 13 (A.H.Su.Ch.12)/ Topic no. 14 (A.H.Su.Ch.13)/ Topic no.15 (A.H.Su.Ch.14) / Topic no.28 (C.S.Su.Ch.12) 4. Topic no. 9(A.H.Su.Ch.8)/ Topic no. 10 (A.H.Su.Ch.9) / Topic no.11 (A.H.Su.Ch.10)/ Topic no. 27 (C.S.Su.Ch.11)/ Topic no.5 (A.H.Su.Ch.4)/ Topic no. 23 (C.S.Su.Ch.7)
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## 6 H - Distribution of Practical Exam

Practical 100 Marks – (Viva 75 + Elective 10 (Set-FC) + IA 15 ) Marks

SN		Heads	Marks
A		<b>Viva (75 Marks)</b>	
	1	Viva on Record Book (of yearly conducted non lecture activities) (Refer Table 5)	15
	2	Viva on Shloka Book and Shloka Recitation (Ref table 3. Recitation )	10
	3	Identification of Tantrayukti Viva on .Introduction to Samhita (ref Table 2: 1)	15
	4	Viva Voce on AH	15
	5	Viva Voce on Ch Su	15
	6	Communication Skill	05
B		<b>Internal Assessment</b>	15
C		<b>Electives</b>	10
		<b>Total Marks</b>	<b>100</b>

## 7. Reference books/Resourses

- **Introduction to Samhita**

1. Ashtanghridayam with the commentaries ‘Sarvangasundara’ of Arundatta and ‘Ayurvedarasayana’ of Hemadri, Collated by Dr. Anna Moreshwar Kunte and Krishna Ramchandra Shastri Navre
2. Sushruta Samhita by Dr. Ambikadutta Shastri
3. Ayurvedeeya Padartha Vijnana by Prof. C. R. Agnivesh
4. Ayurvedeeya Padartha Vijnana and Ayurvedeeya itihaasam by Prof. C. R. Agnivesh
5. Ayurvediya Padarth Vidnyan by Vd. Ranjit Rai Desai
6. History of Medicine in India by Acharya Priyavrat Sharma
7. History of Indian Medicine by J. Jolly

- **Ashtang Hridaya**

1. Ashtanghridayam with the commentaries ‘Sarvangasundara’ of Arundatta and ‘Ayurvedarasayana’ of Hemadri, Collated by Dr. Anna Moreshwar Kunte and Krishna Ramchandra Shastri Navre
2. Ashtanga Hridaya : English commentary by Dr. T. Shreekumar
3. Ashtanga Hridaya : English commentary by Dr. Vishwvasu Gaur
4. Ashtang Hridayam : English translation by Prof. K.R. Srikantha Murthy
5. Ashtanga Hridaya –English translation by Vd. Anantram Shastri
6. Ashtanga Hridayam by Dr. B. Ramarao
7. Illustrated Ashtanga Hridaya text with English Translation by Dr. R. Vidyanath
8. Ashtanga Hridaya. Hindi commentary by Lalchanda Vaidya
9. Ashtanga Hridaya: Hindi commentary by Vd. B.L.Gaur

• **Charak Samhita**

1. Charakasamhita by Agnivesha Revised by Charaka and Dridhbala with the Ayurveda Dipika commentary of Chakrapanidatta Edited by Vaidya Yadavji Trikamji Acharya
2. Charak Samhita (English Commentary): Dr. Ram Karan Sharma and Vd. Bhagwan Dash or Acharya Priyavrata Sharma
3. Charak Samhita with translation of Chakrapani commentary by Harishchandra Kushvaha
4. Charak Samhita by Acharya P.V.Sharma
5. Charak Samhita (Hindi commentary): Vaidya Jayadev Vidyalankar
6. Charak Samhita (Hindi commentary): Vaidya Atridev Vidyalankar
7. Charak Samhita (Hindi commentary): Prof. Gorakhanath Chaturvedi and Kashinath Shastri
8. Charak Samhita (Hindi commentary): Dr. Brahmanand Tripathi
9. Charak Samhita (Hindi commentary): Dr. Ravidatta Tripathi
10. Charaka Samhita –Ayurveda Dipika Commentary- Hindi translation by Dr. B.L.Gaur
11. Legacy of Charak – M S Valiathan
12. Charak e-Samhita –National Institute of Indian Medical Heritage –  
<http://niimh.nic.in/ebooks/ecaraka>
13. Charakasamhitaonline.com- [Charak Samhita New Edition \(carakasamhitaonline.com\)](http://Charak Samhita New Edition (carakasamhitaonline.com))

**COURSE CURRICULUM FOR FIRST PROFESSIONAL BAMS(PRESCRIBED BY NCISM)**

शास्त्रं ज्योतिषं चैव कौशिकं दशनं बुद्धिं चिरात्त्मनिः/



**RACHANA SHARIRA**  
(SUBJECT CODE- AyUG-RS)

# **HUMAN ANATOMY**

**(Applicable from 2021-22 batch onwards for 5 years or until further notification by NCISM, whichever is earlier)**

**BOARD OF AYURVEDA**

**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE  
NEW DELHI-110058**

NCISM

**I Professional Ayurvedacharya  
(BAMS)**

Subject Code: AyUG-RS

**Rachana Sharir  
(Human Anatomy)**

Summary

<b>AyUG-RS</b>			
<b>Total number of Teaching hours: 500</b>			
<b>Lecture hours (LH) - Theory</b>		<b>180 Hours</b>	<b>180 Hours (LH)</b>
Paper I	90 Hours		
Paper II	90 Hours		
<b>Non-Lecture hours (NLH) – Theory</b>		<b>80 Hours</b>	<b>320 Hours (NLH)</b>
Paper I	40 Hours		
Paper II	40 Hours		
<b>Non-Lecture hours (NLH) - Practical</b>		<b>240 Hours</b>	

<b>AyUG-RS</b>					
<b>Examination (Papers &amp; Mark Distribution)</b>					
<b>Item</b>	<b>Theory Component Marks</b>	<b>Practical Component Marks</b>			
		<b>Practical</b>	<b>Viva</b>	<b>Elective</b>	<b>IA</b>
<b>Paper I</b>	<b>100</b>	<b>100</b>	<b>70</b>	<b>--</b>	<b>30</b>
<b>Paper II</b>	<b>100</b>				
<b>Sub-Total</b>	<b>200</b>	<b>200</b>			
<b>Total marks</b>	<b>400</b>				

## Preamble

The primary purpose for teaching Rachana sharir to undergraduate students is to provide a thorough understanding of the basic principles of Sharir. Gross and microscopic structure and development of the human body in perspective of ancient and modern sciences, as well as to acquire necessary skills. Sharir in Ayurveda also provides in depth views to concepts like Marma and srotas.

Learning of Sharir is most useful in further years in diagnosis and management of the diseases.

Various teaching and learning methods, including didactic, demonstration, tutorial, group discussion, seminars, Integrated Teaching (IT), Problem Based Learning (PBL), and Early Clinical Exposure (ECE), Case-Based Learning (CBL), Virtual Dissection, and cadaveric dissection, are used to transfer knowledge to students, and the syllabus is constructed accordingly. As a result, the students appreciate being a part of the teaching and learning process. This will help the students to become competent, self-assured, caring, and concerned humans capable of providing ethical medical treatment.



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## Course Code and Name of Course

	Course code	Name of Course
	<b>AyUG RS</b>	<b>Rachana Sharir (Human Anatomy)</b>

AyUG RS

**Table 1- Course learning outcomes and matched PO.**

<b>SR1</b>	<b>A1</b>	<b>B1</b>
<b>CO No</b>	<b>Course learning Outcome (CO) AyUG RS</b> <b>At the end of the course AyUG RS, the student should be able to-</b>	<b>Course learning Outcome matched with program learning outcomes.</b>
<b>CO1</b>	Describe the fundamentals of Rachana Sharir, interpret and analyze it in relevant context and recognize its significance in Ayurveda	<b>PO1, PO2</b>
<b>CO 2</b>	Explain Garbha Sharir and Embryology in Ayurveda and modern science respectively with clinical significance	<b>PO1, PO2</b>
<b>CO 3</b>	Describe and demonstrate all the bones and joints with attachments of associated structures and its clinical application	<b>PO1, PO2</b>
<b>CO 4</b>	Explain the concept of Sira-Dhamani-Strotas, their organization in the human body and its applied aspect	<b>PO1, PO2</b>
<b>CO 5</b>	Identify the Marmas and understand its classification along with its importance in preventive and therapeutic aspect	<b>PO1, PO2</b>
<b>CO 6</b>	Explain and demonstrate the gross anatomy of the organs of various systems and their applied anatomy in perspective of Ayurveda and Modern science	<b>PO1, PO2, PO3</b>
<b>CO 7</b>	Explain the Indriya Sharir and Sensory organs with its application in preventive and therapeutic domain.	<b>PO1, PO2</b>
<b>CO 8</b>	Identify and locate all the structures of body and mark the topography of the living Sharir.	<b>PO1, PO3</b>
<b>CO 9</b>	Respect the cadaver and perform dissection with commitment to reiterate the theoretical aspect of Ayurved Rachana Sharir and contemporary sciences.	<b>PO1, PO3, PO5</b>
<b>CO 10</b>	Describe the basic principles of imaging technologies and identify the anatomical structures in the radiograph	<b>PO1, PO2, PO3</b>

**Table 2: Contents of Course AyUG-RS**

<b>Paper I</b>					
<b>SN</b>	<b>A2 List of Topics AyUG-RS</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
<b>1</b>	<b>Shariropkramaniya Shaarira</b> <ul style="list-style-type: none"> <li>Sharir and Shaarir vyakhya (definitions of sharira and sharira)</li> <li>Shadangatvam (Six regions of the body)</li> <li>Anga Pratyanga vibhaga (subdivisions)</li> <li>Sharir shastra vibhag</li> <li>Sharir gyan prayojan and its description in contemporary science with its clinical importance</li> </ul>	<b>I</b>	6	4	2
<b>2</b>	<b>Paribhasha Shaarira</b> <ul style="list-style-type: none"> <li>Kurcha, Kandara, Jala, Asthisamghata, Seemnta, Seevani, Rajju, and lasika</li> <li>Terminologies related shadang sharir</li> </ul>	<b>I</b>	4	3	1
<b>3.</b>	<b>Garbha Shaarira</b> <ul style="list-style-type: none"> <li>Garbha Vyakhya (Definition of Garbha)</li> <li>Concept of Shukra and Artava</li> <li>Garbhavranti. Masanumasik grabhavruddhi</li> <li>Role of panchamahabhoot in Garbhavruddhi</li> <li>Concept of Beeja, Beejabhaga, Beejabhagavayava</li> <li>Garbhposhana</li> <li>Apara nirmiti, Garbhanabhinadi</li> <li>Garbha Angapratyanga utpatti according to different Acharya</li> <li>Garbha Vikruti</li> </ul>	<b>I</b>	15	17	5
<b>4.</b>	<b>Asthi Shaarira</b> Enumeration of Asthi, Types, asthi swaropa, with its applied aspect	<b>I</b>	4	2	1
<b>5.</b>	<b>Sandhi Shaarira</b> <ul style="list-style-type: none"> <li>Description of Sandhi and its enumeration,</li> <li>Types of Sandhi with its clinical importance</li> <li>Introduction of diseases of Sandhi explained in Ayurveda</li> </ul>	<b>II</b>	4	2	3
<b>6.</b>	<b>Snayu sharir</b> Concept of Snayu and its clinical importance	<b>II</b>	3	2	1
<b>7.</b>	<b>Peshi Shaarira</b> <ul style="list-style-type: none"> <li>Description of Peshi,</li> <li>Utpatti, types, Swaroop, function with its importance</li> </ul>	<b>II</b>	3	2	1
<b>8.</b>	<b>Kesha, Danta, Nakha Sharir</b> <ul style="list-style-type: none"> <li>Description of Panchbhautik swaroop and its applied value</li> <li>Explanation of its swabhava (Pitruja) and its applied value</li> <li>Description of Prakrita (normal) and Vikruta(abnormal) Swaroop (appearance) of kesha, danta, nakha in concern with disease</li> <li>Importance of examination of kesha, danta, nakha</li> </ul>	<b>II</b>	4	2	1

	as diagnostic tool				
9	<b>Embryology</b> <ul style="list-style-type: none"> <li>• Definitions and branches of embryology.</li> <li>• Embryo and Fetus. Sperm and Ovum, Fertilization, Cleavage.</li> <li>• Germ layers formation and their derivatives.</li> <li>• Laws of heredity, Sex determination and differentiation, Month-wise development of embryo.</li> <li>• Fetal circulation, Placenta formation, Umbilical cord formation</li> </ul>	I	5	7	2
10	<b>Osteology</b> <ul style="list-style-type: none"> <li>• Bone: structure, types and ossification.</li> <li>• Description of each bone with clinical anatomy</li> </ul>	I	12	9	6
11	<b>Arthrology</b> <ul style="list-style-type: none"> <li>• Joints: structure, types and movements.</li> <li>• Description of joints of extremities, inter-vertebral joints and temporomandibular joint with their clinical anatomy.</li> </ul>	II	10	10	6
12	<b>Myology</b> <ul style="list-style-type: none"> <li>• Structure and types of muscles. Description of important muscles: origin, insertion, actions, nerve supply and clinical anatomy.</li> <li>• Muscle movements in Yogasana</li> </ul>	II	4	6	2
13	<b>Nervous System</b> <ul style="list-style-type: none"> <li>• Nervous system: Introduction and classification</li> <li>• Meninges</li> <li>• Description of Brain and Spinal cord.</li> <li>• Description of Peripheral Nervous System: Cranial and Spinal nerves, Brachial, Cervical, Lumbar and Sacral nerve plexus,</li> <li>• Anatomical consideration of Autonomic Nervous System,</li> <li>• Formation and circulation of cerebrospinal fluid</li> <li>• Blood supply of Brain and Spinal cord.</li> </ul>	III	14	14	4
14	<b>Endocrinology</b> <ul style="list-style-type: none"> <li>• Description of endocrine glands (Pituitary, Thyroid, Parathyroid, Thymus, Pineal and Suprarenal glands) with clinical aspects.</li> <li>• Histology of all glands.</li> </ul>	III	8	8	3
15	<b>Lymphatic system</b> <ul style="list-style-type: none"> <li>• Introduction Structure included in lymphatic system: Lymph vessels, Lymph nodes, Lymph glands with their clinical importance.</li> </ul>	III	4	2	2

<b>Paper II AyUG-RS</b>					
<b>SN</b>	<b>A2 List of Topics AyUG-RS</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
<b>1</b>	<b>Pramana Sharira:</b> Anguli pramana & Anjali praman with its applied importance	<b>II</b>	2	2	1
<b>2</b>	<b>Koshtha Evam Ashaya Sharira</b> • Definition of Kostha with its applied importance and • Enumeration of Koshthanga and its description • Concept of Ashaya with its clinical importance	<b>I</b>	4	2	1
<b>3.</b>	<b>Sira Sharir</b> • Concept of Sira • Nirukti, types, enumeration of Sira and its applied aspect • Introduction to Sira vedha	<b>II</b>	4	3	1
<b>4.</b>	<b>Dhamani Sharir</b> • Concept of Dhamani • Nirukti, types, enumeration of Dhamani and its applied aspect	<b>II</b>	2	2	1
<b>5.</b>	<b>Strotas Shaarira</b> • Concept of Strotas • Nirukti, types, number of Srotas, Strotomool and its applied aspect • Types of Strotas and its description. • Applied aspect of Strotas	<b>II</b>	7	8	3
<b>6.</b>	<b>Kala Shaarira</b> • Definition and etymology of Kala • Enumeration and description of Kala • Applied aspect of Kala	<b>III</b>	4	2	2
<b>7.</b>	<b>Indriya Shaarira</b> • Definition of Indriya, Indriya artha and Indriya adhisthan, • Number and importance of Indriya • Description of Gyanendriya, Karmendriya and Ubhayendriya (Manas). • Ayurved sharir of Indriya adhistan- Karna, Twacha, Netra, Jivha, Nasa • Applied aspect of Indriya	<b>III</b>	3	3	1
<b>8.</b>	<b>Twacha Sharir</b> Definition, types and characteristics of Twacha with its clinical importance, significance of Twacha adhisthana in disease manifestation, its relation with Dhatu.	<b>III</b>	3	2	2
<b>9</b>	<b>Marma Sharira</b> • Marma: definition, enumeration, classification, location • Surface demarcation of Marma • Explanation of Trimarma	<b>II</b>	15	13	4

	<ul style="list-style-type: none"> <li>• Detail description of Marma with its applied importance.</li> </ul>				
<b>10</b>	<b>Respiratory System</b> <ul style="list-style-type: none"> <li>• Bronchial tree and Lungs with their clinical aspects.</li> <li>• Respiratory tract: Nasal cavity, Pharynx, Larynx, Trachea</li> <li>• Pleura with its clinical aspects</li> <li>• Diaphragm and its opening</li> <li>• Histology of all organs</li> </ul>	<b>II</b>	10	6	4
<b>11</b>	<b>Digestive system</b> <ul style="list-style-type: none"> <li>• Regions of abdomen</li> <li>• Organs of digestive tract (alimentary tract) with their clinical aspects.</li> <li>• Digestive glands: Liver, Spleen and Pancreas.</li> <li>• Description of peritoneum with its clinical aspects</li> <li>• Histology of all organs</li> </ul>	<b>I</b>	12	10	6
<b>12</b>	<b>Cardiovascular system</b> <ul style="list-style-type: none"> <li>• Description of Heart</li> <li>• Structure of artery &amp; vein</li> <li>• Importance blood vessels with their course and branches.</li> <li>• Pericardium with applied aspect</li> <li>• Histology of Heart</li> </ul>	<b>II</b>	8	8	3
<b>13</b>	<b>Urinary System</b> <ul style="list-style-type: none"> <li>• Urinary tract: Kidney, Ureter, Urinary Bladder and Urethra with their clinical aspects</li> <li>• Histology of all organs</li> </ul>	<b>II</b>	10	8	3
<b>14</b>	<b>Reproductive system</b> <ul style="list-style-type: none"> <li>• Male Reproductive system: Reproductive organs, Scrotum and glands (Testis, Prostate and Seminal vesicles) with their clinical aspects.</li> <li>• Female reproductive system: Introduction of external genital organ in brief and internal reproductive organs in detail, tract and glands with clinical importance.</li> <li>• Histology of all organs</li> </ul>	<b>III</b>	6	7	3
<b>15</b>	<b>Sensory organs</b> Description of structures of Eye, Ear, Nose, Tongue and Skin with their clinical aspects.	<b>III</b>	10	14	5

**Table 3: Learning objectives (Theory) of Course AyUG-RS**

<b>Paper I RACHANA SHARIR –</b>									
A3 Course outcom e	B3 Learning Objective (At the end of the session, the students should be able to)	C3 Domain/ sub	D3 Must to know/ desirable to know/Ni ce to know	E3 Level Does/ Shows how/ Knows how/ Know	F3 T-L method	G3 Assessment	H3 Formati ve /summa tive	I3 Te rm	J3 Integrat ion
<b>Topic 1- Shariroupkramaniya</b> [Time: Lecture: 04 hours, non-lecture 02 hours] Practical- 02 hours									
CO1	Define Sharir.	Cognitive / Recall	MK	Knows	Lecture	Written / viva-voce/ Open book test	F&S	I	
CO1	Describe the constitutional elements of Sharir	Cognitive/ Comprehensi on	MK	Knows	Lecture	Written/ viva-voce	F&S	I	
CO1	Analyze the Constitutional hierarchy of Sharir and its relevance	Cognitive/ analyze	DK	Knows how	Lecture/ GD	Written / viva-voce	F&S	I	
CO1	Enlist Anga -Pratyanga and specific terms for each Pratyanga	Cognitive/ Recall	MK	Knows	Lecture/ GD	Written/ viva-voce	F&S	I	
CO1	Describe the Importance of Pratyaksha (Demonstration & Dissection) method of learning Sharir	Cognitive - comprehensi on	MK	Knows how	Lecture/ demonstration/ TT/ GD	Written / viva-voce	F&S	I	
CO1	Explain the Mruta Samshodhana as mentioned	Cognitive / Comprehensi on	MK	Knows	Demonstration/ simulation/	Written / viva-voce	F&S	I	

	in Sushruta Samhita and as per the modern science.	Psychomotor							
CO1	Appraise the concept of body donation and its relevance in present scenario	Cognitive - analysis, Affective	NK	Knows	Lecture/ educational video/ SDL	Written / viva-voce	F&S	I	
<b>Topic 2- Paribhasha Sharir</b> [Time: Lecture: 03 hours, non-lecture 01 hours] Practical- 6 hours									
CO1	Explain the terms Kandara, Kurcha, Mamsa, Rajju, Sevani, Jala, Seemant, Asthi Sanghat in context to its enumeration, site and structure.	Cognitive / comprehension	MK	Knows	Lecture/ Demonstration	Written/ viva-voce/ Open book test	F&S	I	
CO1	Evaluate the clinical importance of Kandara, Kurcha, Mamsa, Rajju, Sevani, Jala Seemant, Asthi and Sanghat	Cognitive/ Application	DK	Knows how	Lecture/ Demonstration/ SDL	Written/ viva-voce	S	I	
<b>Topic 3- Garbha Sharir</b> [Time: Lecture: 17 hours, non-lecture 05 hours]									
CO 2	Define Garbha and recall the related verse from samhitas.	Cognitive / knowledge	MK	Knows	Lecture/ Recitation	Written/ viva-voce	F & S	I	-
CO 2	Explain the concept of Shukra and recall the related verse from samhitas.	Cognitive / comprehension	MK	Knows	Lecture/ Recitation	Written/ viva-voce	F & S	I	-
CO 2	Explain the concept of Artava and recall the related verse from samhitas.	Cognitive / comprehension	MK	Knows	Lecture/ recitation	Written/ viva-voce	F & S	I	-
CO 2	Describe the role of tridosha and panchamahabhuta in the fetal development	Cognitive / comprehension	MK	Knows how	Lecture/ IT	Written/ viva-voce	F & S	I	Dept. of Streerog Prasuti tantra
CO 2	Explain the concept of Beeja, Beejbhaag, Beejabhagavayava	Cognitive / Comprehension	MK	Knows	Lecture/ GD/ TT	Written/ viva-voce	F & S	I	Dept. of Streerog Prasuti tantra



CO 2	Describe Masanumasik Garbha vriddhi kram and recall the related verse from samhitas.	Cognitive / comprehension	MK	Knows how	Lecture/ Recitation/ demonstration with 3D animated video	Written/ viva-voce/ Open book test	F & S	I	-
CO 2	Describe Garbhaposhana	Cognitive / comprehension	MK	Knows how	Lecture	Written/ viva-voce/ Open book test	F & S	I	-
CO 2	Describe the formation of Apra according to Ayurved	Cognitive / knowledge	MK	Knows, Knows how	Lecture/ demonstration with 3D animated video	Written/ viva-voce/ Open book test	F & S	I	-
CO 2	Describe Garbha nabhinadi	Cognitive / knowledge	MK	Knows	Lecture	Written/ viva-voce	F & S	I	-
CO 2	Explain Angapratyanga utpatti with the related verse from samhitas.	Cognitive / comprehension	MK	Knows how	Lecture/ demonstration with 3D animated video/	Written/ viva-voce/ Assignments/ Open book test	F & S	I	Dept. of Streerog Prasuti tantra
<b>Topic 4- Asthi Shaarira</b> [Time: Lecture: 02 hours, non-lecture 01 hours]									
CO1	Enlist the number of Asthi according to different Acharyas	Cognitive/ Recall	MK	Knows how	Lecture	Written / viva-voce/ Open book test	F & S	I	
CO1	Describe the Asthi Sanghata and Asthi Simanta	Cognitive/ comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	I	
<b>Topic 5- Sandhi Sharir</b> [Time: Lecture: 02 hours, non-lecture 03 hours]									
CO 3	Define the term Sandhi	Cognitive – Recall	MK	Knows	Lecture	Written/ viva-voce	F&S	II	
CO 3	Classify Sandhi into different types.	Cognitive – Recall	MK	Knows	Lecture	Written/ viva-voce/ project work	F&S	II	
CO 3	Demonstrate the movements of Chala Sandhi and	Cognitive – Application	MK	shows	Lecture +	Written/ viva-voce	F&S	II	

	comprehend the structural appearance	Psychomotor			Demonstration thorough model/ simulation				
CO 3	Illustrate the applied aspect of Sandhi and introduction of diseases of Sandhi explained in Ayurveda	Cognitive - Application	DK	Knows how	Lecture/ ECE/ SDL/ Seminar	Written/ viva-voce/ Assignment	F&S	II	Kayachi kitsa
<b>Topic 6- Snayu Sharir</b> [Time: Lecture: 02 hours, non-lecture 01 hours]									
CO 6	Describe Snayu with respect to its definition, structure, types, number, importance with its clinical importance	Cognitive/ comprehension	MK	Knows how	Lecture with demonstration/ SDL/Seminar	Written/ Viva -voce/ Open book test	F&S	II	
<b>Topic 7- Peshi Sharir</b> [Time: Lecture: 02 hours, non-lecture 01 hours]									
CO 5	Describe Peshi Sharir and its classification as per Ayurveda	Cognitive – comprehension	MK	Knows	Lecture/ Demonstration/ SDL/ Seminar	Written/ Viva-voce/ Open book test	F&S	II	
<b>Topic 8- Kesha, Danta, Nakha Sharir</b> [Time: Lecture: 02 hours, non-lecture 01 hours]									
CO 6	Describe Panchabhautik Swaroop, Swabhav (Pitruja) with its applied value in Prakriti and also explain related diseases with importance of examination kesha, danta, nakha as diagnostic tool	Cognitive/ comprehension	MK	Knows how	Lecture with demonstration with 3D animated video/ SDL	Written/ Viva -voce/ Open book test/ Assignment	F&S	II	
<b>Topic 9- Embryology</b> [Time: Lecture: 07 hours, non-lecture 02 hours]									
CO 2	Define embryology and enlist its branches	Cognitive / knowledge / recall	DK	Knows	Lecture	Written/ viva-voce	F & S	I	
CO 2	Define Embryo and Foetus	Cognitive / knowledge / recall	MK	Knows	Lecture	Written/ viva-voce	F & S	I	

CO 2	Describe the anatomical structure of Sperm and Ovum and explain its clinical importance	Cognitive / comprehension	MK	Knows how	Lecture/ Demonstration	Written/ viva-voce/ Assignment	F & S	I	
CO 2	Define term of fertilization	Cognitive / knowledge / recall	MK	Knows	Lecture/ Seminar	Written/ viva-voce	F & S	I	
CO 2	Describe the process of cleavage	Cognitive / comprehension	MK	Knows how	Lecture/ Educational 3D Animated videos	Written/ viva-voce	F & S	I	--
CO 2	Explain the process of germ layer formation and its derivatives	Cognitive / comprehension	MK	Knows how	Lecture/ Educational 3D Animated videos	Written/ viva-voce	F & S	I	Dept. of Streerog Prasuti tantra
CO 2	Explain the laws of heredity	Cognitive / comprehension	MK	Knows how	Lecture/ Seminar	Written/ viva-voce	F & S	I	Dept. of Streerog Prasuti tantra
CO 2	Describe the process of sex determination and differentiation	Cognitive / comprehension	NK	Knows how	Lecture/ Seminar	Written/ viva-voce	F & S	I	--
CO 2	Explain the month wise development of Foetus	Cognitive / comprehension	MK	Knows how	Lecture/ Demonstration	Written/ viva-voce/ Open book test/ Project work	F & S	I	Dept. of Streerog Prasuti ta
CO 2	Explain foetal circulation and the changes in the circulation after birth	Cognitive / comprehension	MK	Knows how	Lecture/Demonstration	Written/ viva-voce	F & S	I	--
CO 2	Describe Placenta formation & its structure with applied anatomy	Cognitive / application	MK	Knows how	Lecture/ Seminar/ ECE	Written/ viva-voce	F & S	I	Dept. of Streerog Prasuti tantra
CO 2	Describe Umbilical cord with clinical importance	Cognitive / knowledge / application	MK	Knows how	Lecture/ Seminar/ ECE	Written/ viva-voce	F & S	I	Dept. of Streerog Prasuti tantra

<b>Topic 10- Osteology</b> [Time: Lecture: 09 hours, non-lecture 06 hours] Practical- 20 hours									
CO3	Explain skeleton and its importance	Cognitive/ comprehension	MK	knows	Lecture/ Demonstration/ Seminar	Written / viva-voce	F & S	I	
CO3	Describe the uses of bones	Cognitive/ comprehension	MK	Knows	Lecture	Written / viva-voce	F & S	I	
CO3	Describe and demonstrate the processes and depressions of various bones	Cognitive/ comprehension, Application	MK	Show how	Lecture / Demonstration	Written / viva-voce	F & S	I	
CO3	Describe the characteristics of the bones	Cognitive/ comprehension	MK	Knows	Lecture	Written / viva-voce	F & S	I	
CO3	Describe the development and ossification of bones	Cognitive/ comprehension	DK	Knows how	Lecture	Written / viva-voce	F & S	I	
CO3	Describe and demonstrate Cranial bones and its applied anatomy	Cognitive / comprehension, Application	MK	Shows how	Lecture/ Demonstration	Written / viva-voce	F & S	I	
CO3	Describe and demonstrate Facial bones and its applied anatomy	Cognitive / comprehension, Application	DK	Shows how	Lecture/ Demonstration	Written / viva-voce	F & S	I	
CO3	Describe and demonstrate pelvic bones and its applied anatomy	Cognitive / comprehension, Application	MK	Shows how	Lecture/ Demonstration	Written / viva-voce	F & S	I	
CO3	Describe and demonstrate vertebral column and its applied anatomy	Cognitive / comprehension, Application	MK	Shows	Lecture/ Demonstration	Written / viva-voce	F & S	I	
CO3	Describe and demonstrate thorax bones and its applied anatomy	Cognitive / comprehension	MK	Shows how	Lecture/ Demonstration	Written / viva-voce	F & S	I	

		on, Application							
CO3	Describe & demonstrate Clavicle and Scapula and its applied anatomy	Cognitive / comprehension, Application	MK	Shows how	Lecture/ Demonstration	Written / viva-voce	F & S	I	Kayachikitsa
CO3	Describe Phalanges, Carpal and Tarsal Bones and its applied anatomy	Cognitive / comprehension	DK	Knows	Lecture/ Demonstration	Written/ viva-voce	F & S	I	
CO3	Describe & demonstrate bones of the upper & lower extremity and its applied anatomy	Cognitive / comprehension, Application	MK	Shows how	Lecture/ Demonstration	Written / viva-voce/ Project work	F & S	I	
CO3	Describe & demonstrate Patella and its applied anatomy	Cognitive / comprehension, Application	DK	Shows	Lecture/ Demonstration	Written / viva-voce	F & S	I	
CO10	Recognize and describe the Radiological structures in radiograph	Cognitive / comprehension, Application	MK	Shows	Lecture/ Demonstration/ PBL/ ECE/ SDL	Written / viva-voce/ Project work/ Assignment	F & S	I	
<b>Topic 11- Arthrology</b> [Time: Lecture: 10 hours, non-lecture 06 hours] Practical- 8 hours									
CO 3	Recall the classification of Joints	Cognitive – Recall	MK	Knows	Lecture	Written/ viva-voce	F&S	II	
CO 3	Demonstrate movements of Synovial Joints and comprehend the structural aspect helping in movements.	Cognitive – Application Psychomotor	MK	Knows how	Lecture/ Demonstration/ Simulation	Written/ viva-voce	F&S	II	
CO 3	Describe constitutional anatomy of joint	Cognitive – Comprehension	MK	Knows	Lecture	Written/ viva-voce	F&S	II	
CO 3	Describe joints of upper limb and lower limb region, TM joint, and its related applied aspect	Cognitive – Application	MK	Knows how	Lecture/ PBL/ ECE	Written/ viva-voce/ Open book test/ Assignment	F&S	II	Kayachikitsa

CO 3	Demonstrate the examination of synovial joints	Psychomotor	MK	Knows + Shows	Demonstration with case presentation in relative aspect/ ECE/ SDL/ 3D Animated videos	Written/ viva-voce/ Practical performance	F&S	II	Rognidan
<b>Topic 12- Myology</b> [Time: Lecture: 06 hours, non-lecture 02 hours] Practical- 8 hours									
CO5	State the types of muscles.	Cognitive – application Psychomotor	MK	Knows	Lecture	Written/ Viva-voce	F & S	II	
CO5	Describe and demonstrate the muscles of upper and lower extremity with their origin, insertion, action & nerve supply and applied aspect and its role in Yogasana	Cognitive – application	MK	Shows	Lecture/ Demonstration/ GD/TT/ SDL/ 3D Animated videos	Written/ Viva-voce/ Open book test/ Project work	F & S	II	Swasthvritta
CO5	Describe and demonstrate muscles of thorax and abdomen with their origin, insertion, action & nerve supply and applied aspect and its role in Yogasana	Psychomotor	MK	Shows	Lecture/ Demonstration/ GD/TT/ SDL/ 3D Animated videos	Written/ Viva-voce/ Open book test/ Project work	F & S	II	Swasthvritta
CO5	Describe and demonstrate muscles of back with origin, insertion, action & nerve supply and applied aspect and role in Yogasana	Cognitive – application	DK	Shows	Lecture/ Demonstration/ GD/TT/ SDL/3D Animated videos	Written/ Viva-voce/ Open book test/ Project work	F & S	II	Swasthvritta
<b>Topic 13- Nervous System</b> [Time: Lecture: 14 hours, non-lecture 04 hours] Practical- 12 hours									
CO6	Explain the hierarchy of structural unit	Cognitive-/ comprehension	MK	Knows	Lecture/ Demonstration	Written/ viva-voce	F&S	III	
CO6	Describe the functional and structural division of the nervous system	Cognitive- comprehension	MK	Knows how	Lecture/ Seminar	Written/ viva-voce	F&S	III	

CO6	Explain the parts of Brain (Cerebrum, Cerebellum)	Cognitive – comprehension	MK	Knows, Knows how	Lecture/ Demonstration	Written/ viva-voce/ Open book test	F&S	III	
CO6	Describe external and internal features of Spinal cord.	Cognitive – comprehension	MK	Knows, Knows how	Lecture/ Demonstration/ 3D animated videos	Written/ viva-voce/ Open book test	F&S	III	
CO6	Illustrate the Blood supply of Brain and Spinal cord.	Cognitive – comprehension	MK	Knows, Knows how	Lecture/ Demonstration/ 3D animated videos	Written/ viva-voce/ Open book test	F&S	III	
CO6	Describe the external features of diencephalon Mid brain, Pons, Medulla oblongata.	Cognitive-Comprehension	DK	Knows	Lecture/ Demonstration/ 3D animated videos	Written/ viva-voce/ Open book test	F&S	III	
CO6	Describe the limbic system	Cognitive-Comprehension	NK	Knows	Lecture/ Demonstration/ 3D animated videos	Written/ viva-voce/ Open book test	F&S	III	
CO6	Describe the general Sulci and gyri of cerebrum and determine the clinical importance of Broadman's classification	Cognitive – application	MK	Knows Knows how	Lecture/ Demonstration/ 3D animated videos	Written/ viva-voce/ Open book test	F&S	III	
CO6	Describe the ascending, descending pathways, upper motor neurons and lower motor neurons, its applied aspect in examination of nervous system	Cognitive/ application Affective /responding	DK	Knows how	Lecture/ Demonstration/ CBL, ECE	Written/ viva-voce/ Open book test	F&S	III	Kaya chikitsa
CO6	Demonstrate the superficial and deep reflexes and its clinical importance	Cognitive /application Psychomotor /perception Affective /responding	DK	shows	Lecture + Demonstration though living object/ ECE/ PBL/ SDL/ CBL	Viva-Voce/ Practical performance	F&S	III	Kayachi kitsa

CO6	Recall the general anatomical consideration of ANS	Cognitive/ Recall	MK	Knows	Lecture/ SDL	Written	F&S	III	
CO6	Describe the cranial and spinal nerves along with formation of nerve plexuses and applied anatomy	Cognitive / Application	DK	Knows how	Lecture/ PBL/ ECE/ SDL	Written / viva-voce/ Assignment	F & S	III	
CO6	Describe the Formation and circulation of cerebro- spinal fluid	Cognitive/ comprehension	MK	Knows how	Lecture	Written / viva-voce	F&S	III	
<b>Topic 14- Endocrinology</b> [Time: Lecture: 08 hours, non-lecture 03 hours] Practical- 02 hours									
CO 6	Define Endocrine Glands and enlist them	Cognitive/ Recall	MK	Knows	Lecture	Written / viva-voce	F & S	III	
CO 6	Describe Structure and Functions of Endocrine Glands	Cognitive-/ Comprehension	MK	Knows	Lecture	Written / viva-voce	F & S	III	
CO 6	State the location, Dimension & Shape of Pituitary	Cognitive/ Recall	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	
CO 6	Describe the Parts & subdivisions of Pituitary	Cognitive / comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	
CO 6	Describe the Blood Supply, Nerve Supply & Lymphatic drainage of Pituitary	Cognitive /comprehension	MK	Knows	Lecture/ Demonstration/ CBL	Written / viva-voce	F & S	III	
CO 6	Enlist the hormones secreted by Pituitary, & histology and discuss its clinical anatomy.	Cognitive/ Application	MK	Knows	Lecture/ Demonstration/ GD	Written / viva-voce/ Open book test	F & S	III	
CO 6	State the location, Dimension & Shape of Thyroid gland	Cognitive/Recall	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	
CO 6	Describe the lobes, border & surfaces of Thyroid gland with its relation.	Cognitive /comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	
CO 6	Describe the blood supply, nerve Supply & lymphatic drainage of Thyroid gland	Cognitive /comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	



CO 6	List the Hormones secreted by Thyroid gland and & histology, and discuss its clinical application	Cognitive - Application	MK	Knows	Lecture/ GD/ CBL	Written / viva-voce/ Open book test	F & S	III	
CO 6	Describe the location, Shape, Dimensions and structure of Parathyroid gland	Cognitive /comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	
CO 6	Describe the Blood Supply, Nerve Supply & Lymphatic drainage of Parathyroid gland	Cognitive /comprehension	DK	Knows	Lecture Demonstration	Written / viva-voce	F & S	III	
CO 6	List the hormones secreted by parathyroid, & histology and discuss its Clinical anatomy	Cognitive /Application	DK	Knows	Lecture/ GD/ CBL	Written / viva-voce/ Open book test	F & S	III	Kayachik itsa
CO 6	State the location, Shape & dimension of Suprarenal gland	Cognitive / Recall	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	
CO 6	Describe the Surface, Borders of Suprarenal gland along with its relation.	Cognitive/comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	
CO 6	List the Functions and Secretions of Suprarenal gland	Cognitive /Recall	MK	Knows	Lecture	Written / viva-voce	F & S	III	Sharir Kriya
CO 6	Describe the Blood Supply, Nerve Supply & Lymphatic drainage of Suprarenal gland	Cognitive /comprehension	DK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	
CO 6	Describe the Internal structure of suprarenal gland	Cognitive /comprehension	DK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	III	
CO 6	Write the Clinical & applied anatomy & histology of Suprarenal gland	Cognitive /application	DK	Knows	Lecture/ CBL	Written / viva-voce/ Open book test	F & S	III	Kayachik itsa

**Topic 7- Lymphatic System** [Time: Lecture: 02 hours, non-lecture 02 hours]

CO 6	Define Lymphatic System	Cognitive / Recall	MK	Knows	Lecture	Written / viva-voce	F & S	III	
CO 6	Describe components of Lymphatic System	Cognitive / comprehension	MK	Knows	Lecture	Written / viva-voce	F & S	III	
CO 6	Describe the anatomical structure of Various Lymph Vessels i.e. Lymphatic Trunks, Thoracic Duct etc and explain its clinical importance	Cognitive / comprehension, Application	MK	Knows how	Lecture/ Demonstration/ CBL	Written / viva-voce	F & S	III	
CO 6	Describe the anatomical structure of Lymph Glands i.e. Lymph Nodes, Spleen, Thymus, Tonsils etc and explain its clinical importance	Cognitive / comprehension, Application	MK	Knows how	Lecture/ Demonstration/ ECE/ CBL	Written / viva-voce/ Open book test	F & S	III	Rognidan Evum Vikriti Vigyan

## Paper II

### Topic 1- Praman sharir [Time: Lecture: 02 hours, non-lecture 01 hours]

CO1	Describe Anguli and Anjali praman with its significance.	Cognitive Comprehension	MK	Knows	Lecture/ Demonstration/ GD	Written/ Viva-voce/ Open book test	F & S	II	
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### Topic 2- Koshtha Evam Ashaya Shaarira [Time: Lecture: 02 hours, non-lecture 01 hours]

CO1	Define of Koshtha and Ashaya	Cognitive/ knowledge	MK	Knows	Lecture	Written/ viva-voce/ Open book test	F&S	I	
CO1	Describe the concept of various numbers of Koshthanga as per Samhitas	Cognitive/ Comprehension	MK	Knows	Lecture	Written/ viva-voce/ Open book test	F&S	I	
CO1	Describe the concept of various Numbers of Ashaya as per Samhitas	Cognitive/ Comprehension	MK	Knows	Lecture/ TT/ GD	Written/ viva-voce/	F&S	I	

						Open book test			
CO1	Describe and explain applied aspects of Koshtha and Ashaya.	Cognitive/ Comprehensiv e application	NK	Knows How	Lecture/ GD/ ECE	Written/ viva-voce/ Assignments/ Open book test	F&S	I	Kayacki tsa
<b>Topic 3- Sira sharir</b> [Time: Lecture: 03 hours, non-lecture 01 hours]									
CO 4	Define Sira, Enumerate the sira & state its Nirukti	Cognitive /Recall	MK	Knows	Lecture/ Seminar	Written / viva-voce/ Open book test	F & S	II	
CO 4	Explain the classification of Sira	Cognitive / Comprehension	MK	Knows how	Lecture	Written / viva-voce/ Open book test	F & S	II	
CO 4	Define Vedhya Sira and Enumerate Vedhya Sira	Cognitive /Recall	MK	Knows	Lecture/ GD	viva-voce/ Open book test	F & S	II	
CO 4	Define Avedhya sira and Enumerate the Avedhya Sira	Cognitive / Recall	MK	Knows	Lecture	Written / viva-voce/ Open book test	F & S	II	
CO 4	Locate the Vedhya Sira in the body according to region	Cognitive / application Psychomotor	MK	Shows	Lecture/ Demonstration/ IT	viva-voce/ Practical performance	F & S	II	Shalyatan tra
CO 4	Describe the applied aspect of Siravedha	Cognitive - application	DK	Knows how	Lecture/ ECE/ IT/ CBL	Written / viva-voce/ Assignment / Open book test	F & S	II	Shalyatan tra
<b>Topic 4- Dhamani Sharir</b> [Time: Lecture: 02 hours, non-lecture 01 hours]									
CO 4	Define Dhamani, and state its Nirukti	Cognitive/ Recall	MK	Knows	Lecture/ Seminar	Written / viva-voce/ Open book test	F & S	II	

CO 4	Explain the classification of Dhamani	Cognitive/Comprehension	MK	Knows how	Lecture/ Seminar	Written / viva-voce/ Open book test	F & S	II	
CO 4	Locate the Dhamani in the body according to region	Cognitive / application Psychomotor	DK	Shows	Lecture/ Demonstration	Viva-voce/ Practical performance	F & S	II	
<b>Topic 5- Srotasa Sharir</b> [Time: Lecture: 08 hours, non-lecture 03 hours]									
CO 4	Define Srotasa and state its Nirukti and types	Cognitive/ Recall	MK	Knows	Lecture/ Seminar	Written / viva-voce/ Open book test	F & S	II	
CO 4	Explain the Classification of Srotasa	Cognitive / Comprehension	MK	Knows	Lecture/ Seminar	Written / viva-voce/ Open book test	F & S	II	
CO 4	State the Moolsthana of all Srotasa as per Acharya Sushrut and Charak and its clinical aspect	Cognitive / Recall	MK	Knows how	Lecture/ Seminar/ ECE	Written / viva-voce/ Assignment/ Open book test	F & S	II	Kayachikitsa/ Panchakarma
<b>Topic 6- Kala Sharir</b> [Time: Lecture:02 hours, non-lecture 02 hours] Practical- 03 hours									
CO1	Define Kala and explain the formation & functions of seven Kala	Cognitive –/ comprehension	MK	Knows	Lecture/ Seminar	Written / viva-voce/ Open book test	F&S	III	
CO1	Describe Saptakalas with its applied aspect	Cognitive /comprehension +application	MK	Knows	Lecture/ demonstration/ ECE	Written / viva-voce/ Open book test	F&S	III	Agadantara
CO1	Relate the Sapta Kala with Sapta Dhatu	Cognitive – application + affective - awareness	NK	Knows how	Lecture/ Seminar/ IT	Written / viva-voce	F&S	III	
<b>Topic 7- Indriya Sharir</b> [Time: Lecture: 03 hours, non-lecture 01 hours]									

CO 7	Define Indriya. Interpret derivation of Indriya and explain its importance.	Cognitive / comprehension	MK	Knows	Lecture/ Seminar	Written / viva-voce/ Open book test	F & S	III	
CO 7	State the meaning of Indriya- artha and Indriya- adhishtan	Cognitive / knowledge	MK	Knows	Lecture/ Seminar	Written / viva-voce/ Open book test	F & S	III	
CO 7	Enlist Dnyanendriyas, Karmendriyas and Ubhayendriya	Cognitive / knowledge	MK	Knows	Lecture/ Seminar	Written / viva-voce/ Open book test	F & S	III	
CO 7	Illustrate classical description of Dnyanendriya Adhishtan – Karna, Twak, Netra, Jivha, Nasa with its clinical perspective	Cognitive / application	MK	Knows how	Lecture/ IT/ ECE/ PBL	Written / viva-voce/ Open book test/ Assignment	F & S	III	Dept. of Shalakyatantra
<b>Topic 8- Twacha Sharir</b> [Time: Lecture: 02 hours, non-lecture 02 hours]									
CO 7	Define Twacha, its types and characteristics with its clinical importance, significance of twacha adhishtana in disease manifestation, its relation with dhatu	Cognitive / comprehension	MK	Knows how	Lecture with demonstration with 3D animated video/ ECE/ SDL	Written/ Viva -voce/ Open book test	F&S	III	
<b>Topic 9- Marma Sharir</b> [Time: Lecture: 13 hours, non-lecture 04 hours] Practical- 12 hours									
CO 5	Define Marma and enumerate the Marmas	Cognitive – Recall	MK	Knows	Lecture/ Seminar	Written / viva-voce/ Open book test	F&S	II	
CO 5	Describe the Marma and Prana tatva with its Significance	Cognitive – Comprehension	MK	Knows	Lecture	Written / viva-voce/ Open book test	F&S	II	

CO 5	Discuss the classification of Marma	Cognitive – Comprehension	MK	Knows	Lecture/ ECE/ PBL	Written / viva-voce/ Open book test	F&S	II	
CO 5	Narrate the importance of marma in Sharir and Shalya vigyan	Cognitive – application	MK	Knows how	Lecture/ ECE/ PBL	Written/ Open book test	F&S	II	Shalyat antra
CO 5	Illustrate the specific location of Marma as per Sushruta Samhita	Cognitive – Comprehension	MK	Knows + Shows	Lecture/ Demonstration/ Workshop	Written / viva-voce/ Open book test	F&S	II	
CO 5	Demonstrate the Marma location as per modern anatomy	Cognitive – Application Psychomotor	MK	Knows + Shows	Lecture with 3D animated demonstration/ Seminar/ Workshop	Viva-voce/ Practical performance	F&S	II	Panchakarma
<b>Topic 10- Respiratory system</b> [Time: Lecture: 06 hours, non-lecture 04 hours] Practical- 10 hours									
CO6	Enlist the parts of the Bronchial tree	Cognitive / Recall	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	State the location and dimension of Lungs	Cognitive - Knowledge	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Differentiate between Right and left Lungs	Cognitive -/ comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Describe the Borders, Surfaces and lobes of the Lungs	Cognitive/ comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce/ Open book test	F & S	II	
CO6	Explain the root of Lungs	Cognitive /comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Explain the Bronchopulmonary segments of the lungs	Cognitive /comprehension	DK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Describe the Blood supply, Nerve supply, Lymphatics of the Lungs	Cognitive /comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	

CO6	Describe histology and Clinical Anatomy of Lungs	Cognitive / application	MK	Knows how	Lecture/ ECE/ PBL	Written / viva-voce/ Assignment	F & S	II	Kaychik ita
CO6	State the extent and features of Trachea	Cognitive / Recall	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Explain the Relations of Trachea	Cognitive – /comprehension	MK	Knows how	Lecture/ Demonstration	Written / viva-voce/ Open book test	F & S	II	
CO6	Describe the Blood supply, Nerve supply and Lymphatics of Trachea	Cognitive /comprehension	MK	Knows how	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Explain the histology and Clinical anatomy of Trachea	Cognitive /Application	MK	Knows how	Lecture/ ECE/ PBL	Written / viva-voce/ Assignment	F & S	II	Shalaky atantra
CO6	State the extent of Larynx and its external features	Cognitive / Recall	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Enlist the paired and unpaired cartilages of Larynx	Cognitive / Recall	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Explain the relations of Larynx	Cognitive /comprehension	DK	Knows how	Lecture/ Demonstration	Written / viva-voce/ Open book test	F & S	II	
CO6	Write the blood supply, nerve supply and lymphatics of Larynx	Cognitive /comprehension	DK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Explain the histology and clinical anatomy of Larynx	Cognitive / application	DK	Knows how	Lecture/ Demonstration	Written / viva-voce/ Assignment	F & S	II	
CO6	State the location of Pleura and enlist its parts	Cognitive/ Recall	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Describe the parts of parietal Pleura	Cognitive/ comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce	F & S	II	
CO6	Explain the Pulmonary ligaments and recesses of Pleura	Cognitive /comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce/	F & S	II	

						Open book test			
CO6	Describe the blood supply, nerve supply, lymphatics of Pleura	Cognitive /comprehension	DK	Knows how	Lecture	Written / viva-voce	F & S	II	
CO6	Explain the clinical anatomy of Pleura	Cognitive – Application	DK	Knows how	Lecture/ ECE/ PBL	Written / viva-voce/ Assignment	F & S	II	Kayachikitsa
<b>Topic 11- Digestive system</b> [Time: Lecture: 10 hours, non-lecture 06 hours] Practical- 22 hours									
CO 6	Describe peritoneum and nine parts of abdomen	Cognitive – application	MK	Knows	Lecture/ Demonstration	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
CO 6	Describe the anatomy of the Oesophagus with relations, histology and clinical anatomy	Cognitive – application	MK	Knows	Lecture/ Demonstration	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
CO 6	Describe the structure of the Stomach, Stomach bed, the interior, histology, blood supply with relations and clinical anatomy	Cognitive – application	MK	Knows	Lecture/ Demonstration/ PBL/ ECE/ IT	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
CO 6	Describe the structure of the Duodenum with relations, histology and clinical anatomy.	Cognitive – application	MK	Knows	Lecture/ Demonstration/ ECE/ PBL/ IT	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
CO 6	Describe the parts, structure, histology and clinical anatomy of Large intestine.	Cognitive – application	MK	Knows how	Lecture/ Demonstration	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
CO 6	Describe the anatomy of the Rectum, Peritoneal &	Cognitive – application	MK	Knows how	Lecture/	Written/	F & S	I	



	visceral relations and applied anatomy of the Rectum.				Demonstration/ ECE/ PBL/ IT	Viva-voce/ Open book test/ Assignment			
CO 6	Describe the anatomy and musculature of the anal canal, histology with its blood supply, venous drainage and applied anatomy	Cognitive – application	MK	Knows how	Lecture/ Demonstration	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
CO 6	Describe the structure of the Pancreas, Pancreatic ducts, applied anatomy, along with histology of endocrine & exocrine part.	Cognitive – application	MK	Knows how	Lecture/ Demonstration/ ECE/ PBL/ IT	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
CO 6	Describe external features, anatomy histology and clinical anatomy of Liver	Cognitive – application	MK	Knows how	Lecture/ Demonstration/ ECE/ PBL/ IT	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
CO 6	Describe the structure, peritoneal & visceral relations histology and applied anatomy of the Spleen.	Cognitive – application	MK	Knows how	Lecture/ Demonstration/ ECE/ PBL/ IT	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
CO 6	Enlist the salivary glands and describe the anatomy of Parotid gland, Submandibular gland and Sublingual gland with its & Clinical anatomy	Cognitive – application	DK	Knows how	Lecture/ Demonstration	Written/ Viva-voce/ Open book test/ Assignment	F & S	I	
<b>Topic 12- Cardiovascular System</b> [Time: Lecture: 08 hours, non-lecture 03 hours]									
CO 6	Describe pericardium with its clinical anatomy	Cognitive – application	MK	Knows how	Lecture/ Demonstration	Written/ Viva-voce	F & S	II	
CO 6	Describe external features of the Heart.	Cognitive – recall	MK	Knows	Lecture/ Demonstration	Written/	F & S	II	

						Viva-voce/ Open book test/ Assignment			
CO 6	Describe internal features of the chambers, valve and auscultatory areas of Heart and its applied anatomy	Cognitive – application	MK	Knows how	Lecture/ Demonstration/ ECE/ PBL/ IT	Written/ Viva-voce/ Open book test/ Assignment	F & S	II	
CO 6	Describe the major arteries and veins of Heart.	Cognitive – Recall	MK	Knows	Lecture/ Demonstration	Written/ Viva-voce	F & S	II	
CO 6	Describe the histology and applied anatomy of Heart.	Cognitive – application	MK	Knows how	Lecture/ Demonstration/ ECE/ PBL/ IT	Written/ Viva-voce/ Open book test/ Assignment	F & S	II	
<b>Topic 13- Urinary System</b> [Time: Lecture: 08 hours, non-lecture 03 hours] Practical- 04 hours									
CO 6	Enlist the components of Urinary System	Cognitive / Recall	MK	Knows	Lecture	Written / viva-voce	F & S	II	
CO 6	Describe the anatomical structure of Kidney, Ureter, Urinary bladder, Urethra	Cognitive / Comprehension	MK	Knows	Lecture/ Demonstration	Written / viva-voce/ Open book test/ Assignment	F & S	II	Kayachik itsa /Panchkar ma/Shala ya-Tantra
CO 6	Explain histology and clinical anatomy of Kidney, Ureter, Urinary bladder, Urethra and its importance	Cognitive / Comprehension & Application	MK	Knows how	Lecture/ Demonstration/ ECE/ PBL/ IT	Written / viva-voce/ Open book test/ Assignment	F & S	II	
CO 6	Enlist developmental anomalies of Kidney, Ureter, Urinary bladder, Urethra	Cognitive / Recall	NK	Knows	Lecture	Written / viva-voce/ Open book test/ Assignment	F & S	II	
<b>Topic 14- Reproductive System</b> [Time: Lecture: 07 hours, non-lecture 03 hours] Practical-02 hour									

CO 6	Enlist the anatomical structures of male reproductive system and discuss its Ayurved Sharir	Cognitive / Comprehension	MK	knows how	Lecture	Written / viva-voce/ Open book test	F & S	III	
CO 6	Describe the male reproductive organs – Testes, Scrotum, Epididymis, Ductus deference, Ejaculatory duct, penis, Spermatic cord with histology and applied aspect	Cognitive / application	MK	knows how	Lecture	Written / viva-voce/ Open book test	F & S	III	
CO 6	Enlist the anatomical structures of female reproductive system and discuss its Ayurved Sharir.	Cognitive / Comprehension	MK	knows how	Lecture/ Seminar	Written / viva-voce/ Open book test	F & S	III	
CO 6	Describe external female reproductive organs	Cognitive / Comprehension	MK	knows	Lecture/ Seminar	Written / viva-voce	F & S	III	
CO 6	Explain Internal reproductive organs in detail with histology and its applied anatomy (Uterus, Fallopian tube, Cervix, Vagina, Ovary)	Cognitive / application	MK	knows how	Lecture/ ECE/ PBL/ IT	Written / viva-voce/ Open book test/ Assignment	F & S	III	
CO 6	Explain histology of Uterus, Fallopian tube, Cervix, Vagina, Ovary	Cognitive / application	DK	knows how	Lecture/ Demonstration	Written / viva-voce/ Open book test/ Assignment	F & S	III	
<b>Topic 15- Sensory organ</b> [Time: Lecture: 14 hours, non-lecture 05 hours]									
CO7	Explain five sensory receptors, hierarchy of development of five senses and need of five senses	Cognitive - comprehension	MK	Knows how	Lecture with 3D animated demonstration	Written / viva-voce/ Open book test/ Assignment	F&S	III	
CO7	Describe structural aspect of five sensory organ	Cognitive – comprehension	MK	Knows	Lecture	Written / viva-voce/ Open book	F&S	III	

						test/ Assignment			
CO7	Describe the pathways of each sense in understanding of its functional anatomy	Cognitive - comprehension	NK	Knows how	Lecture with 3D animated demonstration/ ECE/ PBL/ IT	Written / viva-voce/ Open book test/ Assignment	F&S	III	
CO7	Determine Method of examination, tool of examination and Importance of sensory organ in systemic examination	Cognitive - comprehension + Psychomotor	DK	Knows + Shows	Lecture with practical demonstration of tools/ ECE/ PBL/ IT	Written / viva-voce/ Open book test/ Assignment	F&S	III	Shalaky dept. Kaya chikitsa dept

**\*MK-Must Know, DK- Desirable to Know, NK- Nice to Know, TT- Tutorial, GD- Group Discussion, PBL- Problem Based Learning, IT- Integrated Teaching, ECE- Early Clinical Exposure, SDL- Self Directed Learning, CBL- Case Base Learning (P)- Practical**

## List of Practicals AyUG-RS

Marks: 200

Hours: 240

SN	Name of Practical	Term	Hours
P1	<ul style="list-style-type: none"><li>• Branches of anatomy. History of Anatomy</li><li>• Ethics in dissection hall</li></ul>	I	2
P2	<u>Anatomical Terminologies</u> Anatomical position, Planes, and explanation of anatomical terms related to skin, fasciae, bones, joints and their movements, muscles, ligaments, tendons, blood vessels, nerves.	I	4
P3	Preservation methods of the cadaver, Mrut sharir Samshodhan <ul style="list-style-type: none"><li>• Different methods of preservation techniques.</li></ul> Brief introduction of chemical composition of preservative fluid.	I	2
P4	Introduction of Anatomy Act and Brief detailing about Bio medical waste management act 1960	I	2
P5	Shava vichhedana – detailed dissection of the whole body <ul style="list-style-type: none"><li>• Line of incision</li><li>• Dissection technique</li><li>• Identification of different tools and its Uses</li><li>• Identification and characteristics of Different layers and its relation</li></ul>	I	32
	<u>In Extremities:</u> Dissection of extremities & Identification of related structures	II	40
	<u>In Trunk region:</u> Demonstration of visceral relation of thoracic, abdominal and pelvic organ	II	38
	<u>In Head Region:</u> Dissection of head, Identification of Meninges, Major Sulci and gyri, Superficial origin of Cranial Nerve and venous Sinus.	III	14
	Dissection of sensory organs	III	22
P6	<ul style="list-style-type: none"><li>• Practical study of vital organs, Histological slides</li><li>• Identification of external features of thoracic, abdominal and pelvic viscera</li></ul>	II	06
P7	Practical study of bones	I	36

	Identification of external features of bones and different attachment		
	<p>Surface and Radiological anatomy</p> <p><b><u>In Radiology Anatomy:</u></b> Characteristics of radio imaging film and detailing about its color contrasting</p> <p>Identification of Normal alignment of bodily structure – X ray film</p> <ol style="list-style-type: none"> <li>Chest X Ray – A.P And P.A view</li> <li>Detailing of A.P view of Shoulder joint, Elbow Joint, Wrist joint, Hip joint, knee joint, Ankle joint.</li> <li>Identification of basic clinical finding through X ray film related to long bones and joints</li> </ol>	III	22
P8	<p><b><u>In Surface Anatomy Section:</u></b></p> <ul style="list-style-type: none"> <li>Identification of Underlying viscera of Nine region based upon Cadaveric and Living Anatomy</li> <li>Surface marking of thoracic, abdominal and pelvic viscera</li> </ul>	III	6
P9	<p>Practical study of Marma</p> <p>Surface markings of all Marma points and its anatomical demarcation.</p>	III	12
P10	<p>Brief detailing about body donation, organ donation and its awareness (Communication skills)</p>	III	2

**\*Note: one practical should not be less than 2 hrs.**

**Table 4: Learning objectives (Practical) of AyUG- RS**

<b>A4 Course outcome</b>	<b>B4 Learning Objective  (At the end of the session, the students should be able to)</b>	<b>C4 Domain/s ub</b>	<b>D4 Must to know/ desirabl e to know/N ice to know</b>	<b>E4 Level Does/ Shows how/ Knows how/ Know</b>	<b>F4 T-L method</b>	<b>G4 Assessment</b>	<b>H4 Form ative /sum mative</b>	<b>I4 Te rm</b>	<b>J4 Integration</b>
<b>Practical 1- Definition and branches of anatomy. History of Anatomy</b> [Time: Practical or other activity - 02 hours]									
<b>CO1</b>	Define and describe branches of anatomy and its history	Cognitive / knowledge / recall	MK	Know	Lecture/ Tutorial	Written +viva-voce	F&S	I	
<b>CO9</b>	Practice of ethics in the context of human dissection	Cognitive / knowledge / recall/ Affective/ psychomotor	MK	Knows Shows	Tutorial/ Demonstration	viva-voce	F&S	I	
<b>Practical 2- Anatomical Terminologies</b> [Time: Practical- 2 hours and other activity 2 hours]									
<b>CO1</b>	Demonstrate anatomical position, Planes, and explanation of anatomical terms related to skin, fasciae, bones, joints and their movements, muscles, ligaments, tendons, blood vessels, nerves.	Cognitive / knowledge / recall	MK	Knows	Tutorial/ Demonstration/ Simulation	Written +viva-voce/ Open book test/ Assignments	F&S	I	

<b>Practical 3- Preservation methods of the cadaver, Mrut sharir Samshodhan</b> [Time: Practical or other activity - 02 hours]									
CO9	Describe and demonstrate preservation methods of the cadaver and Mrut sharir Samshodhan	Cognitive / knowledge / recall	MK	Knows, Shows	Tutorial/ Demonstration	Written +viva-voce	F&S	I	
CO9	Describe the different methods of preservation techniques and give brief introduction of chemical composition of preservative fluid.	Cognitive / knowledge / recall	MK	Knows	Tutorial/ Demonstration	Written +viva-voce, spotting, OSPE	F&S	I	
<b>Practical 4- Introduction of Anatomy Act and Brief detailing about Bio medical waste management act 1960</b> [Time: Practical or other activity - 02 hours]									
CO9	Describe and follow the Anatomy Act and Bio medical waste management act 1960	Cognitive - comprehension, Affective/ psychomotor	NK	Knows, know how, Shows	Lecture/ Tutorial/ Demonstration	Written +viva-voce/ Practical performance/ Public awareness	F&S	I	
<b>Practical 5- Shava vichhedana – detailed dissection of the whole body</b> [Time: Practical- 126 hours and other activity 20 hours]									
CO9	Demonstrate the line of incision, dissection technique, different tools and their uses	Cognitive / knowledge / recall	MK	Knows/ Shows/ Shows How	Tutorial/ Demonstration / Cadaveric dissection	Written +viva-voce, spotting, OSPE	F&S	I	
CO9	Identify and characteristics of Different layers and its relation	Cognitive / knowledge / recall	DK	Knows	Tutorial/ Demonstration / Simulations /	Written +viva-voce, spotting, OSPE	F&S	I	



					Cadaveric dissection				
CO9	Identify and demonstrate muscles of extremities and its related structures	Cognitive / knowledge / recall	DK	Knows, Shows	Tutorial/ Demonstration / Cadaveric dissection	Written +viva-voce	F&S	II	
CO6	Describe and demonstrate the visceral relation of thoracic and abdominal organ	Cognitive - comprehension + psychomotor	DK	Knows, Shows	Demonstration / Simulations / Cadaveric dissection	Written +viva-voce, spotting, OSPE/ Practical performance	F&S	II	
CO6	Describe and demonstrate surface identification of parts of brain, major sulci and gyri, superficial origin of cranial nerve and meninges and venous sinus.	Cognitive - comprehension + psychomotor	MK	Knows, Shows	Demonstration / Simulations/ Cadaveric dissection	Written +viva-voce, spotting, OSPE/ Practical performance	F&S	III	
CO6	Describe, dissect and demonstrate the sensory organs	Cognitive - comprehension + psychomotor	MK	Knows, Shows	Demonstration / Simulations/ Cadaveric dissection	Written +viva-voce, spotting, OSPE/ Practical performance	F&S	III	
<b>Practical 6- Practical study of vital organs, Histological slides and identification of external features of thoracic and abdominal viscera</b>									
[Time: Practical- 04 hours and other activity 02 hours]									
CO6	Focus the histological slides of identified organs	Cognitive / knowledge / recall	DK	Knows	Tutorial/ Demonstration	Written +viva-voce spotting, OSPE	F&S	II	
CO6	Describe and demonstrate the	Cognitive - comprehension +	MK	Knows Shows	Demonstration	Written +viva-voce, spotting,	F&S	II	

	external features of thoracic and abdominal viscera	psychomotor				OSPE/ Practical performance			
<b>Practical 7- Practical study of bones</b> [Time: Practical- 30 hours or other activity 06 hours]									
CO3	Describe and demonstrate external features of bones and muscle attachments	Cognitive - comprehension + psychomotor	MK	Knows, Shows	Demonstration / Simulations	Written +viva-voce, spotting, OSPE/ Practical performance	F&S	I	
CO10	Describe the characteristics of radio imaging film and difference in color contrasting	Cognitive / knowledge / recall	DK	Knows	Tutorial/ Demonstration / Simulations	Written +viva-voce spotting, OSPE	F&S	I	
<b>Practical 8- Surface and Radiological anatomy</b> [Time: Practical- 20 hours and other activity 08 hours]									
CO10	Describe and demonstrate the normal alignment of chest X Ray – A.P And P.A view	Cognitive - comprehension + psychomotor	MK	Knows, Shows	Tutorial/ Demonstration	Written +viva-voce, spotting, OSPE/ Practical performance	F&S	III	
CO10	Describe and demonstrate the normal alignment of A.P view of Shoulder joint, Elbow Joint, Wrist joint, Hip joint, knee joint, Ankle joint	Cognitive - comprehension + psychomotor	MK	Knows, Shows	Tutorial/ Demonstration	Written +viva-voce, spotting, OSPE/ Practical performance	F&S	III	
CO10	Identify the basic clinical finding through X ray film	Cognitive - comprehension +	NK	Knows, Shows	Tutorial/ Demonstration	Written +viva-voce, spotting, OSPE/	F&S	III	Kaychikitas, Shalyatantra

	related to long bones and joints	Psychomot or				Practical performance			
CO8	Describe and demonstrate underlying viscera of Nine region based upon cadaveric and Living Anatomy	Cognitive - comprehension + psychomot or	DK	Knows, Shows	Tutorial/ Demonstration	Written +viva-voce, spotting, OSPE/ Practical performance	F&S	III	
CO8	Describe and demonstrate surface marking of thoracic and abdominal viscera	Cognitive - comprehension + psychomot or	DK	Knows, Shows	Tutorial/ Demonstration	Written +viva-voce, spotting, OSPE/ Practical performance	F&S	III	
<b>Practical 9- Practical study of Marma</b> [Time: Practical or other activity - 12 hours]									
CO5, CO8	Describe and demonstrate surface markings of Marma points and its anatomical demarcation of all Marma as per Shadang sharir	Cognitive - comprehension + psychomot or	MK	Knows + Shows	Tutorial/ Demonstration / Cadaveric dissection	Written +viva-voce, spotting, OSPE/ Practical performance	F&S	III	Panchakarma
<b>Practical 10- Body donation, organ donation and its awareness</b> [Time: Practical or other activity - 02 hours]									
CO9	Describe body donation and organ donation process with respect to specific organ and its awareness Demonstrate process of communication	Affective/ psychomot or	DK	Knows, know how, Shows	Tutorial/ Demonstration	Written +viva-voce/ Public awareness/ social work	F&S	III	Shalyatantra and Shalakyatantra
		Psychomot oe	MK		Role Play			III	

	process in awareness speech or counselling for Body donation.								
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**Table 5: Non-Lecture Activities Course AyUG-RS**

1	List non lecture Teaching-Learning methods	No of Activities (Values in hours)
a	Seminar / Workshop	14
b	Tutorial (TT) / Group Discussion (GD)	14
c	Problem based learning (PBL)	8
d	Integrated teaching (IT)	8
e	Early Clinical Exposure (ECE)/ Case Base Learning (CBL)	18
f	Self-Directed Learning (SDL) / Summary writing	12
g	Field visit	6
		<b>80</b>
2	<b>Practical (refer Table 4)</b>	<b>240</b>
	<b>Total</b>	<b>320</b>

**Other Educational Activities(Additional):**

- Field visit (community/anatomy museum) - II & III term
- Practical journal – II & III term
- Summary/ Essay writing (Research papers/Samhitas literature review)- II or III term

**Table 6: Assessment Summary****6 A - Number of Papers and Marks Distribution**

S.No.	Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand Total
				Practical/ Clinical	Viva	Electives	IA	Sub Total	
1.	AyUG-RS	2	200	100	70	-	30	200	400

**6 B - Scheme of Assessment (formative and Summative) AyUG-RS**

SR.NO.	PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
		First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
1	First	3 PA & First TT	3 PA & Second TT	3 PA & UE

PA: Periodical Assessment; TT: Term Test; UE: University Examinations

### 6 C - Calculation Method for Internal assessment Marks (30 Marks) AyUG-RS

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 30 Marks (D/15*30)	Term Test (Marks converted to 30)	Sub Total _/60 Marks	Term Assessment (..../30)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks) [MCQ (20*1 Marks), SAQ (8*5), LAQ (4*10)] and Practical (100 Marks) Then convert to 30 marks.							

### 6 D - Evaluation Methods for Periodical Assessment

S. No.	Evaluation Methods for Periodical Assessment
1.	Practical / Clinical Performance
2.	Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
3.	Open Book Test (Problem Based)
4.	Summary Writing (Research Papers/ Samhitas)
5.	Class Presentations; Work Book Maintenance
6.	Problem Based Assignment
7.	Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)
8.	Extra-curricular Activities, (Social Work, Public Awareness, Surveillance Activities, Sports or Other Activities which may be decided by the department).
9.	Small Project
10.	Other activities explained in Table 3 Column G3 as per indicated term and objective of the topic.

## 6 E - Paper Layout

### I PROFESSIONAL BAMS EXAMINATIONS

#### AyUG-RS

##### PAPER-1

Time: 3 Hours      Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

TOTAL MARKS 100

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ)	20	1	20
Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Long answer questions (LAQ)	4	10	40
				100

### I PROFESSIONAL BAMS EXAMINATIONS

#### AyUG-RS

##### PAPER-1I

Time: 3 Hours      Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

TOTAL MARKS 100

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ)	20	1	20
Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Long answer questions (LAQ)	4	10	40
				100

**6 F – I - Distribution of Theory exam AyUG- RS**

	Paper I	A List of Topics	B Term	C Marks	D Type of Questions “Yes” can be asked. “No” should not be asked.		
					MCQ (1 Mark)	SAQ (5 Marks)	LAQ (10 Marks)
1		Sharitropkramaniya Shaarira	I	Refer Next table	Yes	Yes	No
2		Paribhasha Shaarira	I		Yes	Yes	No
3.		Garbha Shaarira	I		Yes	Yes	Yes
4.		Asthi Shaarira	I		Yes	Yes	Yes
5.		Sandhi Shaarira	II		Yes	Yes	Yes
6.		Snayu sharir	II		Yes	Yes	No
7.		Peshi Shaarira	II		Yes	Yes	No
8.		Kesha, Danta, Nakha Sharir	II		Yes	Yes	No
9		Embryology	I		Yes	Yes	Yes
10		Osteology	I		Yes	Yes	Yes
11		Arthrology.	II		Yes	Yes	Yes
12		Myology	II		Yes	Yes	No
13		Nervous System.	III		Yes	Yes	Yes
14		Endocrinology	III		Yes	Yes	Yes
15		Lymphatic system	III		Yes	No	Yes

	Paper II	A List of Topics	B Term	C Marks	D Type of Questions “Yes” can be asked. “No” should not be asked.		
					MCQ (1 Mark)	SAQ (5 Marks)	LAQ (10 Marks)
1		Pramana Shaarira:	II	Refer Next Table	Yes	No	No
2		Koshtha Evam Ashaya Shaarira	I		Yes	Yes	Yes
3.		Sira Sharir	II		Yes	Yes	Yes
4.		Dhamani Sharir	II		Yes	Yes	Yes
5.		Strotas Shaarira	II		Yes	Yes	Yes
6.		Kalaa Shaarira	III		Yes	Yes	Yes
7.		Indriya Shaarira	III		Yes	Yes	Yes
8.		Twacha Sharir	III		Yes	Yes	Yes
9		Marma Shaarira	II		Yes	Yes	Yes
10		Respiratory System	II		Yes	Yes	Yes



11	Digestive system	I		Yes	Yes	Yes
12	Cardiovascular system	II		Yes	Yes	Yes
13	Urinary System	II		Yes	Yes	Yes
14	Reproductive system	III		Yes	Yes	Yes
15	Sensory organs	III		Yes	Yes	Yes

## 6 F – II - Theme table

### Paper-I:

Theme*	Topics	Term	Marks	MCQ	SAQ	LAQ
a	1) Shariropakramaniya 2) Paribhasha Sharir	I	10	YES	YES	NO
b	3) Garbha Sharir 9) Embryology	I	20	YES	YES	YES
c	4) Asthi Sharir 10) Osteology	I	16	YES	YES	YES
d	8) Kesh, Dant, Nakha Sharir 7) Peshi Sharir 12) Myology	II	11	YES	YES	NO
e	5) Sandhi Sharir 6) Shayu Sharir 11) Arthrology	II	17	YES	YES	YES
f	13) Nervous System	III	14	YES	YES	YES
g	14) Endocrinology 15) Lymphatic	III	12	YES	YES	YES

\*Theme: is group of similar topics in Ayurved Sharir and Anatomy. Used in 6G question paper blue print

### Paper-II

Theme	Topics	Term	Marks	MCQ	SAQ	LAQ
a	2) Koshta Evam Ashay Sharir 11) Digestive system	I	16	YES	YES	YES
b	1) Praman Sharir 9) Marma Sharir	II	17	YES	YES	YES
c	3) Sira Sharir 4) Dhamani Sharir 5) Strotas Sharir 12) Cardiovascular System	II	21	YES	YES	YES
d	10) Respiratory System	II	10	YES	YES	YES
e	13) Urinary System	II	10	YES	YES	YES
f	14) Reproductive System	III	6	YES	YES	NO
g	6) Kala Shair 7) Indriya Sharir 8) Twacha Sharir 15) Sensory organs	III	20	YES	YES	YES

## 6 G Question paper Blue print for AyU-RS:

### PAPER-I

A Question Sr. No	B Type of Question	C Question Paper Format (Refer table 6 F II Theme table for themes)
Q1	<p><b>Multiple choice Questions (MCQ)</b></p> <p>20 Questions</p> <p>1 mark each</p> <p>All compulsory</p> <p><b>Must know part: 15 MCQ</b>  <b>Desirable to know: 3 MCQ.</b>  <b>Nice to know: 2 MCQ</b></p>	<ol style="list-style-type: none"> <li>1. Theme a</li> <li>2. Theme a</li> <li>3. Theme a</li> <li>4. Theme a</li> <li>5. Theme a</li> <li>6. Theme b</li> <li>7. Theme b</li> <li>8. Theme b</li> <li>9. Theme b</li> <li>10. Theme b</li> <li>11. Theme c</li> <li>12. Theme d</li> <li>13. Theme e</li> <li>14. Theme e</li> <li>15. Theme f</li> <li>16. Theme f</li> <li>17. Theme f</li> <li>18. Theme f</li> <li>19. Theme g</li> <li>20. Theme g</li> </ol>
Q2	<p><b>Short answer Questions (SAQ)</b></p> <p>Eight Questions</p> <p>5 Marks Each</p> <p>All compulsory</p> <p><b>Must know part: 7 SAQ</b>  <b>Desirable to know: 1 SAQ</b>  <b>Nice to know: Nil</b></p>	<ol style="list-style-type: none"> <li>1. Theme a</li> <li>2. Theme b</li> <li>3. Theme c</li> <li>4. Theme d</li> <li>5. Theme d</li> <li>6. Theme e</li> <li>7. Theme g/f</li> <li>8. Theme g/f</li> </ol>
Q3	<p><b>Long answer Questions (LAQ)</b></p> <p>Four Questions</p> <p>10 marks each</p> <p>All compulsory</p> <p><b>All questions on must know</b>  <b>No Questions on Nice to know and Desirable to know</b></p>	<ol style="list-style-type: none"> <li>1. Theme b</li> <li>2. Theme c</li> <li>3. Theme e</li> <li>4. Theme f/g</li> </ol>

## PAPER-II

Question Sr. No		SET
Q1	<p><b>Multiple choice Questions (MCQ)</b></p> <p>20 Questions</p> <p>1 mark each</p> <p>All compulsory</p> <p><b>Must know part: 15 MCQ</b> <b>Desirable to know: 3 MCQ.</b> <b>Nice to know: 2 MCQ</b></p>	<ol style="list-style-type: none"><li>1. Theme a</li><li>2. Theme b</li><li>3. Theme b</li><li>4. Theme c</li><li>5. Theme c</li><li>6. Theme c</li><li>7. Theme c</li><li>8. Theme c</li><li>9. Theme c</li><li>10. Theme d/e</li><li>11. Theme d/e</li><li>12. Theme d/e</li><li>13. Theme e/d</li><li>14. Theme e/d</li><li>15. Theme f</li><li>16. Theme g</li><li>17. Theme g</li><li>18. Theme g</li><li>19. Theme g</li><li>20. Theme g</li></ol>
Q2	<p><b>Short answer Questions (SAQ)</b></p> <p>Eight Questions</p> <p>5 Marks Each</p> <p>All compulsory</p> <p><b>Must know part: 7 SAQ</b> <b>Desirable to know: 1 SAQ</b> <b>Nice to know: Nil</b></p>	<ol style="list-style-type: none"><li>1. Theme a</li><li>2. Theme b</li><li>3. Theme c</li><li>4. Theme d/e</li><li>5. Theme e/d</li><li>6. Theme e/d</li><li>7. Theme f</li><li>8. Theme g</li></ol>
Q3	<p><b>Long answer Questions (LAQ)</b></p> <p>Four Questions</p> <p>10 marks each</p> <p>All compulsory</p> <p><b>All questions on Must to know</b> <b>No Questions on Nice to know and Desirable to know</b></p>	<ol style="list-style-type: none"><li>1. Theme a</li><li>2. Theme b</li><li>3. Theme c</li><li>4. Theme g</li></ol>

## 6 H - I - Distribution of Practical Exam

Practical 100 Marks + (Viva 70 + IA 30) Marks

SN	Heads	Marks
1	Spotting (Refer Table 6 H II below)	20
3	Kostha Ashay Sharir, Dissected organs and histology slides	20
4	Ashti, Sandhi, Peshi, Bones and Joints,	20
5	Marma Sharir, Surface & Radiological anatomy	20
6	Practical record (15 Marks) and Communication Skill (5 Marks)	20
7	Viva-Voce (Objective Structured) (Refer table 6 H – III)	70
8	Internal assessment	30
	<b>Total Marks</b>	<b>200</b>

### 6 H - II Practical Spot examination Questions – (20 marks)

SN	Question	Mark allotment
<b>Topic- Garbha/Sira/Kala</b>		
1	Identify the structure & give the Drushtant/ Metaphor related with it. e.g.- Gunja Phala- Artava, Spatik-Shukra, etc	Identification- 1 Drushtant- 1
<b>Topic- Marma</b>		
1	Identify the Marma & write its type as per Parinama & Rachana	Identification- 1 Type-1
2	Identify the Marma & write its Pariman & any two anatomical structures related to the Marma	Identification- 0.5 Pariman – 0.5 Anatomical structure - 1
3	Identify the Marma & write its applied aspect	Identification- 1 Viddha-1
<b>Topic- Bones, Muscles</b>		
1	Identify the bone & write its peculiarities (Any 2) e.g.- Atlas vertebra	Identification- 0.5 Peculiarities- 1.5
2	Identify the indicated part on the bone & write its attachment (Any 2) e.g., Scapula spine	Identification- 1 Attachment- 1
3	Identify the side of the given bone & write side determination points	Side identification- 0.5 Points- 1.5
4	Identify the side of the given bone & write its applied anatomy (Any 2 points)	Identification-1 Applied -1
5	Write the type of the given bone as per Ayurved & Modern science e.g., Tibia- Nalakasthi, long bone	Ayu. Type- 1 Modern type- 1
6	Identify the indicated muscle on the bone & write whether it originates or inserts there	Muscle identification- 1 Origin/insertion- 1
7	Identify the indicated muscle & write its action (Any 2)	Identification- 1 Action-1
8	Identify the indicated muscle & write its blood supply/nerve supply	Identification-1

		Supply-1
9	Identify the indicated muscle & write its applied anatomy	Identification-1 Applied -1
10	Identify the bone and write any two processes	Identification-1 Processes -1
11	Identify the bone and write any two angles	Identification-1 Angle -1
12	Identify the bone and write any one peculiarity related to gender e.g., Hip bone, Clavicle, Sacrum	Identification-1 Peculiarities- 1
<b>Topic- Joints</b>		
1	Identify the joint & write its ligaments (Any 3)	Identification- 0.5 Ligaments- 1.5
2	Identify the joint & write names of actions occurring there (Any 3)	Identification- 0.5 Actions- 1.5
3	Identify the joint & write the type of joint as per Ayurved & Modern science	Identification- 1 Ayu. Type- 0.5 Modern type- 0.5
4	Identify the joint & write its clinical anatomy (Any two)	Identification- 1 Clinical anatomy-1
5	Identify the joint & write its relation (Any two)	Identification- 1 Relation -1
6	Identify the joint & write the movements along with the muscle	Identification- 1 Movement -0.5 Muscle – 0.5
<b>Topic- Organs</b>		
1	Identify the organ & write name of the Srotas related to it	Identification- 1 Srotas-1
2	Identify the organ & write name of the kala related to it	Identification- 1 Kala-1
3	Identify the organ & write its Utpatti as per Ayurved	Identification- 1 Utpatti-1
4	Identify the organ & write its visceral impressions (Any 3)	Identification- 0.5 Impressions-1.5
5	Identify the organ & write its blood/nerve supply	Identification- 0.5 Supply-1.5
6	Identify the organ & write its borders (Any two)	Identification- 1 Borders -1
7	Identify the organ & write its surfaces (Any two)	Identification- 1 Borders -1
8	Identify the organ & write its applied anatomy (Any 3 points)	Identification-0.5 Applied -1.5
<b>Topic- Radiology</b>		
1	Identify the X-ray & write the structures seen in it (Any 3)	Identification- 0.5 Structures-1.5
2	Identify the view of the X-ray & write the marked structures (Any two)	Identification- 1 Structures-1
<b>Topic- Central Nervous System/ Sense organs</b>		
1	Name the lobes of the given organ e.g., cerebrum	Each lobe – 0.5 Total -2

2	Identify the sense organ & write its nerve supply e.g., tongue	Identification- 1 Supply-1
3	Identify the marked structure and write its applied aspect (Any two)	Identification- 1 Applied aspect-1

### 6 H - III Viva Voce (70 Marks)

Recall Questions	Comprehension Questions	Application Questions
40 Marks	20 Marks	10 Marks
1. Sira-Dhamani-Srotas 2. Shariropakramaniya Sharir 3. Paribhasha Shaarir 4. Praman Shaarira 5. Anatomical terminologies 6. Kalaa Sharir 7. Indriya Sharir & Sensory organ 8. Reproductive system	1. Nervous system 2. Endocrine system 3. Lymphatic system 4. Cardiovascular system 5. Urinary system	1. Garbha Sharir, 2. Embryology 3. Respiratory system 4. Digestive system
e.g., Definition, types, numbers, planes, parts, Shlokas, etc.	e.g., Relations, Blood supply, Nerve Supply, Venous & Lymphatic drainage, etc.	e.g., Applied anatomy, Clinical anatomy, Surgical anatomy, Congenital anomalies etc.

### 7. Reference and Resources

1. Parishadhya Shabdarth Sharir
2. Pratyaksha shaririram
3. Sharisthana of all Samhita
4. Sushrut Samhita Sharirshtana- Dr. Bhaskar Govind Chanekar
5. Brihat Shariram Vaidyaratna- P.S. Varrier
6. Abhinava Shariram- Acharya Damodar Sharma Gaur
7. Manava Sharir (Revised Edition)- Prof. Dinkar Govind Thatte
8. Sharir Rachana Vigyan (English)- Vaidya P.G. Athawale
9. Manual of Practical Anatomy Cunnigham Practical Manual Vol-1, Vol-2, Vol-3
10. Clinical Anatomy in Ayurveda - Prof. D.G. Thatte & Prof. Suresh Chandra
11. Ayurvedic Human Anatomy - Prof. Dr. Giridhar M. Kanthi
12. Sharir Rachana Vigyan Vol I & II- Dr. Sunil Kumar Yadav
13. Regional Anatomy - B. D. Chaurasia
14. Rachana Sharir Vigyana - Dr. Mahendra Sing
15. Relevant chapters of Brihtrayee and Laghutrayer
16. Gray's Anatomy
17. Text Book of Human Anatomy- Inderbir Singh
18. Clinical Anatomy- Richard S Snell
19. Fundamentals of Human Anatomy- Dr. Chakraborty
20. Human Osteology - Poddar
21. A Handbook of Anatomical Terminology- Dr. Nidhi Shrivastava, Dr. Ravi Kumar Shrivastava, Dr. Rakesh Kumar Sharma.



प्राणशिरः- प्रमाद्यतनानाम्

SCAN ME

Dr. Chakraborty

Dr. Nidhi Shrivastava

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Dr. Sushrut Samhita Sharirshtana

Dr. B. D. Chaurasia

Dr. Richard S Snell

Dr. Inderbir Singh

Dr. Rakesh Kumar Sharma

Dr. Nidhi Shrivastava

Dr. Ravi Kumar Shrivastava

Dr. Mahendra Sing

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Dr. Acharya Damodar Sharma Gaur

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Dr. Bhaskar Govind Chanekar

Kriya

chana Sharir, I BAMS(Ayurved)

**COURSE CURRICULUM FOR FIRST PROFESSIONAL BAMS**

**(PRESCRIBED BY NCISM)**

शास्त्रं ज्योतिः प्रकाशार्थं दशशतं  
बुद्धिरात्मनिः।

**KRIYA SHARIRA**

**(SUBJECT CODE- AyUG-KS)**

**HUMAN PHYSIOLOGY**

**(Applicable from 2021-22 batch onwards for 5 years or until further  
notification by NCISM, whichever is earlier)**

**BOARD OF AYURVEDA**

**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE  
NEW DELHI-110058**

NCISM

# I professional Ayurvedacharya (BAMS)

Subject Code: AyUG KS

## Kriya Sharir

### Summary

<b>AyUG KS</b> Total number of Teaching hours: 400			
<b>Lecture hours (LH) - Theory</b>		<b>150 Hours</b>	<b>150 Hours (LH)</b>
Paper I	75 Hours		
Paper II	75 Hours		
<b>Non-Lecture hours (NLH) – Theory</b>		<b>50 Hours</b>	<b>250 Hours (NLH)</b>
Paper I	25 Hours		
Paper II	25 Hours		
<b>Non-Lecture hours (NLH) - Practical</b>		<b>200 Hours</b>	

<b>AyUG KS</b> Examination (Papers & Mark Distribution)				
<b>Item</b>	<b>Theory Component Marks</b>	<b>Practical Component Marks</b>		
		<b>Practical</b>	<b>Viva</b>	<b>IA</b>
<b>Paper I</b>	<b>100</b>	<b>100</b>	<b>70</b>	<b>30</b>
<b>Paper II</b>	<b>100</b>			
<b>Sub-Total</b>	<b>200</b>	<b>200</b>		
<b>Total marks</b>	<b>400</b>			



## Preface

Kriya Sharir (Human Physiology) is an important subject of the BAMS program for the undergraduate students of Ayurveda. The term sharir means 'in the sharir' or 'related to the sharir' thus Sharir Kriya deals with the study of the human body concerning its physiological norms i.e., the functioning of the human body in its normal state. This subject refers to the physiology and biochemistry of contemporary medical science.

The swasthya of an individual is based on 3 pillars of the body i.e., dosha, dhatu & mala. Kriya Sharir subject mainly deals with these 3 pillars. The basic concepts, knowledge, and applicability of Tridosha (Vata, Pitta, Kapha), Sapta Dhatus (Rasa, Rakta, Mamsa, Meda, Asthi, Majja, Shukra), and Trimala (Mutra, Purish, Sweda) are very important in the critical understanding of the disease. Kriya Sharir also deals with Prakriti, Strotas, Kosta, Agni, Oja, Mana, Aahar (Basic principles of food), shatkriyakal, the system-wise study of contemporary science, senses function and dysfunction, etc. All these fundamental topics are essential for the proper understanding of etiopathogenesis, diagnosis of disease, and its management which will be covered in para-clinical and clinical subjects.

New curriculum of Kriya Sharir is designed considering cognitive, affective, and psychomotor domains. There are group discussions, workshops, field visits, and activities beyond the textbook during the practical hours like preparation of charts, models, seminar presentations by students. Kriya Sharir subject also deals with teaching-learning methods like role play, flipped the classroom, etc. Some assessment methods like OSPE, PBL, DOPS, CBD, skill assessment, etc are incorporated. The main aim of the curriculum is to highlight the basic knowledge and to give a new scientific approach to undergraduate students to develop their skills of Ayurveda and make them competent to apply in clinical practice and research.

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## Course Code and Name of Course

	Course code	Name of Course
	<b>AyUG KS</b>	<b>Kriya Sharir (Human Physiology)</b>

## AyUG KS Course

Table 1- Course learning outcomes and matched PO.

SR1	A1	B1
CO No	Course learning Outcomes (CO) AyUG KS At the end of the course AyUG-KS, the student should be able to-	Course learning Outcomes matched with program learning outcomes.
CO 1	Explain all basic principles & concepts of Kriya Sharir along with essentials of contemporary human physiology and biochemistry related to all organ systems.	PO1, PO2
CO 2	Demonstrate and communicate normal and abnormal variables pertaining to Kriya Sharir such as Sara, Agni, Koshtha, Srotas etc.	PO2, PO3
CO 3	Differentiate between Prakriti and Vikriti in the individuals after carrying out relevant clinical examinations.	PO1, PO2, PO3, PO5
CO 4	Carry out clinical examination and experiments using equipments with interpretation of their results	PO4
CO 5	Differentiate the strengths & limitations of Ayurved and contemporary sciences	PO2
CO 6	Present a short project work / research activity covering the role of Kriya Sharir in preventive and promotive healthcare.	PO5, PO6, PO7, PO8, PO9
CO 7	Show a sense of curiosity and questioning attitude towards the life processes and to display compassion and ethical behaviour	PO2, PO5, PO6, PO7, PO9
CO 8	Effectively communicate verbally and in writing preferably using Ayurvedic terminology along with contemporary terminology among peers, teachers and community	PO8, PO9

**Table 2 : Contents of Course AyUG KS**

<b>Paper I – AyUG-KS</b>					
<b>Sr No</b>	<b>A2 List of Topics AyUG-KS Paper I</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non-Lecture hours</b>
<b>PART-A (Marks-60)</b>					
1	<b>Sharir:</b> Definition and synonyms of term Kriya, Sharir & Shaarir. Description of Sharir Dosha and Manasa Dosha. Mutual relationship between Triguna-Tridosha & Panchmahabhuta.	I	08	2	1
2	<b>Basic principles of Ayurveda:</b> Dosha dhatu mala mulam hi shariram. Description of basics of Srotas	I		2	1
3.	<b>Tridosha:</b> General description of Tridosha. Inter relationship between Ritu-Dosha-Rasa- Guna. Biological rhythms of Tridosha on the basis of day-night-age-season and food intake. Role of Dosha in the formation of Prakriti of an individual and in maintaining of health. Prakrita and Vaikrita Dosha.	I		3	0
4.	<b>Vata Dosha:</b> Vyutpatti (derivation), Nirukti (etymology) of the term Vata, general locations, general properties and general functions of Vata, five types of Vata (Prana, Udana, Samana, Vyana, Apana) with their specific locations, specific properties, and specific functions.	I	26	6	2
5.	<b>Pitta Dosha:</b> Vyutpatti, Nirukti of the term Pitta, general locations, general properties and general functions of Pitta, five types of Pitta (Pachaka, Ranjaka, Alochaka, Bhrajaka, Sadhaka) with their specific locations, specific properties, and specific functions. Similarities and differences between Agni and Pitta.	I		5	1
6.	<b>Kapha Dosha:</b> Vyutpatti, Nirukti of the term Kapha, general locations, general properties and general functions of Kapha, five types of Kapha (Bodhaka, Avalambaka, Kledaka, Tarpaka, Śleshaka) with their specific locations, specific properties, and specific functions.	II		4	1
7.	<b>Dosha Vriddhi-Kshaya:</b> Etiological factors responsible for Dosha Vriddhi, Dosha Kshaya and their manifestations.	II		1	1
8.	<b>Kriyakala:</b> Concept of Kriyakala, applied physiology of diseases produced due the vitiation of vata, pitta and kapha.	II		1	1
9	<b>Prakriti:</b> <b>Deha- Prakriti:</b> Vyutpatti, Nirukti, various definitions and synonyms for the term "Prakriti". Intra-uterine and extra-uterine factors influencing Deha-Prakriti, classification and characteristic features of each kind of Deha-Prakriti. <b>Manasa- Prakriti:</b> Introduction and types of Manasa- Prakriti	II	7	3	
10.	<b>Ahara:</b> Definition, classification and significance of Ahara,	III	3	1	

	Ahara-vidhi-vidhana, Ashta Aharavidhi Viseshayatana, Ahara Parinamkar Bhava.				
11.	<b>Agni:</b> Definition and importance, synonyms, classification, location, properties and functions of Agni and functions of Jatharagni, Bhutagni, and Dhatvagni.	III	26	4	1
12.	<b>Aharapaka</b> (Process of digestion): Description of Annavaha Srotas and their Mula. Description of Avasthapaka (Madhura, Amla and Katu). Description of Nishthapaka (Vipaka) and its classification. Role of Grahani & Pittadhara Kala. Separation of Sara and Kitta. Absorption of Sara. Genesis of Vata-Pitta-Kapha during Aharapaka process. Definition of the term Koshtha. Classification of Koshtha and the characteristics of each type of Koshtha.	III		7	2
<b>PART-B (Marks-40)</b>					
1	<b>Physiology Homeostasis:</b> Definition and mechanisms of maintenance of homeostasis. Cell physiology. Membrane physiology. Transportation of various substances across cell membrane. Resting membrane potential and action potential. Acid-base balance, water and electrolyte balance. Study of basic components of food.	I		5	1
2	<b>Physiology of Respiratory system:</b> functional anatomy of respiratory system. Definition of ventilation, mechanism of respiration, exchange and transport of gases, neural and chemical control of respiration, artificial respiration, asphyxia, hypoxia. Introduction to Pulmonary Function Tests.	II	23	5	2
3	<b>Physiology of Gastrointestinal system:</b> Functional anatomy of gastro-intestinal tract, mechanism of secretion and composition of different digestive juices. Functions of salivary glands, stomach, liver, pancreas, small intestine and large intestine in the process of digestion and absorption. Movements of the gut (deglutition, peristalsis, defecation) and their control. Enteric nervous system. Digestion and metabolism of proteins, fats and carbohydrates. Vitamins & Minerals- sources, daily requirement, functions, manifestations of hypo and hypervitaminosis.	II		7	2
4	<b>Physiology of Nervous System:</b> General introduction to nervous system, neurons, mechanism of propagation of nerve impulse, physiology of CNS, PNS, ANS; physiology of sensory and motor nervous system, Functions of different parts of brain, intelligence, memory, learning and motivation. Physiology of sleep and dreams, EEG. Physiology of speech and articulation. Physiology of temperature regulation.	III	17	7	3
5	<b>Physiology of Endocrine glands:</b> General introduction to endocrine system, classification and characteristics of hormones, physiology of all endocrine glands, their functions and their effects.	III		6	2

<b>Paper II – AyUG-KS</b>					
	<b>A2 List of Topics Paper II</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
<b>PART-A (Marks-60)</b>					
1	<b>Dhatu:</b> Etymology, derivation, definition, general introduction of term Dhatu, different theories related to Dhatuposhana (Dhatuposhana Nyaya)	I	18	2	1
2	<b>Rasa Dhatu:</b> Etymology, derivation, location, properties, functions and Praman of Rasa-dhatu. Physiology of Rasavaha Srotas, Formation of Rasa Dhatu from Aahara Rasa, circulation of Rasa (Rasa-Samvahana), role of Vyana Vayu and Samana Vayu in Rasa Samvahana. Description of functioning of Hridaya. Ashtavidha Sara, characteristics of Tvakasara Purusha, conceptual study of Aashraya-Aashrayi Bhaava and its relation to Rasa and Kapha. Manifestations of kshaya and Vriddhi of Rasa	I		4	1
3.	<b>Rakta Dhatu:</b> Etymology, derivation, synonyms, location, properties, functions and Praman of Rakta Dhatu. Panchabhautikatva of Rakta Dhatu, physiology of Raktavaha Srotas, formation of Raktadhatu, Ranjana of Rasa by Ranjaka Pitta, features of Shuddha Rakta, specific functions of Rakta, characteristics of Raktasara Purusha, manifestations of Kshaya and Vriddhi of Raktadhatu, mutual interdependence of Rakta and Pitta.	I		3	1
4.	<b>Mamsa Dhatu:</b> Etymology, derivation, synonyms, location, properties and functions of Mamsa Dhatu, physiology of Mamsavaha Srotas, formation of Mamsa Dhatu, characteristics of Mamsasara Purusha, manifestations of Kshaya and Vriddhi of Mamsa Dhatu, Concept of Peshi.	I		2	1
5.	<b>Meda Dhatu:</b> Etymology, derivation, location, properties, functions and Praman of Meda Dhatu, physiology of Medovaha Srotas, formation of Medo Dhatu, characteristics of Medasara Purusha and manifestations of Kshaya and Vriddhi of Meda.	I		3	1
6.	<b>Asthi Dhatu:</b> Etymology, derivation, synonyms, location, properties, functions of Asthi Dhatu. Number of Asthi. Physiology of Asthivaha Srotas and formation of Asthi Dhatu, characteristics of Asthisara Purusha, mutual interdependence of Vata and Asthi Dhatu, manifestations of Kshaya and Vriddhi of Asthi Dhatu.	II	19	2	1
7.	<b>Majja Dhatu :</b> Etymology, derivation, types, location, properties, functions and Praman of Majjaa Dhatu, physiology of Majjavaha Srotas, formation of Majja Dhatu, characteristics of Majja Sara Purusha, relation of Kapha, Pitta, Rakta and Majja, manifestations of Kshaya and Vriddhi of	II		3	1

	Majja Dhatu.				
8.	<b>Shukra Dhatu:</b> Etymology, derivation, location, properties, functions and Praman of Shukra Dhatu, physiology of Shukraravaha Srotas and formation of Shukra Dhatu. Features of Shuddha Shukra, characteristics of Shukra-Sara Purusha, manifestations of Kshaya and Vriddhi of Shukra Dhatu.	II		3	1
9	<b>Concept of Ashraya-Ashrayi bhava</b> i.e. inter-relationship among Dosha, Dhatu Mala and Srotas. Applied physiology of diseases asserting saptadhatu enlisted under dhatu pradoshaj vikar.	II		1	1
10.	<b>Ojas:</b> Etymological derivation, definition, formation, location, properties, Praman, classification and functions of Ojas. Description of Vyadhikshamatva. Bala Vriddhikara Bhava. Classification of Bala. Etiological factors and manifestations of Ojavisramsa, Vyapat and Kshaya.	II		3	1
11.	<b>Upadhatu:</b> General introduction, etymological derivation and definition of the term Upadhatu. Formation, nourishment, properties, location and functions of each Upadhatu. <b>Stanya:</b> Characteristic features and methods of assessing Shuddha and Dushita Stanya, manifestations of Vriddhi and Kshaya of Stanya. <b>Artava:</b> Characteristic features of Shuddha and Dushita Artava. Differences between Raja and Artava, physiology of Artavavaha Srotas. <b>Tvak:</b> classification, thickness of layer and functions.	II		6	1
12.	<b>Mala:</b> Etymological derivation and definition of the term Mala. Aharamala: Enumeration and description of the process of formation of Aharamala. <b>Purisha:</b> Etymological derivation, definition, formation, properties, quantity and functions of Purisha. Physiology of Purishavaha Srotas, manifestations of Vriddhi and Kshaya of Purisha. <b>Mutra:</b> Etymological derivation, definition, formation, properties, quantity and functions of Mutra. Physiology of Mutravaha Srotas, physiology of urine formation in Ayurveda, manifestations of Vriddhi and Kshaya of Mutra. <b>Sveda:</b> Etymological derivation, definition, formation and functions of Sveda. Manifestations of Vriddhi and Kshaya of Sveda. Discription of Svedvaha Srotas <b>Dhatumala:</b> Brief description of each type of Dhatumala.	III	23	6	2
13	<b>Indriya vidnyan:</b> Physiological description of Panchagyaanendriya and physiology of perception of Shabda, Sparsha, Rupa, Rasa and Gandha. Physiological description of Karmendriya.	III		1	1
14	<b>Manas:</b> Properties, functions and objects of Manas. Physiology of Manovaha Srotas.	III		2	1
15	<b>Atma:</b> Properties of Atma. difference between Paramatma and Jivatma; Characteristic features of existence of Atma in living body.	III		2	0
16	<b>Nidra &amp; Swapna:</b> Nidrotpatti, types of Nidra, physiological and clinical significance of Nidra; Svapnotpatti and types of Svapna.	III		2	0

<b>PART-B (Marks-40)</b>					
<b>1</b>	<b>Haemopoetic system:</b> composition, functions of blood and blood cells, Haemopoiesis (stages and development of RBCs, and WBCs and platelets), composition and functions of bone marrow, structure, types and functions of haemoglobin, mechanism of blood clotting, anticoagulants, physiological basis of blood groups, plasma proteins, introduction to anaemia and jaundice.	<b>I</b>	18	5	2
<b>2</b>	<b>Immunity:</b> classification of immunity: Innate, acquired and artificial. Different mechanisms involved in immunity: Humoral (B-cell mediated) and T-Cell mediated immunity. Hypersensitivity.	<b>I</b>		2	0
<b>3</b>	<b>Physiology of cardio-vascular system:</b> Functional anatomy of cardiovascular system. Cardiac cycle. Heart sounds. Regulation of cardiac output and venous return. Physiological basis of ECG. Heart-rate and its regulation. Arterial pulse. Systemic arterial blood pressure and its control.	<b>I</b>		5	2
<b>4</b>	<b>Muscle physiology:</b> comparison of physiology of skeletal muscles, cardiac muscles and smooth muscles. Physiology of muscle contraction.	<b>II</b>	07	2	0
<b>5</b>	<b>Adipose tissue:</b> lipoproteins like VLDL, LDL and HDL triglycerides. Functions of skin, sweat glands and sebaceous glands.	<b>II</b>		2	1
<b>6</b>	<b>Physiology of male and female reproductive systems:</b> Description of ovulation, spermatogenesis, oogenesis, menstrual cycle.	<b>II</b>	15	5	2
<b>7</b>	<b>Physiology of Excretion:</b> functional anatomy of urinary tract, functions of kidney. Mechanism of formation of urine, control of micturition. Formation of faeces and mechanism of defecation.	<b>III</b>		4	2
<b>8</b>	<b>Special Senses, Sleep and Dreams:</b> Physiology of special senses. physiology of sleep and dreams	<b>III</b>		5	1



**Table 3: Learning objectives (Theory) of Course AyUG-KS**

<b>PAPER I</b>									
<b>A3</b> Course outcome	<b>B3</b> Learning Objective (At the end of the session, the Students should be able to)	<b>C3</b> Domain/sub	<b>D3</b> Must to know/ desirable to know/Nice to know	<b>E3</b> Level Does/ Shows how/ Knows how/ Know	<b>F3</b> T-L method	<b>G3</b> Assessment	<b>H3</b> Formative /summative	<b>I3</b> Term	<b>J3</b> Integration
<b>Paper I (Part A) (60 Hours)</b>									
<b>Topic 1 – Sharir (human body) (3 hr) [Lecture: 2 hours, non-lecture: 1 hour]</b>									
CO 1	Explain the definition and synonyms of the term <i>kriya, sharira</i> and <i>shaarira</i>	Cognitive (recall, comprehension)	Mk	K	Lecture	Written/ (MCQ, MEQ, LAQ, SAQ) Viva voce	F & S	I	
CO 2	Enlist the <i>sharira dosha</i> and <i>manasa dosha</i> and	Cognitive (recall, comprehension)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Explain mutual relationship between <i>triguna, panchmahabhuta</i> and <i>tridosha</i>	Cognitive (comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
<b>Topic 2 – Basic Principles of Kriya Sharir (3 hr) [Lecture: 2 hours, non-lecture: 1 hour]</b>									
CO 1	Express critical view of why <i>dosha- dhatu-mala</i> are described in specific numbers.	Cognitive (recall)	Dk	Kh	Discussion	Written	F	I	
CO 1	Explain the principle of “ <i>dosha-dhatu-mala mulam hi shariram</i> ”.	Cognitive (recall)	Mk	Kh	Lecture Discussion	Written	F & S	I	
CO 1	Discuss term homeostasis in <i>dosha-</i>	Cognitive (comprehension)	Dk	Kh	Discussion	Viva voce	F	I	

	<i>dhatu-mala.</i>								
CO 1	Explain role of <i>srotas</i> in the body.	Cognitive (comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Explain the basic concept of <i>srotas</i> and classify different <i>srotas</i> based on Rachana (morphological), <i>kriya</i> (functions) and <i>guna</i> (properties)	Cognitive (comprehension)	Mk	Kh	Lecture Discussion Flipped classroom	Written/ Viva voce	F & S	I	<i>Rachana sharir</i>
CO 1	Describe the significance of the knowledge of <i>srotas</i> in <i>kriya sharira</i>	Cognitive (comprehension)	Mk	Kh	Discussion	Written/ Viva voce	F & S	I	
CO 1	Compare <i>mula sthana</i> of <i>srotas</i> described in <i>samhitas</i> in view of <i>kriya sharir</i> and contemporary medical science	Cognitive (application)	Dk	Kh	Model Discussion Tutorial Assignment	Viva voce	F & S	I	
CO 1	Find out similarities and differences between <i>srotas</i> and system of contemporary science.	Cognitive (application)	Nk	Kh	Discussion Self-learning Think-Pair-Share	Short notes	F	I	
CO 1	Document observations on correlation of anyone environmental global change and physiological variation as per Ayurved, contemporary sciences.	Cognitive (application)	Nk	Kh	Discussion Self-learning Think-Pair-Share	Short notes	F	I	
CO 1	Recognize the contribution of Ayurveda in the formation of four basic principles of Bioethics mentioned in contemporary science.	Cognitive (recall) (comprehension)	Nk	Kh	Lecture Discussion	Written	F	I	
<b>Topic 3 – Tridosha (Three humors of the body) (3 hr) [Lecture: 3 hours, non-lecture: 0 hours]</b>									
CO 1	Describe <i>utpatti</i>	Cognitive	Mk	K	Lecture	Written/	F & S	I	

Kriya Sharir, I BAMS(Ayurvedacharya),

	( <i>prasad &amp; malabhuta</i> ), locations of <i>dosha</i> .	(recall)				Viva voce			
CO 1	State biological rhythms or circadian cycle of <i>tridosha</i> based on day-night-age-season food intake and relation to the environment	Cognitive (comprehension)	Mk	Kh	Lecture discussion Seminar	Written/ Viva voce	F & S	I	
CO 1	Explain the applied role of <i>dosha</i> in maintaining health and State of equilibrium and recognize the role of <i>dosha</i> in the formation of <i>prakriti</i> of an individual	Cognitive (comprehension)	Mk	Kh	Lecture discussion Seminar	Written/ Viva voce	F & S	I	
CO 1	State importance of <i>dosha</i> in lifestyle management and mutual relationship between <i>ritu-kala-dosha-rasa-guna</i>	Cognitive (application)	Nk	Kh	Discussion PBL	Viva voce	S	I	
CO 1	Interpret <i>gurvadi guna</i> of <i>dosha</i> in term of applied physiology and clinical aspect in different chapters of Charak.	Cognitive (application)	Nk	Kh	Discussion PBL/CBD	Written	F	I	<i>Padartha Vijnana. Kayachikitsa</i>
CO 1	Interpret <i>sama &amp; niram</i> lakshana of <i>dosha</i>	Cognitive (comprehension)	Dk	Kh	Discussion	Written	F	I	
CO 1	Discuss the evidences of functional significance of <i>vata</i> , <i>pitta</i> and <i>kapha</i> in perspective of nervous, endocrine, immune or any other system.	Cognitive (application)	Nk	Kh	Discussion Think-Pair-Share	Self-assessment	SA	I	
CO 1	Discuss how to examine <i>vrudhhi-kshaya</i> of <i>dosha</i>	Cognitive (comprehension)	Dk	Kh	Discussion PBL	Viva voce	S	I	
CO 1	State materialism and	Cognitive	Mk	Kh	Discussion	Viva voce	F	I	

	immaterialism of tridosha	(comprehension)							
<b>Topic 4 – Vata dosha (8 hr)</b> [Lecture: 6 hours, non-lecture: 2 hours]									
CO 1	Define the <i>vyutpatti</i> and <i>nirukti</i> of <i>vata</i> .	Cognitive (Recall)	Mk	K	Lecture	Written/ Viva voce	F & S	I	
CO 1	Describe <i>guna</i> and general locations of <i>vata dosha</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe general properties & functions of <i>vata dosha</i> and demonstrate the normal <i>guan, karma of vata dosha</i> in a healthy person.	Cognitive (Comprehension)	Mk	Kh/Sh	Lecture Discussion	Written/ Viva voce	F & S	I	<i>Rognidan Vikriti Vidnyan</i>
CO 1	Enlist five types of <i>vata</i> and describe <i>prana, udana vata</i> with their specific locations, properties and functions.	Cognitive (Recall & Comprehension)	Mk	Kh	Lecture Confusion technique Demonstration Chart, Model	Written/ Viva voce Skill assessment	F & S	I	
CO 1	Explain the term <i>nishwas, ucchwas, shwasan</i> & describe the role of <i>prana vayu &amp; udana vayu</i> in <i>shwasan prakriya</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture	Written/ Viva voce	F & S	I	
CO 1	Describe <i>shwasan prakriya</i> according to <i>sharangadhar</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Model, Video	Written/ Viva voce	F & S	I	
CO 1	Describe clinical importance of classification of <i>swara</i> and <i>vyanjana</i> according to their <i>uccharana sthan</i> .	Cognitive (Application)	Nk	Sh	Demonstration Discussion Assignment PBL/CBL	Self- assessment	SA	I	Sanskrit
CO 1	Describe the formation and articulation of <i>shabda</i> (words) and explain the bio-physiology of	Cognitive (Comprehension)	Dk	Kh	Lecture A/V aids.	Written/ Viva voce	F & S	I	

	induction of <i>vaak</i> and role of <i>udaan vaayu</i> in it.								
CO 1	Explain role of pranayama, <i>puraka</i> , <i>rechaka</i> and <i>kumbhaka</i> in <i>samyaka shwasana</i> , <i>swara/ ghosha utpatti</i>	Cognitive (Analysis)	Nk	Sh	Demonstration Discussion Assignment PBL/CBL	Self-assessment	SA	I	<i>Swasthavrutta</i>
CO 1	Describe <i>samana</i> with their specific locations, properties and functions.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Confusion technique Demonstration Chart, Model	Written/ Viva voce	F & S	I	
CO 1	Describe <i>vyana vata</i> with their specific locations, properties and functions.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Confusion technique Demonstration Chart, Model	Written/ Viva voce	F & S	I	
CO 1	Describe role of <i>vyana vayu</i> & <i>samana vayu</i> in the process of <i>rasa-samvahanana</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	I	
CO 1	Review the contribution of <i>vyana</i> and <i>saman vayu</i> in the process of cardiac circulation.	Cognitive (Comprehension)	Dk	K	Discussion	Written/ Viva voce	F	I	
CO 1	Interprete microbiota, gut brain axis for understanding enteric nervous system in perspective of <i>vata</i> , <i>saman vayu</i> .	Cognitive (Comprehension)	Nk	K	Discussion	Self-assessment	SA	I	
CO 1	Describe <i>Apana vata</i> with their specific locations, properties and functions.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Confusion technique Demonstration	Written/ Viva voce	F & S	I	

CO 1	Document & discuss your observations on correlation of functions of <i>apana vayu</i> with which type of nervous system & why?	Cognitive (Comprehension)	Nk	K	Discussion	Self-assessment	SA	I	
CO 1	Illustrate gati (directions) of types of vata by using lebel diagramme.	Cognitive (analysis)	Dk	Kh	Illustration	Self-assessment Peer evaluation.	SA	I	
CO3	Explain difference between <i>kshaya</i> & <i>vridhhi lakshana</i> of <i>vata Dosha</i>	Cognitive (Comprehension)	MK	Kh	Chalk-board Presentation Symposium Discussion	Written/ Viva voce	F & S	I	
CO5	Interpret which type of <i>vata dosha</i> gets vitiated and in which clinical condition the use of proper <i>aahar dravya</i> is prevalent as per <i>kshaya, vridhhi of vata dosha</i> .	Cognitive (Application)	Dk	Sh	Demonstration Discussion PBL	Written/ Viva voce	F & S	I	
CO 1	Recite and to explain the important verses of <i>vata dosha</i> . ( <i>ex-sthana, karma, types, vridhhi and kshaya</i> )	Cognitive (Recall)	Dk	Sh	Discussion Recitation	Written/ Viva voce	F & S	I	Sanskrit Samhita
<b>Topic 5 – Pitta dosha (6 hr)</b> [Lecture: 5 hours, non-lecture: 1 hour]									
CO 1	Define the <i>vyutpatti</i> and <i>nirukti</i> of <i>pitta</i> .	Cognitive (Recall)	Mk	Kh	Lecture	Written/ Viva voce	F & S	II	
CO 1	Describe <i>guna</i> and general locations of <i>pitta dosha</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Demonstration	Written/ Viva voce Skill assessment	F & S	II	
CO 1	Describe general	Cognitive (Recall)	Mk	Kh	Lecture	Written/	F & S	II	<i>Rognidan</i>

	properties & functions of <i>pitta dosha</i> and explain the normal <i>guna, karma of pitta dosha</i> in a healthy person.	& Comprehension)			Discussion Seminar	Viva voce			<i>Vikriti Vidnyan</i>
CO 1	Enlist five types of <i>pitta dosha</i> and describe <i>pachaka</i> with their specific locations, properties and functions.	Cognitive Recall	Mk	Kh	Lecture Discussion Demonstration	Written/ Viva voce	F & S	II	
CO 1	Record your opinions about functions of <i>pachak pitta</i> and digestive enzymes separately.	Cognitive (Comprehension)	Nk	Kh	Group discussion	Self-assessment	SA	II	
CO 1	Describe <i>ranjaka pitta</i> with their specific locations, properties and functions.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Demonstration	Written/ Viva voce	F & S	II	
CO 1	Describe role of <i>ranjaka pitta</i> in <i>rasaranjan</i> process as per different <i>aacharyas</i> .	Cognitive (Comprehension)	Dk	Kh	Lecture	Written/ Viva voce	F & S	II	
CO 1	Interprete stages of erythropoiesis and role of intrinsic factor, vit. B <sub>12</sub> etc in hemopoiesis.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	II	
CO 1	Describe <i>alochaka, bhranjaka, sadhaka pitta</i> with their specific locations, properties and functions.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Demonstration	Written/ Viva voce	F & S	II	
CO 1	Discuss rhodopsin and iodopsin along with <i>alochaka pitta</i> and note down	Cognitive (Recall)	Nk	Kh	Self study	Self-assessment	SA	II	

CO 1	Elaborate the functions of bhrajaka pitta in term physiology.	Cognitive (Comprehension)	Nk	Kh	Self study	Self-assessment	SA	II	
CO 1	Describe the role of <i>sadhaka</i> pitta in <i>sadhana</i> , concentration and observe changes upon heart rate and respiratory rate	Attitude (Imitation)	Nk	Sh	Discussion Demonstration	Self-assessment	SA	II	
CO 1	Find out similarities and differences between fuctions of sadhaka pitta and neurotransmitter.	Cognitive (Analysis)	Nk	Kh	Self study	Self-assessment	SA	II	
CO 1	Explain difference between <i>kshaya</i> & <i>vridhhi lakshana</i> of <i>pitta Dosha</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 5	Interpret which type of <i>pitta dosha</i> gets vitiated and in which clinical condition the use of proper <i>aahar dravya</i> is prevalent as per <i>kshaya, vridhhi</i> of <i>pitta dosha</i> .	Cognitive (Application)	Dk	Sh	Demonstration Discussion PBL	Written/ Viva voce	F & S	II	<i>Swasthavrutta</i>
CO 1	Distinguish the similarities & differences between <i>agni</i> and <i>pitta</i> in terms of their <i>guna</i> with examples in compendia.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion PBL Seminar	Written/ Viva voce	S	II	
CO 1	Make inferences and find evidences / examples in daily regimen to support generalization of <i>agni</i> & <i>pitta</i> statement.	Cognitive (Analysis)	Nk	Sh	Demonstration Discussion Assignment PBL/CBL	Self-assessment	SA	II	
CO 1	Recite and explain the important verses of <i>pitta dosha</i> . (ex-	Cognitive (Recall)	Dk	Kh	Discussion Recitation	Written/ Viva voce	F & S	II	



	<i>sthana, karma, types, vriddhi and kshaya)</i>								
	<b>Topic 6 – Kapha dosha (5 hr)</b> [Lecture: 4 hours, non-lecture: 1 hour]								
CO 1	Define the <i>vyutpatti</i> and <i>nirukti</i> of <i>kapha dosha</i> .	Cognitive (Recall Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe general properties & functions of <i>kapha dosha</i> and demonstrate the normal <i>guan, karma</i> of <i>kapha dosha</i> in a healthy person.	Cognitive (Recall) (Application)	Mk	Kh	Lecture Discussion Demonstration	Written/ Viva voce Skill assessment	F & S	II	
CO 1	Enlist five types of <i>kapha dosha</i> & describe <i>bodhaka kapha kledaka, tarpaka</i> with their specific locations, properties and functions.	Cognitive (Recall)	Mk	Knows	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Identify the role of saliva in taste perception and also in other way.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe role of <i>kledaka kapha</i> in lubricating and protective properties of mucus.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the role of <i>tarpaka kapha</i> in protects the sensory organs.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe <i>avalambaka, sleshaka</i> with their specific locations, properties and functions.	Cognitive (Recall)	Mk	Knows	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the role of	Cognitive	Dk	Kh	Lecture	Written/	F & S	II	

	<i>avalambaka</i> in heart protection and <i>sleshaka kapha</i> in arthritis.	(Comprehension)			Discussion	Viva voce			
CO 1	Explain difference between <i>kshaya</i> & <i>vridhhi lakshana</i> of <i>kapha Dosha</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	State importance of <i>prakrit shleshmik bala / veerya</i> & <i>vikrit shleshmik mala</i> & find out significance of above cognitive in applied aspect	Cognitive (Application)	Nk	Kh	Lecture Discussion	Self-assessment	SA	II	<i>Kayachikitsa</i>
CO 5	Interpret which type of <i>kapha dosha</i> gets vitiated and in which clinical condition the use of proper <i>aahar dravya</i> is prevalent as per <i>kshaya, vridhhi</i> of <i>kapha dosha</i> .	Cognitive (Application)	Nk	Sh	Demonstration Discussion PBL	Viva voce	F & S	II	<i>Swasthavrutta</i>
CO 1	Recite and explain the important verses of <i>kapha dosha</i> . (ex- <i>sthana, karma, vridhhi and kshaya</i> )	Cognitive (Recall & Comprehension)	Dk	Sh	Discussion Recitation	Written/ Viva voce	F & S	II	
CO 1	Describe neural & chemical communication system of body	Cognitive (Comprehension)	Nk	Kh	Self study	Self-assessment	SA	II	
<b>Topic 7 – Dosha Vridhhi-Kshaya (Hyper and hypo state of dosha) (2 hr) [Lecture: 1 hour, non-lecture: 1 hour]</b>									
CO 1	Describe etiological factors causing <i>tridosha vridhhi</i> & <i>kshaya</i> on the basis of <i>dravya, guna, karma, aahaar &amp; vihara</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	<i>Dravyaguna</i>
CO 1	Describe, observe and interpret individual	Cognitive (Comprehension)	Nk	Sh	Demonstration Discussion	Self-assessment	SA	II	

	causes and symptoms of <i>panchavidha vataprakopa</i> . ( <i>Ashtanga Hridaya nidana sthana</i> 16)	Application)			PBL				
CO 1	Describe <i>vridhdhi-kshaya lakshana</i> of <i>vata dosha</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe <i>vridhdhi &amp; kshaya lakshana</i> of <i>pitta</i> and <i>kapha dosha</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Enumerate the <i>nanatmaj vyadhi</i> of <i>tridosha</i>	Cognitive (Recall)	Nk	K	Lecture	Self-assessment	SA	II	
<b>Topic 8 – Kriyakala (Treatment as per prevalent kala) (2 hr) [Lecture: 1 hour, non-lecture: 1 hour]</b>									
CO 1	Explain the Concept of <i>kriyakala</i> & enumerate stages of <i>kriyakala</i> .	Cognitive (Recall) (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	<i>Rognidan Vikriti Vidnyan</i>
CO 1	Describe the stages <i>sanchaya, prakopa, prasara</i> of <i>kriyakala</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the stages <i>sthansanshraya, vyaktavastha &amp; bhedavastha</i> of <i>kriyakala</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the applied physiology of diseases produced due the vitiation of <i>vata, pitta</i> and <i>kapha</i> .	Cognitive (Comprehension)	Nk	Sh	Lecture Discussion	Self-assessment	SA	II	
CO 1	Describe ideas given in the <i>shat-kriyakala</i> about preventive measures	Cognitive (Comprehension)	Nk	Kh	Group discussion	Self-assessment	SA	II	
<b>Topic 9 – Prakriti (Deha- Prakriti, Manasa- Prakriti) (Body constitution, personality, temperament of individuals) (10 hr) [Lecture: 7 hours, non-lecture: 3 hours]</b>									
CO 1	Define the term <i>prakriti</i> and describe etymology & different	Cognitive (recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	II	

	meanings of the term <i>prakriti</i> .								
CO 1	Describe the role of different <i>matrijadi bhava</i> (genetic, intra-uterine and extra-uterine factors) influencing <i>prakriti</i> according to <i>Charaka and Sushruta</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Symposium	Written/ Viva voce	F & S	II	
CO 1	Describe the classification of different <i>prakriti</i> according to various Samhitas	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Enumerate types of <i>deha prakriti</i> and classify <i>deha prakriti</i> into <i>eka-doshaja, dvanvaja, samadoshaja</i> .	Cognitive (Recall)	Mk	Kh	Lecture Discussion Model Demonstration	Written/ Viva voce	F & S	II	
CO 1	Describe the <i>guna</i> (attributes) of <i>vata prakriti</i> according to <i>Charaka Samhita</i>	Cognitive (Comprehension)	Mk	Sh	Lecture Discussion Model Demonstration	Written/ Viva voce	F & S	II	
CO 1	Describe the <i>guna</i> (attributes) of <i>pitta prakriti</i> according to <i>Charaka Samhita</i>	Cognitive (Comprehension)	Mk	Sh	Discussion Role play real life experience	Written/ Viva voce	F & S	II	
CO 1	Describe the <i>guna</i> (attributes) of <i>kapha prakriti</i> according to <i>Charaka Samhita</i>	Cognitive (Comprehension)	Mk	Sh	Lecture Discussion video show Simulation	Written/ Viva voce	F & S	II	
CO 1	Describe <i>guna</i> of <i>vata, pitta &amp; kapha prakriti</i> according to Vagbhata (abhiruchi) & <i>Sushruta samhita (anukatva)</i>	Cognitive (Comprehension)	Mk	Sh	Discussion Model Demonstration Team project work, Tutorial	Written/ Viva voce	F & S	II	
CO 1	Describe the <i>guna</i> (attributes) of <i>vata, pitta &amp; kapha prakriti</i> according to	Cognitive (Comprehension)	Nk	Sh	Discussion	SA	SA	II	

	<i>Sharangadhara Samhita</i>								
CO 1	Describe the relationship between individual <i>prakriti</i> & <i>agni, koshtha</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe classification of <i>bhautik prakriti</i> and characteristic features of the individuals belonging to each kind of <i>bhautik prakriti</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe classification of <i>manas prakriti</i> and characteristic features of the <i>satvic prakriti</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the characteristic features of <i>rajasic &amp; tamasic manas prakriti</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe classification of and characteristic features of the individuals belonging to each kind of <i>jatyadi-prakriti</i>	<i>Cognitive (Comprehension)</i>	<i>Mk</i>	<i>Kh</i>	<i>Lecture Discussion</i>	<i>Written</i>	<i>F &amp; S</i>	II	
CO 1	Similarities and difference between the <i>sharirik &amp; manas prakriti</i> descriptions given in various Samhitas.	Cognitive (Comprehension)	Dk	Kh	Discussion Team project work	Written	F	II	<i>Kayachikitsa</i>
CO 1	Significance of the Cognitive of <i>prakriti</i> in clinical aspect and <i>pathya-apathya kalpana</i> in <i>ahara</i> and <i>vihara</i> of each type of <i>prakriti</i> .	Cognitive (Comprehension)	Mk	Kh	Discussion Self-learning Buzz group	Written Role play	F & S	II	
CO 1	Appreciate the use of various validated tools for assessing	Cognitive (Application)	Mk	Sh	Discussion Tutorial, Demonstration	Written/ Viva voce	F & S	II	

	Ayurvedic concept of human constitution (prakriti) (software/questionnaire) to evaluate <i>prakriti</i> - Ex-CCRAS portal								
CO 1	Describe the relevance of <i>desha-kala-ritu-vaya-ahara-vihara-satmya</i> , <i>aushadha</i> of parents especially of mother on <i>prakriti</i> of individual.	Cognitive (Application/Analysis)	Dk	Kh	Tutorial, Discussion	Viva voce Seli-assessment	SA	II	<i>Kayachikitsa</i>
CO 1	Appreciate the application of recent advances in the domain of research related to <i>prakriti</i> (genetic, physiological basis)	Cognitive (Application/Analysis)	Nk	Kh	Discussion	Seli-assessment	SA	II	
CO 1	Recite and explain the important verses of <i>vata</i> , <i>pitta</i> & <i>kapha doshaja prakriti</i> .	Cognitive (Recall & Comprehension)	Dk	Kh	Discussion Recitation	Written/ Viva voce	F & S	II	
CO 1	Observe distinguish features of individuals of three contrasting <i>prakriti</i> types <i>vata</i> , <i>pitta</i> and <i>kapha</i> by IGIB. Link: <a href="https://doi.org/10.1186/1479-5876-6-48">https://doi.org/10.1186/1479-5876-6-48</a>	Cognitive (Application)	Nk	Sh	Team project work	Team assessment	TA	II	
CO 1	Observe standardized <i>prakriti</i> assessment tool by CCRAS. Link: <a href="https://doi.org/10.5005/jp-journals-10064-0019">doi/10.5005/jp-journals-10064-0019</a>	Cognitive (Application)	Nk	Sh	Team project work	Team assessment	TA	II	
CO 1	Compare human constitution ( <i>prakriti</i> ) & genomic	Cognitive (Comprehension)	Nk	Kh	Group discussion	Self-assessment	SA	II	
CO 1	Record the known physiological variation	Cognitive (Application)	Dk	Kh	Real life experience	Demonstration	SA	II	

	of your friends in different <i>rutu</i> as per different <i>prakriti</i> .				Role play				
CO 1	Discuss correlation of genotype and phenotype with <i>prakriti</i> .	Cognitive (Comprehension)	Nk	Kh	Group discussion	Self-assessment	SA	II	
CO 1	Trace interrelationship between aging and <i>prakriti</i>	Cognitive (Comprehension)	Nk	Kh	Discussion	Self-assessment	SA	II	
CO 1	Point out hematological difference as per different <i>prakriti</i> .	Cognitive (Analysis)	Nk	Kh	Survey	Self-assessment	SA	II	
CO 1	Discuss <i>manas prakriti</i> and personality.	Cognitive (Comprehension)	Dk	Kh	Role pay	Self-assessment	SA	II	
CO 1	Role of <i>prakriti</i> (Ayurgenomics) in the concept of personalised medicine	Cognitive (Comprehension)	Nk	Kh	Group discussion Seminar	Self-assessment	SA	II	
CO 1	Explore thes Immunophenotyping & human dosha <i>prakriti</i> .	Cognitive (Comprehension)	Nk	Kh	Online material	Self-assessment	SA	II	
<b>Topic 10 – Ahara (Diet and nutrition in Ayurveda) (4 hr) [Lecture: 3 hours, non-lecture: 1 hour]</b>									
CO 1	Describe the <i>Nirukti</i> (etymology)& <i>paribhasa</i> (definition) of <i>ahar</i> .	Cognitive (Recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the <i>Bheda</i> (classification) and <i>upayogita</i> (importance) of <i>ahara</i> .	Cognitive (Recall)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Define, enlist and describe- the types of <i>ahara</i> in detail with examples	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Tutorial	Written/ Viva voce	F & S	III	

CO 1	Define, enlist and describe <i>ashta ahara-vidhi-viseshayatana</i> (8 factors to be considered while preparing and processing the food) in detail with examples	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	III	<i>Swathavritta</i>
CO 1	Describe <i>ahara vidhi vidhana</i> (rules for consuming the food) in detail with examples.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Explains the role of <i>ahara vidhi vidhana</i> in the context of present-day lifestyle, cooking habits and eating behaviour.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion Real life experience Evidance based learning	Written/ Viva voce	F & S	III	
CO 1	Define, enlist and describe <i>ahara parinamkara bhava</i> (factors responsible for proper digestion) and the importance of each of these factors in the process of digestion	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Explain the concept of <i>viruddha ahara</i> (incompatible diet) and its relevance in present-day food processing methods and dietary consumption behaviour in individuals.	Cognitive (application)	Dk	Sh	Lecture Discussion Observation	Written/ Viva voce	SA	III	<i>Swathavritta</i>
CO 1	Explain the role of <i>ahara</i> in today's aspect related to <i>anupana</i> habits etc.	Cognitive (application)	Nk	Sh	Lecture Discussion	Self assessment	SA	III	
CO 1	Explain the role in today's lifestyle of food, compatible food, the proper time for	Cognitive (application)	Nk	Sh	Lecture Discussion Assignment	Self-notes	SA	III	



	food taking, practice regarding food intake etc. in individual's health.								
CO 1	Explain dietary guidelines, how to eat food in Ayurvedic view.	Cognitive (application)	Nk	Kh	Lecture Discussion	Self assessment	SA	III	
<b>Topic 11 – Agni (The digestive fire of the body) (5 hr) [Lecture: 4 hours, non-lecture: 1 hour]</b>									
CO 1	Describe different meanings of <i>agni</i> in different contexts and define <i>agni</i> in the context of <i>kriya sharir</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	State the importance of <i>agni</i> in maintaining the different aspects of human physiology	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Enumerate and explain the different synonyms of <i>agni</i> regarding <i>kriya sharir</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Enumerate and define various classifications of <i>agni</i> concerning their locations and functions in the body	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the physiological roles of <i>jatharagni</i> , <i>bhutagni</i> and <i>dhatvagni</i> and explain the differences and similarities between the three.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	<i>Kayachikitsa</i>
CO 1	Classify and explain the features of four functional / abnormal states of <i>jatharagni</i> : <i>samagni</i> , <i>vishamagni</i> , <i>mandagni</i> & <i>tikshnagni</i> and explain evaluation process of <i>jarana-</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	<i>Rognidan</i>

	<i>shakti.</i>								
CO 1	Enumerate the factors affecting the normal functioning of Agni and the symptoms of improper functioning of <i>agni</i> seen in certain clinical conditions	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Viva voce	F	III	
CO 1	Enumerate and discuss different entities in the body that can represent different forms of <i>agni</i> from the contemporary physiology and biochemistry (hormones, enzymes etc) point of view	Cognitive (Comprehension)	Nk	Kh	Lecture Discussion	Self assessment Debate	SA	III	
CO 1	Record the opinions among your friends on the concept of free radicals & antioxidant	Cognitive (Application)	Nk	Sh	Team project work	Team assessment	TA	III	
CO 1	Identify digestive and metabolic functions of <i>Agni</i> & its clinical importance.	Cognitive (Application)	Nk	Sh	Group discussion	Self Assessment	SA	III	
CO 1	Distinguish the similarities & differences between <i>agni</i> and <i>pitta</i> in terms of their <i>guna</i> with examples in compendia. (mentioned in <i>pitta</i> also)	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion PBL	Written/ Viva voce	S	III	
<b>Topic-12. Annapachana / Aahara-paka (Digestion and metabolism in Ayurveda) (9 hr) [Lecture: 7 hours, non-lecture: 2 hours]</b>									
CO 1	Describe the <i>annavaha srotas</i> along with its <i>mula sthana</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Enumerate and describe different organs of <i>annavaha</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	

	<i>srotas</i> and their important functions. according to Ayurveda and contemporary physiology								
CO 1	Describe three stages of digestion: <i>madhura, amla</i> and <i>katu avasthapaka</i> in detail	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Tutorial	Written/ Viva voce	F & S	III	
CO 1	Describe the process of <i>udeerana</i> (increase/ release) of <i>vata, pitta, kapha</i> during <i>avasthapaka</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the formation of <i>prakrit</i> and <i>vaikrit dosha</i> ( <i>prasadbhuta, malabhuta dosha</i> ) and their role.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	<i>Rognidan</i>
CO 1	Describe the definition of <i>vipaka</i> ( <i>nisthapaka</i> ) and classification of <i>vipaka</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe how to identify <i>vipak</i> of <i>aahar</i> as per their effect on the body.	Cognitive (application)	Dk	Sh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the similarities and differences between <i>avasthapaka</i> and <i>nishthapaka</i>	Cognitive (Comprehension)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	III	

CO 1	Explain the role of different sub-types of <i>dosha</i> in the process of digestion: <i>bodhaka kapha, prana vayu, kledaka kapha, samana vayu, pachaka pitta, apana vayu</i> etc.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
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CO 1	Describe the process of separation of <i>saara</i> and <i>kitta</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	State the application of the theory of <i>pilu-paka</i> and <i>pithara paka</i> in <i>aharapaka</i>	Cognitive (Comprehension)	Nk	Kh	Lecture Discussion	Self-assessment	SA	III	
CO 1	Explain the role of <i>grahani</i> & <i>pittadhara kala</i> & describe possible relation between <i>pittadhara</i> and <i>majjadhara kala</i> .	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	State the importance of <i>pachaka pitta</i> and <i>jatharagni</i> in the process of digestion	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Explain the role of <i>bhutagni</i> and <i>dhatvagni</i> in <i>ahara parinaman</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the process of formation of <i>ahara-rasa</i> and absorption of <i>sara bhaga</i> / <i>anna-veerya</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Draw parallels between the different types of <i>agni</i> and various digestive enzymes and hormones	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Define <i>ahara gati</i> , <i>abhyavaharana shakti</i> , <i>annagrahana</i> , <i>pachana</i> , <i>vivechana</i> , <i>munchana</i> and <i>jaranashakti</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Discuss applied clinical aspect of <i>annavaha srotas</i> : <i>arochaka</i> , <i>ajirna</i> , <i>atisara</i> , <i>grahani</i> , <i>chardi</i> , <i>parinama shula</i> etc	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Viva voce CBD	F & S	III	

CO 1	Define different meanings of the term <i>koshtha</i> and explain the term in the context of <i>kriya sharira</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Enumerate the different types of <i>koshtha</i> according to the predominance of <i>dosha</i> ( <i>krura-mridu and madhya</i> )	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	<i>Panchakarma</i>
CO 1	State clinical significance of <i>koshtha</i> and the process of evaluating <i>koshtha</i> in an individual.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce DOPS	F & S	III	
<b>Part B ( 40 Hours) –</b>									
<b>Topic 1 - Physiology Homeostasis (6 hr) [Lecture: 5 hours, non-lecture: 1 hour]</b>									
CO 1	Define homeostasis and describe mechanisms of maintenance of homeostasis.	Cognitive (Recall/ Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Distinguish between the shell temperature and core temperature	Cognitive (Recall/ Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Define the terms Cell death, Cell degeneration, Cell aging. Describe animal tissue.	Cognitive (Recall/ Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe mechanism of positive and negative feedback system with at least two examples.	Cognitive (Recall/ Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the structure and function of cell, cell membrane, cytoplasmic	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	

	organelles, genetic material (DNA & RNA.)								
CO 1	Explain the process of DNA replication & inhibitors of replication.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the acid-base balance, water and electrolyte balance.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the concept of pH & buffer systems in the body and Na-K pump	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe and discuss transport mechanisms across cell membranes. (Active & facilitated)	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe and discuss the molecular basis of resting membrane potential and action potential	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
<b>Topic 2 - Physiology of respiratory system: (7 hr)</b> [Lecture: 5 hours, non-lecture: 2 hours]									
CO 1	Describe divisions of the respiratory system based on its functions.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe pulmonary circulation.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the mechanics of normal respiration, pressure changes during ventilation.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the lung volume and capacities, compliance, diffusion of lungs	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe and discuss the exchange and transport of gases - Oxygen and Carbon dioxide	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	I	

CO 1	Describe the neural and chemical control of respiration.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe physiological situations that affect respiration and discuss artificial respiration, dyspnoea, asphyxia, hypoxia, cynosis.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe Haldane effect & Kussmaul breathing.	Cognitive (Comprehension)	Nk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe basic of pulmonary function tests.	Cognitive (Comprehension)	Nk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
<b>Topic 3 - Physiology of Gastrointestinal system (9 hr) [Lecture: 7 hours, non-lecture: 2 hours]</b>									
CO 1	Describe enzyme and its fuctions in metabolism	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe functional anatomy and physiology of the digestive system	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the functions of salivary glands, stomach, liver, gall bladder pancreas, small intestine, large intestine in the process of digestion and absorption.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the mechanism of secretion, composition, functions, and regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe GIT movements deglutition, peristalsis, defecation and control	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the major components of food, the process of digestion and	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	II	

	metabolism of proteins, fats and carbohydrates								
CO 1	Describe the physiological role of vitamins	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the Gut-Brain Axis and enteric nervous system, and its function	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Discuss the physiology aspects of gastro-oesophageal reflux disease, vomiting, diarrhoea, constipation	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
<b>Topic 4 - Physiology of Nervous System (10 hr)</b> [Lecture: 7 hours, non-lecture: 3 hours]									
CO 1	Describe organization of nervous system.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the mechanism of propagation of nerve impulses.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the functions & properties of synapse, reflex, receptors	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the functional anatomy of the central nervous system (CNS) and peripheral nervous system (PNS)	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	III	
CO 1	Describe the physiology of autonomous nervous system (ANS)	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the physiology of sensory (general sensations) and motor nervous system	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe and discuss spinal cord, its functions, lesion & sensory disturbances	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe and discuss functions of the cerebral cortex, basal ganglia,	Cognitive (Comprehension)	Nk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	



	thalamus, hypothalamus cerebellum, mid brain, pons and medulla oblongata.								
CO 1	Describe and discuss the physiological basis of intelligence, memory, learning and motivation.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the physiology of cranial nerves	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe physiology of speech and articulation.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe physiology of temperature regulation.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the physiology of pain	Cognitive (Comprehension)	Nk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
<b>Topic 5 - Physiology of Endocrine glands (8 hr)</b> [Lecture: 6 hours, non-lecture: 2 hours]									
CO 1	Enlists and describe hormones & endocrine glands based on synthesis, secretion, transport, physiological actions, regulation.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe hormones secreted by anterior & posterior pituitary gland, their functions, disorders of pituitary gland (hyper & hypo activity)	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe hormones secreted by the Thyroid gland, their functions & disorders of Thyroid and parathyroid gland (hyper and hypoactivity)	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	III	
CO 1	Describe hormones secreted by Pancreas,	Cognitive (Comprehension)	Nk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	

	their functions & disorders of Pancreas (hyper and hypoactivity)								
CO 1	Describe hormones secreted by Adrenal cortex gland, their functions & disorders of Adrenal cortex gland (hyper and hypoactivity)	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe hormones secreted by Adrenal medulla gland, their functions & disorders of Adrenal medulla (hyper and hypoactivity)	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Enlist other Glands and their functions	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the synthesis and functions of local hormones	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
<b>PAPER II</b>									
<b>A3</b> Course outcome	<b>B3</b> Learning Objective (At the end of the session, the students should be able to)	<b>C3</b> Domain/sub	<b>D3</b> Must to know/ desirable to know/Nice to know	<b>E3</b> Level Does/ Shows how/ Knows how/ Know	<b>F3</b> T-L method	<b>G3</b> Assessment	<b>H3</b> Formative /summative	<b>I3</b> Term	<b>J3</b> Integration
<b>AyGU-KS</b>									
<b>Paper II ( 60 Hours )</b>									
<b>Topic-1. Introduction to Dhatu (3 hr) [Lecture: 2 hours, non-lecture: 1 hour]</b>									
CO 1	Explain the etymology, derivation, definition, synonyms and general	Cognitive (Recall)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	<i>Sanskrit Samhita/</i>

	introduction of the term <i>dhatu</i> .									<i>Rognidan Vikriti Vidnyan</i>
CO 1	Explain the difference between <i>dhatu</i> and <i>upadhatu</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I		
CO 1	Explain different theories related to <i>dhatuposhana Nyaya</i> (nourishment of different <i>dhatu</i> s).	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written / Viva voce	F & S	I		
CO 1	Explain the applicability of <i>nyaya</i> in the different physiological mechanisms.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Jigsaw	Written/ Viva voce	F & S	I		
CO 1	Describe <i>utpatti &amp; poshana</i> of <i>dhatu</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I		
CO 1	Compile various terminologies related to <i>dhau gati</i> and <i>dhatu poshana</i>	Cognitive (Comprehension)	Dk	Sh	Assignment Tutorial	Self- assessment	SA	I		
CO 1	Mention your opinion about <i>nyaya</i> concept on the basis of different metabolic pathways, transformation, transport of substances through cell membrane.	Cognitive (Application)	Nk	Kh	Group discussion Buzz group	Self- assessment	SA	I		
CO 1	Discuss theory of tissues formation and differentiation in context with physiological changes of aging.	Cognitive (Application)	Nk	Kh	Group discussion Homework based assignment	Self- assessment	SA	I		
CO 1	Discuss stem cells along with concepts of regeneration in <i>Ayurveda</i>	Cognitive (Recall/ Comprehension)	Nk	Kh	Lecture Online teaching aids	self assessment	SA	I		
CO 1	Study <i>Ayurvedic</i> aspect of <i>dhatu sarata</i> and its application	Cognitive (Application)	Nk	Kh	Group discussion Seminar	Self- assessment	SA	I		
	<b>Topic-2. Rasa Dhatu (5 hr)</b> [Lecture: 4 hours, non-lecture: 1 hour]									

CO 1	Explain the etymology, derivation, location, properties, functions and <i>pramana</i> of <i>rasa-dhatu</i> . <i>panchabhautikatva</i> of <i>rasa dhatu</i> .	Cognitive (Recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the functions of <i>rasavaha srotas</i> & <i>mula</i> of <i>rasavaha srotas</i> .	Cognitive (Recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the process of formation of <i>rasa dhatu</i> from <i>ahara rasa</i> , and circulation of <i>rasa-rakta</i> ( <i>rasa-rakta samvahana</i> )	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe <i>kshaya-vriddhi</i> & <i>rasapradoshaja vikara</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Assignment	Written/ Viva voce	F & S	I	
CO 1	Description of functioning of <i>hridaya</i> and physiological significance of <i>hridaya</i> .	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion Flipped classroom	Written/ Viva voce	F & S	I	
CO 1	Description of <i>sira</i> , <i>dhamani</i> and <i>srotas</i>	Cognitive (Comprehension)	Nk	Kh	Discussion Video show	Written/ Viva voce	F & S	I	
CO 1	Enumerate <i>ashtavidha sara</i> (8 types of <i>sara</i> ), and describe the features of individuals belonging to <i>tvak-saara purusha</i> .	Cognitive (Recall)	Mk	K	Lecture, Role play, real life experience, Discussion Brainstorming	Written/ Viva voce	F & S	I	
<b>Topic-3. Rakta Dhatu (4 hr)</b> [Lecture: 3 hours, non-lecture: 1 hour]									
CO 1	Explain the etymology, derivation, synonyms, location, properties, functions and <i>pramana</i> of <i>rakta dhatu</i> & explain the <i>panchabhautikatva</i> of <i>rakta dhatu</i> ,	Cognitive (Recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the physiology of <i>raktavaha srotas</i> , and describe the <i>mula</i> of <i>rakta-vaha srotas</i> and mutual interdependence of <i>rakta</i> and <i>pitta</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	

CO 1	Describe the formation of <i>rakta-dhatu</i> , <i>ranjana of rasa</i> by <i>Ranjaka pitta</i> , features of <i>shuddha rakta</i> , specific functions of <i>rakta</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the characteristics of <i>raktasaara Purusha</i>	Cognitive (Recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the manifestations of <i>kshaya and vriddhi</i> and name <i>pradoshaja vikara</i> of <i>raktadhatu</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Assignment	Written/ Viva voce	F & S	I	<i>Vikriti Vigyana</i>
CO 1	Elaborate the concept about inclusion or exclusion of <i>rakta dhatu</i> as a fourth dosha.	Cognitive (Comprehension)	Nk	Kh	Discussion Brainstorming	Written/ Viva voce	F	I	
<b>Topic-4. Mamsa Dhatu (3 hr)</b> [Lecture: 2 hours, non-lecture: 1 hour]									
CO 1	Describe the etymology, derivation, synonyms, location, properties and functions of <i>mamsa dhatu</i> , physiology of <i>mamsavaha srotas</i> , <i>mula of mamsavaha srotas</i>	Cognitive (Recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the formation of <i>mamsa dhatu</i> and the definition of <i>peshi</i> characteristics of <i>mamsasaara purusha</i> ,	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe manifestations of <i>kshaya</i> and <i>vriddhi</i> of <i>mamsa Dhatu</i> & describe the physiological basis of these manifestations. Name <i>mamsa pradoshaja vikara</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Assignment	Written/ Viva voce	F & S	II	<i>Vikriti Vigyana</i>
<b>Topic-5. Meda Dhatu (4 hr)</b> [Lecture: 3 hours, non-lecture: 1 hour]									

CO 1	Describe the etymology, derivation, location, properties, functions and <i>pramana</i> of <i>meda dhatu</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the <i>medovaha srotas</i> , its <i>mula</i> , the physiology of <i>medovaha srotas</i> , formation of <i>medo dhatu</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the characteristics of <i>medasaara purusha</i> and manifestations of <i>kshaya</i> and <i>vridhhi</i> of <i>meda</i> . Name <i>meda pradoshaja vikara</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Assignment	Written/ Viva voce	F & S	II	
CO 1	Describe the clinical features of <i>sthaulya</i> and <i>karshya</i> along with the physiological basis of these clinical conditions	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	<i>Vikriti Vigyana</i>
CO 1	Record the properties of lipid & mamsa dhatu.	Cognitive (Comprehension)	Nk	Kh	Discussion	Self assessment	F	II	
<b>Topic-6. Asthi Dhatu (3 hr)</b> [Lecture: 2 hours, non-lecture: 1 hour]									
CO 1	Describe the definition, synonyms, classification, properties ( <i>guna</i> ), and formation of <i>asthi dhatu</i> .	Cognitive (Comprehension)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the <i>asthi dhara kala</i> ; relation with <i>purishdharakala</i> and the features of <i>asthi sarata</i> .	Cognitive (Comprehension)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the applied physiology of <i>asthi dhatu</i> ( <i>asthi vridhhi/ asthi kshaya</i> ) and name <i>asthi pradoshaja vikara</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Assignment	Written/ Viva voce	F & S	II	<i>Vikriti Vigyana</i>

	<b>Topic-7 Majja Dhatu (4 hr)</b> [Lecture: 3 hours, non-lecture: 1 hour]								
CO 1	Describe the definition, synonyms and location ( <i>sthana</i> ) of <i>majja dhatu</i> .	Cognitive (Recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the formation of <i>majja dhatu majjavaha srotas</i> and its <i>mula</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe <i>majja dhara kala</i> in relation with <i>pittadhara kala</i> and the features of <i>majja sarata</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe applied physiology of <i>majja dhatu</i> ( <i>majja vridhhi and kshaya</i> ) and name <i>majja pradoshaja vikara</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Assignment	Written/ Viva voce	F & S	II	<i>Vikriti Vigyana</i>
CO 1	Comment on concept of <i>majja dhatu</i> and bone marrow	Cognitive (Comprehension)	Dk	Kh	Discussion Online teaching aids	Self assessment	F	II	
	<b>Topic-8. Shukra Dhatu (4 hr)</b> [Lecture: 3 hours, non-lecture: 1 hour]								
CO 1	Describe the etymology and derivation of <i>shukra dhatu</i> , location, properties, <i>pramana</i> functions of <i>shukra dhatu</i> .	Cognitive (Recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the formation of <i>shukra dhatu, poshana krama</i> and its <i>updathu</i> and <i>mala</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Puzzle	Written/ Viva voce	F & S	II	
CO 1	Describe the <i>mula</i> of <i>shukravaha srotas</i> and the properties of <i>shuddha shukra</i> along with <i>shukra saara purusha</i> symptoms.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the features of <i>kshaya &amp; vridhhi</i> of	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	<i>Vikriti Vigyana</i>

	<i>shukra dhatu &amp; shukra pradoshaja vikara</i>				Assignment				
CO 4	Identify histological structure explain structure of different tissue (dhatu)	Cognitive (Comprehension) Psychomotor	Mk	Kh	Demonstration Perform	Practical Skill assessment OSPE	F & S		
<b>Topic-9. Ashraya- Ashrayi Bhava (2 hr)</b> [Lecture: 1 hour, non-lecture:1 hour]									
CO 1	Describe the concept of <i>ashraya-ashrayi bhava</i> i.e. inter-relationship among <i>dosha, dhatu mala and srotas</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	<i>Vikriti Vigyana</i>
CO 1	Describe the applied physiology of diseases affecting <i>saptadhatu</i> enlisted under dhatu <i>pradoshaja vikara</i> .	Cognitive (Comprehension)	Dk	Kh	Discussion Seminar	Written	F	III	
CO 1	Explain use of <i>Ashraya-Ashrayi Bhava</i> in laghan bruhan.	Cognitive (application)	Nk	Kh	Discussion	Self- assessment	SA	III	
<b>Topic -10. Oja (4 hr)</b> [Lecture: 3 hours, non-lecture: 1 hour]									
CO 1	Recall etymological derivation, definition, classification, and <i>pramana</i> of <i>oja</i>	Cognitive (Recall)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the process of formation of <i>ojas</i> along with locations and properties	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the concept of <i>vyadhikshamatva</i> , explain <i>bala vriddhikara bhava</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Classify <i>bala</i> and describe etiological factors ( <i>kshaya karan</i> ) for <i>oja visramsas, vyapat and kshaya</i> and elaborate	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	<i>Vikriti Vigyana</i>



	the manifestation of these clinical conditions.								
CO 1	Collect different opinoins on oja given by different aacharya and try to understand the logic behind it.	Cognitive (Recall)	Nk	Kh	Discussion	Written	F	III	
CO 1	Interpret your opinion about oja-bala-kapha in its normal state.	Cognitive (Recall)	Nk	Kh	Discussion	Self-assessment	SA	III	
	<b>Topic-11. Upadhatu (7 hr)</b> [Lecture:6 hours, non-lecture: 1 hour]								
CO 1	Describe the general introduction, etymological derivation and definition of the term <i>upadhatu</i>	Cognitive (Recall)	Mk	K	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the formation, nourishment, properties, location and functions of each <i>upadhatu</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the characteristic features and methods of assessing <i>shuddha</i> and <i>dushita stanya</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	<i>Vikriti Vigyana</i>
CO 1	Describe the characteristic features of <i>vridhhi</i> and <i>kshaya</i> of <i>stanya</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe characteristic features of <i>shuddha</i> and <i>dushita artava</i> along with enumerating the differences between <i>raja</i> and <i>artava</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe <i>artava-vaha srotas</i> and its <i>mula</i> along with the common clinical conditions related to <i>artava-vaha srotas</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	<i>Vikriti Vigyana</i>

	<i>(kashtartava, vandhyata, pradara etc).</i>								
CO 1	Describe the classification, thickness of each layer and functions of <i>tvak</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Interpret the skin layer as per contemporary science.	Cognitive (Recall)	Nk	Kh	Discussion	Written	F	III	
<b>Topic 12. Mala (8 hr)</b> [Lecture: 6 hours, non-lecture: 2 hours]									
CO 1	Describe the etymological derivation and definition of the term <i>mala</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Enumerate <i>aharamala</i> and describe of the process of formation of <i>aharamala</i> .	Cognitive (Recall)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the etymological derivation, definition, formation, properties, quantity and functions of <i>purisha</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the physiology of <i>purishavaha srotas</i> , <i>purish visarjana</i> and manifestations of <i>vriddhi</i> and <i>kshhaya</i> of <i>purisha</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Explain the relation between <i>purishdhara kala</i> and <i>asthidhara kala</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the etymological derivation, definition, formation, properties, quantity and functions of <i>mutra</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the physiology of <i>mutravaha srotas</i> and the process of urine formation and <i>mutra visarjana</i> in Ayurveda.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	

CO 1	Explain the manifestations of <i>vridhhi</i> and <i>kshhaya</i> of <i>mutra</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Explain the urge of micturition & defecation in perspective of reflexes	Cognitive (Application)	Nk	Kh	Discussion	Self-assessment	SA	III	
CO 1	Describe and enumerate <i>dhatumala</i> and describe the functions of each type of <i>dhatumala</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Explain the etymological derivation, definition, formation and functions of <i>sveda</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Explain the functions of <i>svedvaha srotas</i> along with describing the manifestations of <i>vridhhi</i> and <i>kshaya</i> of <i>sveda</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Review Ayurveda compendia for several colour of purish and <i>mutra</i> as per their different diseased conditions.	Cognitive (Application)	Nk	Kh	Discussion	Self-assessment	SA	III	
<b>Topic 13. Indriya vijnyana (2 hr)</b> [Lecture: 1 hour, non-lecture: 1 hour]									
CO 1	Describe the <i>pancha-jnyaanendriya</i> and physiology of perception of <i>shabda</i> , <i>sparsha</i> , <i>rupa</i> , <i>rasa</i> and <i>gandha</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Tutorial	Written/ Viva voce	F & S	III	<i>Padarth vidnyan</i>
CO 1	Describe the physiology of <i>karmendriya</i>	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
<b>Topic 14. Manas (3 hr)</b> [Lecture: 2 hours, non-lecture: 1 hour]									
CO 1	Describe location and properties, functions and objects of <i>manas</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	

CO 7	Describe the physiology of <i>dhee, driti, smriti</i> and <i>manovaha srotas</i> along with the applied physiology of <i>unmada and apasmara</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Real life experience	Written/ Viva voce	F & S	III	<i>Kayachikitsa</i>
CO7	Describe <i>kriyatmak</i> (physiological) importance of <i>manas</i>	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
<b>Topic 15. Atma (2 hr)</b> [Lecture: 2 hours, non-lecture: 0 hours]									
CO 1	Describe properties and functions of <i>atma</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S		
CO 7	Enumerate the difference between <i>paramatma</i> and <i>jivatma</i> , characteristic features of <i>atma</i> in living beings.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	<i>Padarth vidnyan</i>
CO 7	Explain characteristic features of <i>atma</i> in living beings.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO7	Describe <i>kriyatmak</i> (physiological) importance of <i>atma</i>	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion tutorials	Written/ Viva voce		III	
<b>Topic 16. Nidra &amp; Svapna (2 hr)</b> [Lecture: 2 hours, non-lecture: 0 hours]									
CO 1	Describe the process of <i>nidrotpatti</i> , classify <i>nidra</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Explain the physiological and clinical significance of <i>nidra</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe <i>svapnotpatti</i> and types of <i>svapna</i> .	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Discuss about different types of <i>swapna</i> among your friends and try to understand relation of <i>swapna &amp; prakriti</i> .	Cognitive (Comprehension)	Nk	Kh	Group Discussion	Team assessment	TA	III	

	<b>Part B (40 Hours) –</b>								
	<b>Topic 1. Physiology of Hemopoietic System (7 hr)</b> [Lecture: 5 hours, non-lecture: 2 hours]								
CO 1	Describe the composition, functions of blood and blood cells.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Stages and development of RBCs, WBCs, platelets.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the composition and functions of bone marrow	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the process of erythropoiesis and explain necessary factors for erythropoiesis.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the formation & destruction of RBCs	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the structure, types, synthesis and functions of haemoglobin along with abnormalities of Hb.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the types of WBCs	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the mechanism of hemostasis, (coagulation of blood) and blood clotting factors.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	I	
CO 1	Describe the ABO & Rh system of blood group and explain the physiological basis of blood groups.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	Medical Physiology
CO 1	Explain the concept of erythroblastosis fetalis on the basis of Rh incompatibility.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	I	
CO 1	Describe the classification and	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	

	functions of plasma proteins.								
CO 1	Describe the properties and hemostasis functions of platelets.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the physiological basis of manifestations of different blood disorders (anaemia, jaundice etc.)	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the functions of spleen.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the functions of lymph.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
<b>Topic 2. Immune System (2 hr)</b> [Lecture: 2 hours, non-lecture: 0 hours]									
CO 1	Describe classification of immunity (Innate, acquired and artificial),	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the different mechanisms involved in immunity: Humoral (B-cell mediated) and T-Cell mediated immunity.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Distinguish between the passive immunization and active immunization	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the applied physiology of immunity: Immunodeficiency diseases, Hypersensitivity reactions, Auto-immune diseases etc.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion Seminar	Written/ Viva voce	F & S	I	
<b>Topic 3. Cardiovascular Physiology (7 hr)</b> [Lecture: 5 hours, non-lecture: 2 hours]									
CO 1	Describe the mechanical and electrical properties	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	

	of heart muscles, describe different phases of the Cardiac cycle.								
CO 1	Describe the physiological and clinical significance of heart sounds.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the physiology of regulation of cardiac output and venous return.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the physiological basis of ECG.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the regulation of heart-rate and arterial pulse,	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Define and describe the regulation of systemic arterial blood pressure	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the physiology of fetal circulation.	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Define and describe the regulation of systemic arterial blood pressure	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	I	
CO 1	Describe the history of the discovery of blood circulation	Cognitive (Comprehension)	Nk	Kh	Online	Self assessment	SA	I	
<b>Topic 4. Muscle physiology (2 hr)</b> [Lecture: 2 hours, non-lecture: 0 hours]									
CO 1	Compare and contrast the functions and properties of skeletal muscles, cardiac muscles and smooth muscles.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the physiology of muscle contraction of all types of muscles.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
<b>Topic 5. Skin, Adipose Tissue and circulating Lipids (3 hr)</b> [Lecture: 2 hours, non-lecture: 1 hour]									
CO 1	Describe the functions of the skin, sweat glands, sebaceous glands and subcutaneous tissue	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	

CO 1	Describe the functions of Adipose Tissue including adipokines	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the process of formation & metabolism of lipoproteins like VLDL, LDL and HDL and that of triglycerides.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the functional anatomy and physiology of the male reproductive system	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the physiology of regulation of spermatogenesis, functions of testosterone and male sexual act	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe physiology of the female reproductive system including oogenesis, ovulation and hormonal regulation of the menstrual cycle	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the functions of placenta	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the physiology of lactation	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
CO 1	Describe the applied physiology of the reproductive system of male and female infertility.	Cognitive (Comprehension)	Nk	Kh	Lecture Discussion	Written/ Viva voce	F & S	II	
<b>Topic 7. Renal Physiology (6 hr)</b> [Lecture: 4 hours, non-lecture: 2 hours]									
CO 1	Describe the functional anatomy of kidney.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the functions of kidney, ureters and bladder.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe stages of the mechanism of urine formation.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion Semiar	Written/ Viva voce	F & S	III	



CO 1	Describe control of micturition.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the role of Juxta glomerular apparatus in regulation of blood pressure and pH of body fluids.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	Medical Physiology
CO 1	Describe the applied physiology of the urinary system (urolithiasis, acute and chronic renal failure etc).	Cognitive (Comprehension)	Dk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the physiology of special senses.	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the visual process and visual pathway	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the mechanism of hearing and auditory pathway	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the taste, smell and skin sensation	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	
CO 1	Describe the physiology of sleep and dreams	Cognitive (Comprehension)	Mk	Kh	Lecture Discussion	Written/ Viva voce	F & S	III	

## List of Practicals

<b>PRACTICALS (Marks-100)</b>				
	<b>List of Topics</b>	<b>Term</b>	<b>Lecture</b>	<b>Non-Lecture</b>
1	Dhatu sararata parikshana	<b>I</b>	0	10
2.	Demonstrate laboratory equipment (spotting)	<b>I</b>	0	1
3.	Demonstrate blood collection	<b>I</b>	0	1
4.	Estimate haemoglobin	<b>I</b>	0	2
5.	Estimate bleeding time & clotting time	<b>I</b>	0	2
6.	Estimate blood grouping	<b>I</b>	0	2
7.	Prakriti parikshana	<b>II</b>	0	20
8.	Dosha vriddhi kshaya parikshana	<b>II</b>	0	4
9.	Dhatu vriddhi kshaya parikshana	<b>II</b>	0	5
10.	Nadi parikshana	<b>II</b>	0	3
11.	Pulse examination	<b>II</b>	0	2
12.	WBC estimation	<b>II</b>	0	2
13.	RBC estimation	<b>II</b>	0	2
14.	DLC estimation	<b>II</b>	0	2
15.	Measurement of Blood pressure	<b>II</b>	0	2
16.	Perform the procedure Inspection of respiratory system	<b>II</b>	0	2
17.	Perform the procedure Inspection of heart sound	<b>II</b>	0	3
18.	Agni parikshana	<b>III</b>	0	6
19.	Koshtha parikshana	<b>III</b>	0	2
20.	Urine examination	<b>III</b>	0	2
21.	Demonstrate ESR, PCV	<b>III</b>	0	1
22.	Observe the procedure of ECG	<b>III</b>	0	2
23.	Perform the procedure of examining the cranial nerves and reflexes	<b>III</b>	0	2

**Table 4: Learning objectives (Practical) of AyUG- KS**

<b>A4 Course outcom e</b>	<b>B4 Learning Objective  (At the end of the session, the Students should be able to)</b>	<b>C4 Domain/ sub</b>	<b>D4 Must to know/ desirabl e to know/Ni ce to know</b>	<b>E4 Level Does/ Shows how/ Knows how/ Know</b>	<b>F4 T-L method</b>	<b>G4 Assessment</b>	<b>H4 Formativ e /summati ve</b>	<b>I4 Te rm</b>	<b>J4 Integratio n</b>
<b>AyUG – KS Practical (100 marks) (Total 200 Hr)</b>									
<b>Practical (100 marks) =(Kriya Sharir 50 + Physiology 30 + Non Lecture practical activities 20)</b>									
<b>1. Assessment of prakriti parikshana (20 classes) [Lecture: 0 hours, non-lecture: 20 hours]</b>									
CO 3	Describe the procedure of <i>prakriti parikshan</i> of CCRAS portal.	Cognitive	Mk	Kh	Lecture Demonstration Discussion Observe Tutorial	Practical Viva voce	F & S	II	
CO 3	Demonstrate <i>prakriti parikshan</i> under the supervision of teacher.	Psychomotor	Mk	Sh	Demonstration in practical room & Bed side clinic Discussion	Viva voce	F & S	II	
CO 3	Determines <i>prakriti</i> of a paerson in an individual independently	Psychomotor	Mk	Dose	Demonstration in practical room & Bed side clinic Discussion Perform	Practical Viva voce Skill assessment OSPE, DOPS, CBD, Simulation	F & S	II	
CO 1	Recite verses of <i>vata, pitta &amp; kapha prakriti</i> .	Cognitive (Recall Comprehe nsion)	Dk	Kh	Discussion Recitation	Viva voce	F & S	II	
<b>2. Assessment of dhatusarata parikshana (10 classes) [Lecture: 0 hours, non-lecture: 10 hours]</b>									
CO 2	Describe the procedure of	Cognitive	Mk	Kh	Lecture Demonstration Discussion Observe	Practical Viva voce	F & S	I	

	<i>dhatuserata parikshana</i>								
CO 2	Demonstrate <i>dhatuserata parikshana</i> under the supervision of the teacher.	Psychomotor	Mk	Sh	Demonstration in practical room & Bed side clinic Discussion Assist	Viva voce	F & S	I	
CO 2	Evaluates <i>dhatuserata</i> in an individual independently	Psychomotor	Mk	Dose	Demonstration Bed side clinic Discussion Perform	Practical Viva voce Skill assessment OSPE, DOPS, CBD, Simulation	F & S	I	
CO 1	Recite verses of <i>ashta dhatuserata</i> .	Cognitive (Recall & Comprehension)	Dk	Kh	Discussion Recitation	Viva voce	F & S	I	
<b>3. Assessment of agni parikshana (6 classes) [Lecture: 0 hours, non-lecture: 6 hours]</b>									
CO 2	Describe the procedure of <i>agni parikshana</i>	Cognitive/comprehension	Mk	Kh	Lecture Demonstration Discussion Observe	Practical Viva voce	F & S	III	
CO 2	Demonstrate <i>agni parikshana</i> under the supervision of the teacher.	Psychomotor	Mk	Sh	Demonstration Bed side clinic Discussion Assist	Viva voce	F & S	III	
CO 2	Analyse <i>agni</i> in an individual independently	Psychomotor	Mk	Dose	Demonstration Bed side clinic Discussion Perform	Practical Viva voce Skill assessment OSPE	F & S	III	
CO 1	Recite verses of <i>agni</i> .	Cognitive (Recall & Comprehension)	Dk	Kh	Discussion Recitation	Viva voce	F & S	III	
<b>4. Assessment of koshtha parikshana (2 classes) [Lecture: 0 hours, non-lecture: 2 hours]</b>									
CO 2	Discuss the procedure of <i>koshtha parikshana</i>	Cognitive	Mk	Kh	Lecture Demonstration Discussion Observe	Practical Viva voce	F & S	III	
CO 2	Demonstrate <i>koshtha parikshana</i> under the	Psychomotor	Mk	Sh	Demonstration Bed side clinic Discussion	Viva voce	F & S	III	

	supervision of the teacher.				Assist				
CO 2	Evaluate <i>koshtha</i> of an individual independently	Psychomotor or	Mk	Dose	Demonstration Bed side clinic Discussion rform	Practical Viva voce Skill assessment OSPE	F & S	III	

<b>5. Assessment of dosha vrddhi kshaya lakshana (4 classes) [Lecture: 0 hours, non-lecture: 4 hours]</b>									
CO 3	Discuss the procedure of <i>dosha vrddhi kshaya lakshana</i>	Cognitive	Mk	Kh	Lecture Demonstration Discussion Observe	Practical Viva voce	F & S	II	
CO 3	Demonstrate <i>dosha vrddhi kshaya parikshana</i> under the supervision of the teacher.	Psychomotor	Mk	Sh	Demonstration Bed side clinic Discussion Assist	Viva voce	F & S	II	
CO 3	Perform <i>dosha vrddhi kshaya parikshana</i> in an individual independently	Psychomotor	Mk	Dose	Demonstration Bed side clinic Discussion Perform	Practical Viva voce Skill assessment OSPE	F & S	II	
CO 1	Recite verses of <i>dosha vrddhi kshaya</i> .	Cognitive (Recall Comprehension)	Dk	Kh	Discussion Recitation	Viva voce	F & S	II	
<b>6. Assessment of dhatu vrddhi kshaya parikshana (5 classes) [Lecture: 0 hours, non-lecture: 5 hours]</b>									
CO 3	Describe the procedure of <i>dhatu vrddhi kshaya lakshana</i>	Cognitive	Mk	Kh	Lecture Demonstration Discussion Observe	Practical Viva voce	F & S	II	
CO 3	Demonstrate <i>dhatu vrddhi kshaya parikshan</i> under the supervision of the teacher.	Psychomotor	Mk	Sh	Demonstration Bed side clinic Discussion Assist	Viva voce	F & S	II	
CO 3	Perform <i>dhatu vrddhi kshaya parikshan</i> in an individual independently	Psychomotor	Mk	Dose	Demonstration Bed side clinic Discussion Perform	Practical Viva voce Skill assessment OSPE	F & S	II	
CO 1	Recite verses of	Cognitive	Dk	Kh	Discussion	Viva voce	F & S	II	

	<i>dhatu vrddhi kshaya.</i>	(Recall & Comprehension)			Recitation				
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	<b>7. Assessment of nadi parikshana (3 classes) [Lecture: 0 hours, non-lecture: 3 hours]</b>								
CO 5	Describe the procedure of <i>nadi parikshana</i>	Cognitive	Mk	Kh	Lecture Demonstration Discussion Observation Tutorial	Practical Viva voce	F & S	II	
CO 5	Demonstrate <i>nadi parikshana</i> under the supervision of the teacher.	Psychomotor	Mk	Sh	Demonstration Bed side clinic Discussion Assist	Viva voce	F & S	II	
CO 5	Find out recent advances in nadi pariksha	Cognitive	Mk	Kh	Lecture Demonstration Discussion Observe	Practical Viva voce OSPE	F & S	II	
<b>Part B 30 practical of 2 hr each</b>									
[Lecture: 0 hours, non-lecture: 30 hours]									
CO 4	Explain the general laboratory etiquette  demonstrate the use of laboratory equipment.	Cognitive  Psychomotor	Mk	Sh	Lecture Demonstration Discussion Observe	Practical Viva voce Skill assessment OSPE	F & S	I	
CO 4	Discuss procedure of collection of a blood sample – prick, venepuncture method, use of anticoagulants.	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce	F & S	I	
CO 4	Describe Observe procedure of haemoglobin estimation, bleeding time and clotting time, blood grouping and Rh typing,	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce	F & S	I	

	differential Leukocyte Counting procedure.								
CO 4	Evaluate Hb, Bleeding time, clotting time, blood grouping & Rh typing, several Leukocyte Count (independently).	Psychomotor	Mk	Sh	Lecture Demonstration Discussion Perform	Practical Viva voce Skill assessment OSPE	F & S	I	
CO 4	Describe the procedure of WBC counting, RBC counting.	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce	F & S	II	
CO 4	Count WBC, RBC (independently).	Psychomotor	Mk	D	Perform	Practical	F	II	
CO 4	Describe the procedure of ESR, PCV	Cognitive	Mk	Sh	Lecture Demonstration Discussion Assist	Viva voce	F	III	
CO 4	Describe the procedure of physical and chemical examination of urine.	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce	F & S	III	
CO 4	Identify physical and chemical properties of urine.	Psychomotor	Dk	Sh	Lecture Demonstration Discussion Assist	Practical Viva voce Skill assessment OSPE, DOPS	F & S	III	
CO 4	Discuss the procedure of pulse examination demonstrated.	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce	F & S	II	
CO 4	Examine pulse independently.	Psychomotor	Mk	Sh	Lecture Demonstration Discussion Perform	Practical Viva voce Skill assessment OSPE	F & S	II	
CO 4	Describe the procedure of measurement of blood pressure	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce	F & S	II	

CO 4	Measure blood pressure (independently).	Psychomotor	Mk	Sh	Lecture Demonstration Discussion Perform	Practical Viva voce Skill assessment OSPE	F & S	II	
CO 4	Discuss the procedure of inspection of CVS and assessment of heart sounds	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce	F & S	II	
CO 4	Illustrate inspection of CVS and assessment of heart sounds (independently).	Psychomotor	Mk	Sh	Lecture Demonstration Discussion Perform	Practical Viva voce Skill assessment OSPE	F & S	II	
CO 4	Discuss the procedure of ECG recording demonstrated by the teacher.	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce Spotting	F & S	II	
CO 4	Discuss procedure of inspection of the respiratory system demonstrated by the teacher.	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce	F & S	II	
CO 4	Examine of the respiratory system (independently).	Psychomotor	Mk	Sh	Lecture Demonstration Discussion Perform	Practical Viva voce Skill assessment OSPE	F & S	II	
CO 4	Discuss the procedure of examining the cranial nerves and reflexes (superficial/ deep /visceral) demonstrated by the teacher.	Cognitive	Mk	Kh	Lecture Demonstration Discussion Assist	Viva voce Skill assessment OSPE	F & S	III	
CO 4	Perform the procedure of examining the cranial nerves and	Psychomotor	Mk	Sh	Lecture Demonstration Discussion Perform	Practical Viva voce Skill assessment OSPE	F & S	III	



	reflexes (superficial/deep/ visceral) by students independently.								
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**Table 5: Non-Lecture Activities Course AyUG- KS**

<b>Theory Non Lecture 50 (Paper I -25 &amp; Paper II-25)</b>		<b>No of Activity hours</b>
1.	Assignment - homework based	3
2.	Brainstorming	2
3.	Buzz group	1
4.	Case based learning	1
5.	Confusion technique	1
6.	Debate	1
7.	Demonstration	2
8.	Direct observation skill (DOPS)	1
9.	Flipped classroom	1
10.	Group Discussion	3
11.	Jigsaw or puzzle	1
12.	Mnemonics	2
13.	Model based learning	1
14.	Online teaching aids	1
15.	Panel discussion	1
16.	Problem based learning	2
17.	Real-life experience	1
18.	Recitation	3
19.	Role Play	1
20.	Self directed learning	3
21.	Seminar by students	5
22.	Simulated condition	1
23.	Skill assessment	2
24.	Symposium	2
25.	Team project work	1
26.	Think-Pair-Share	2
27.	Tutorial	3
28.	Video show	2
<b>Practical Non Lecture 100 (200 hours)</b>		
1.	Ayurveda Practicals – 50	100
2.	Modern Practicals – 30	60
3.	Activity based learning – 20	40
	Communication Skills, Small project / Experiment designing, Task-based learning, Teamwork based learning, Team project, Problem Based Learning (PBL)/(CBL), Group Discussion, Workshops, Field visits, Preparation of charts 1, models and computerized simulation models etc. , Seminar presentations by students	
<b>Total Non Lecture hours</b>		<b>250</b>

### Additional Suggested topics for tutorials

Point No.	Name of Topic
T – 1 CO 6	<i>Atma lakshana</i>
T – 2 CO3	Characteristics of <i>Prakriti Eka doshaja, dwandwaja and sama prakriti. Clinical importance of deha prakriti, anukatva.</i>
T – 3 CO5	<i>Nadi vigyan</i>
T – 4 CO6	<i>Anukatva</i>
T – 5 CO6	<i>Indriya panch panchak and physiological study of panchajyanendriya and panchakarmendriya.</i>
T – 6 CO6	<i>Meanings of terminologies used for dhatu poshana nyaya related to dhatu poshana</i>
T – 7 CO1	<i>Ahara dravya vargikarana</i>
T – 8 CO1	<i>Avasthapaka &amp; Vipak</i>

### Suggested topics for seminar topics

Sr. No.	Content
S – 1 CO8	<i>Tridosha</i>
S – 2 CO8	<i>Agni</i>
S – 3 CO8	<i>Rasa rakta samvahan</i>
S – 4 CO8	<i>Pranavah srotas and shwasana prakriya</i>
S – 5 CO8	<i>Ashtavidh sara</i>
S – 6 CO8	<i>Trividh nyaya</i>
S – 7 CO8	<i>Prakriti</i>
S – 8 CO8	Basic concept of nervous system
S – 9 CO8	Rh Incompatibility
S – 10 CO8	Digestion of Carbohydrates, proteins & fats
S – 11 CO8	Blood clotting mechanism
S – 12 CO8	Immune system
S – 13 CO8	O <sub>2</sub> -Co <sub>2</sub> gaseous exchange
S – 14 CO8	Hormones
S – 15 CO8	Renal system

### Suggested topics for group discussion

Sr. No.	Content
GD – 1 CO1	<i>Dosha dhatu mala mulam hi shariram</i>
GD – 2 CO1	<i>Concept of agni</i>
GD – 3 CO1	<i>Concept of upadhatu</i>
GD – 4 CO1	<i>Role of ranjak pitta in formation of rakta dhatu</i>
GD – 5 CO1	<i>Concept of srotas</i>
GD – 6 CO1	<i>Physiology of purishadhara kala / asthidhara kala. Pittadhara kala/ majjadhara kala</i>
GD – 7 CO1	<i>Generation of doshas</i>
GD – 8 CO1	<i>Ashraya-ashrayi bhava sambhadha of asthi and vata</i>
GD – 9 CO1	<i>Process of urine formation described in ayurveda compendia</i>
GD – 10 CO1	<i>Avasthapaka</i>
GD – 11 CO1	<i>Concept of shatkriyakala</i>
GD – 12 CO1	<i>Manas Prakriti</i>

**Table 6: Assessment Summary**

**6 A- Number of papers and Marks Distribution**

S.No.	Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand Total
				Practical/ Clinical	Viva	Electives	IA	Sub Total	
1.	AyUG-KS	2	200	100	70	-	30	200	400

**6 B - Scheme of Assessment (formative and Summative)**

SR.NO.	PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
		First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
1	First	3 PA & First TT	3 PA & Second TT	3 PA & UE

PA: Periodical Assessment; TT: Term Test; UE: University Examinations

**6 C - Calculation Method for Internal assessment Marks (30 Marks)**

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 30 Marks (D/15*30)	Term Test (Marks converted to 30)	Sub Total _/60 Marks	Term Assessment (.../30)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert to 30 marks.							

## 6 D - Evaluation Methods for Periodical Assessment

S. No.	Evaluation Methods for Periodical Assessment
1.	Practical / Clinical Performance
2.	Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
3.	Open Book Test (Problem Based)
4.	Summary Writing (Research Papers/ Samhitas)
5.	Class Presentations; Work Book Maintenance
6.	Problem Based Assignment
7.	Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)
8.	Extra-curricular Activities, (Social Work, Public Awareness, Surveillance Activities, Sports or Other Activities which may be decided by the department).
9.	Small Project
10.	Other activities explained in Table 3 Column G3 as per indicated term and objective of the topic.

## 6 E- Paper Layout

### I PROFESSIONAL BAMS EXAMINATIONS

#### AyUG-KS

##### Paper-I

Time: 3 Hours      Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

TOTAL MARKS 100.

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ)	20	1	20
Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Long answer questions (LAQ)	4	10	40
				100

#### AyUG-KS

##### Paper-II

Time: 3 Hours      Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

TOTAL MARKS 100.

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ)	20	1	20

Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Long answer questions (LAQ)	4	10	40
				100

## 6 F- Disribution of Theory Exam

	<b>Paper I Part-A (Marks-60)</b>	<b>B Term</b>	<b>C Marks</b>	<b>D Type of Questions "Yes" can be asked. "No" should not be asked.</b>		
				<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
	<b>A List of Topics AyUG-KS</b>					
1	<b>Sharir:</b>	<b>I</b>	8	Yes	Yes	No
2	<b>Basic principles of Ayurveda:</b>	<b>I</b>		Yes	Yes	No
3.	<b>Tridosha:</b>	<b>I</b>		Yes	Yes	No
4.	<b>Vata Dosha:</b>	<b>I</b>	26	Yes	Yes	Yes
5.	<b>Pitta Dosha:</b>	<b>I</b>		Yes	Yes	Yes
6.	<b>Kapha Dosha:</b>	<b>II</b>		Yes	Yes	Yes
7.	<b>Dosha Vriddhi-Kshaya:</b>	<b>II</b>		Yes	Yes	No
8.	<b>Kriyakala:</b>	<b>II</b>		Yes	Yes	No
9	<b>Prakriti: Deha- Prakriti: Manasa- Prakriti:</b>	<b>II</b>	26	Yes	Yes	Yes
10.	<b>Ahara:</b>	<b>III</b>		Yes	Yes	Yes
11.	<b>Agni:</b>	<b>III</b>		Yes	Yes	Yes
12.	<b>Aharapaka</b>	<b>III</b>		Yes	Yes	Yes
<b>Part-B (Marks-40)</b>						
1	<b>Physiology Homeostasis:</b>	<b>I</b>	23	Yes	Yes	Yes
2	<b>Physiology of Respiratory system:</b>	<b>II</b>		Yes	Yes	Yes
3	<b>Physiology of Gastrointestinal system:</b>	<b>II</b>		Yes	Yes	Yes
4	<b>Physiology of Nervous System:</b>	<b>III</b>	17	Yes	Yes	Yes
5	<b>Physiology of Endocrine glands:</b>	<b>III</b>		Yes	Yes	Yes

<b>Paper II</b> PART-A (Marks-60)				<b>D</b> <b>Type of Questions</b> "Yes" can be asked. "No" should not be asked.		
<b>A</b> List of Topics AyUG-KS	<b>B</b> Term	<b>C</b> Marks	<b>MCQ</b> (1 Mark)	<b>SAQ</b> (5 Marks)	<b>LAQ</b> (10 Marks)	
<b>Part-A (Marks-60)</b>						
<b>1</b>	<b>Dhatu:</b>	<b>I</b>	<b>18</b>	Yes	Yes	No
<b>2</b>	<b>Rasa Dhatu:</b>	<b>I</b>		Yes	Yes	Yes
<b>3.</b>	<b>Rakta Dhatu:.</b>	<b>I</b>		Yes	Yes	Yes
<b>4.</b>	<b>Mamsa Dhatu:</b>	<b>I</b>		Yes	Yes	Yes
<b>5.</b>	<b>Meda Dhatu:</b>	<b>I</b>		Yes	Yes	Yes
<b>6.</b>	<b>Asthi Dhatu:</b>	<b>II</b>	<b>19</b>	Yes	Yes	Yes
<b>7.</b>	<b>Majja Dhatu :</b>	<b>II</b>		Yes	Yes	Yes
<b>8.</b>	<b>Shukra Dhatu:</b>	<b>II</b>		Yes	Yes	Yes
<b>9</b>	<b>Concept of Ashraya-Ashrayi bhava</b>	<b>II</b>		Yes	Yes	No
<b>10.</b>	<b>Ojas:</b>	<b>II</b>		Yes	Yes	Yes
<b>11.</b>	<b>Upadhatu:</b> <b>Stanya:</b> <b>Artava:</b> <b>Tvak:</b>	<b>II</b>	<b>23</b>	Yes	Yes	Yes
<b>12.</b>	<b>Mala:</b> <b>Purisha:</b> <b>Mutra:</b> <b>Sveda:</b> <b>Dhatumala:</b>	<b>III</b>		Yes	Yes	Yes
<b>13</b>	<b>Indriya vidnyan:</b>	<b>III</b>		Yes	Yes	Yes
<b>14</b>	<b>Manas:</b>	<b>III</b>		Yes	Yes	Yes
<b>15</b>	<b>Atma:</b>	<b>III</b>		Yes	Yes	No
<b>16</b>	<b>Nidra &amp; Swapna:</b>	<b>III</b>		Yes	Yes	No
<b>Part-B (Marks-40)</b>						
<b>1</b>	<b>Haemopoetic system:</b>	<b>I</b>	<b>18</b>	Yes	Yes	Yes
<b>2</b>	<b>Immunity:</b>	<b>I</b>		Yes	Yes	No
<b>3</b>	<b>Physiology of cardio-vascular system:</b>	<b>I</b>		Yes	Yes	Yes
<b>4</b>	<b>Muscle physiology:</b>	<b>II</b>	<b>07</b>	Yes	Yes	No
<b>5</b>	<b>Adipose tissue:</b>	<b>II</b>		Yes	Yes	No
<b>6</b>	<b>Physiology of male and female reproductive</b>	<b>II</b>	<b>15</b>	Yes	Yes	Yes
<b>7</b>	<b>Physiology of Excretion:</b>	<b>III</b>		Yes	Yes	Yes
<b>8</b>	<b>Special Senses, Sleep and Dreams:</b>	<b>III</b>		Yes	Yes	Yes



## 6 G- Question paper blue print

### Paper I

AyUG-KS		
A Question Sr. No	B Type of Question	C Question Paper Format
.Q1	<p><b>Multiple choice Questions (MCQ)</b></p> <p>20 Questions</p> <p>1 mark each</p> <p>All compulsory</p> <p>Must know part - 15 MCQ Desirable to know - 3 MCQ Nice to know part - 2 MCQ</p>	<p><b>MCQ no.      Topic No</b></p> <ol style="list-style-type: none"> <li>1. Topic number part A 1</li> <li>2. Topic number part A 2</li> <li>3. Topic number part A 3</li> <li>4. Topic number part A 4</li> <li>5. Topic number part A 4</li> <li>6. Topic number part A 5</li> <li>7. Topic number part A 6</li> <li>8. Topic number part A 7</li> <li>9. Topic number part A 8</li> <li>10. Topic number part A 9</li> <li>11. Topic number part A 9</li> <li>12. Topic number part A 10</li> <li>13. Topic number part A 11</li> <li>14. Topic number part A 12</li> <li>15. Topic number part A 12</li> <li>16. Topic number part B 1</li> <li>17. Topic number part B 2</li> <li>18. Topic number part B 3</li> <li>19. Topic number part B 4</li> <li>20. Topic number part B 5</li> </ol>
Q2	<p><b>Short answer Questions (SAQ)</b></p> <p>Eight Questions 5 Marks Each All compulsory</p> <p>Must know - 7 SAQ Desirable to know - 1 SAQ No questions on Kice to know</p>	<ol style="list-style-type: none"> <li>1. Topic no. Part A 1/ Topic no. Part A 2/ Topic no. Part A 3</li> <li>2. Topic no. Part A 4/ Topic no. Part A 5/ Topic no. Part A 6</li> <li>3. Topic no. Part A 7/Topic no. Part A 8</li> <li>4. Topic no. Part A 9/Topic no. Part A 10</li> <li>5. Topic no. Part A 11/ Topic no. Part A 12/</li> <li>6. Topic no. Part B 1/ Topic no. Part B 2/</li> <li>7. Topic no. Part B 3</li> <li>8. Topic no. Part B 4/ Topic no. Part B 5</li> </ol>
Q3	<p><b>Long answer Questions (LAQ)</b></p>	<ol style="list-style-type: none"> <li>1. Topic no. Part A 4/ Topic no. Part A 5/ Topic no. Part A 6</li> <li>2. Topic no. Part A 9/ Topic no. Part A 10/ Topic no. Part A 11/</li> </ol>

	<p>Four Questions 10 marks each All compulsory</p> <p>All questions on must know. No Questions on Nice to know and Desirable to know</p>	<p>Topic no. Part A 12</p> <p>3. Topic no. Part B 1/ Topic no. Part B 2/ Topic no. Part B 3</p> <p>4. Topic no. Part B 4/ Topic no. Part B 5</p>
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## Paper II

AyUG-KS		
A Question Sr. No	B Type of Question	C Question Paper Format
.Q1	<p><b>Multiple choice Questions (MCQ)</b></p> <p>20 Questions</p> <p>1 mark each</p> <p>All compulsory</p> <p>Must know part - 15 MCQ Desirable to know - 3 MCQ Nice to know part - 2 MCQ</p>	<p><b>MCQ no. Topic no.</b></p> <ol style="list-style-type: none"> <li>1. Topic number part A 1/2</li> <li>2. Topic number part A 3</li> <li>3. Topic number part A 4/5</li> <li>4. Topic number part A 6</li> <li>5. Topic number part A 7</li> <li>6. Topic number part A 8</li> <li>7. Topic number part A 9/10</li> <li>8. Topic number part A 11</li> <li>9. Topic number part A 12</li> <li>10. Topic number part A 13/14/15/16</li> <li>11. Topic number part B 1</li> <li>12. Topic number part B 2</li> <li>13. Topic number part B 3</li> <li>14. Topic number part B 4</li> <li>15. Topic number part B 5</li> <li>16. Topic number part B 6</li> <li>17. Topic number part B 6</li> <li>18. Topic number part B 7</li> <li>19. Topic number part B 7</li> <li>20. Topic number part B 8</li> </ol>
Q2	<p><b>Short answer Questions (SAQ)</b></p> <p>Eight Questions 5 Marks Each All compulsory</p> <p>Must know - 7</p>	<ol style="list-style-type: none"> <li>1. Topic no. Part A 1/ Topic no. Part A 2/ Topic no. Part A 3/ Topic no. Part A 4/ Topic no. Part A 5</li> <li>2. Topic no. Part A 6/ Topic no. Part A 7/ Topic no. Part A 8/ Topic no. Part A 9/ Topic no. Part A 10</li> <li>3. Topic no. Part A 11/ Topic no. Part A 12</li> <li>4. Topic no. Part A 13/ Topic no. Part A 14/ Topic no. Part A 15</li> </ol>

	Desirable to know - 1 SAQ No questiona on Nice to know	Topic no. Part A 16 5. Topic no. Part B 1/ Topic no. Part B 2/ Topic no. Part B 3/ 6. Topic no. Part B 4/ Topic no. Part B 5 7. Topic no. Part B 6/ Topic no. Part B 8 8. Topic no. Part B 7
<b>Q3</b>	<b>Long answer Questions (LAQ)</b> Four Questions 10 marks each All compulsory  All questions on Must know. No Questions on Nice to know and Desirable to know	1. Topic no. Part A 2/ Topic no. Part A 3/ Topic no. Part A 4/ Topic no. Part A 5 2. Topic no. Part A 6/ Topic no. Part A 7/ Topic no. Part A 8/ Topic no. Part A 10 3. Topic no. Part A 11/ Topic no. Part A 12/ Topic no. Part A 13/ Topic no. Part A 14 4. Topic no. Part B 1/ Topic no. Part B 2/ Topic no. Part B 3

### 6 H Distribution of Practical Exam

(Practical 100 +Viva 70+ IA 30) = (Total 200 Marks)

AyUG-KS			
SN	Heads	Topic	Marks
<b>A</b>	<b>Practical</b>		
<b>1</b>	<b>Spotting</b>	Spotting (including two problem-based test) <ol style="list-style-type: none"> <li>1. Histology slide</li> <li>2. ECG report (counting heart rate etc.)</li> <li>3. Blood report (normal-abnormal values and significance)</li> <li>4. Photograph of prakriti character.</li> <li>5. Problem based sara/agni parikshan.</li> <li>6. Case of vrudhhi kshay lakshan.</li> <li>7. Aplicability of one spot used in haematological practical.</li> <li>8. Identify the difference between two things &amp; use.</li> <li>9. Model based</li> <li>10. Human experiment related</li> </ol>	10 Marks

<b>2</b>	<b>Ayu. Practical</b>	Performance based components. (Take only one practical separately OR make combination of few components of more than one practical) Ayurveda practical - Prakriti parikshana (Self / volunteer / patients)	40 Marks
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		Sara parikshana Agni & koshtha <i>parikshana</i> Dosha vrddhi-kshaya lakshana/ Dhatu vriddhi -kshaya Lakshana	
<b>3</b>	<b>Lab. Practical</b>	Laboratory practical (Hb, BT, CT, Blood group, Urine exam) Human physiology practical (pulse examination, BP, heart sounds, reflexes)	30 Marks
<b>4</b>	<b>Project work</b>	Project work (Activity based)	10 Marks
<b>5</b>	<b>Practical Record</b>	Practical Record	10 Marks
		<b>Total</b>	<b>100 Marks</b>
<b>B</b>	<b>Viva Voce</b>	General viva voce based on Ayurveda (20), Viva on instruments (20), Structured viva on Part B (refer Table 2)(10), Recitation of verses (15), and Communication skill (5)	70 Marks
<b>C</b>	<b>IA</b>	Internal Assessment	30 Marks
		<b>Total Marks</b>	<b>200 Marks</b>

## 7. References / Resources

- Ayurvediya Kriyasharir - Ranjit Rai Desai
- Kayachikitsa Parichaya - C. Dwarikanath
- Prakrit Agni Vigyan - C. Dwarikanath
- Sharir Kriya Vigyan - Shiv Charan Dhyani
- Abhinava Sharir Kriya Vigyana - Acharya Priyavrata Sharma
- Dosha Dhatu Mala Vigyana - Shankar Gangadhar Vaidya
- Prakrita Dosha Vigyana - Acharya Niranjana Dev
- Tridosha Vigyana - Shri Upendranath Das
- Sharira Tatva Darshana - Hirlekar Shastri
- Prakrita Agni Vigyana - Niranjana Dev
- Deha Dhatvagni Vigyana - Vd. Pt. Haridatt Shastri
- Sharir Kriya Vigyana (Part 1-2) - Acharya Purnchandra Jain
- Abhinava Sharir Kriya Vigyana - Dr. Shiv Kumar Gaur
- Pragyogik Kriya Sharir - Acharya P.C. Jain
- Kaya Chikitsa- Ramraksha Pathak
- Kaya Chikitsa Parichaya - Dr. C. Dwarkanath
- Concept of Agni - Vd. Bhagwan Das
- Purush Vichaya - Acharya V.J. Thakar
- Kriya Sharir - Prof. Yogesh Chandra Mishra
- Sharira Kriya Vijnana (Part 1 and 2) – Nandini Dhargalkar
- Sharir Kriya Vigyana - Prof. Jayaram Yadav & Dr. Sunil Verma.
- Kriya Sharir mcq – Dr. Kiran Tawalare
- Basic Principles of Kriya-Sharir (A treatise on Ayurvedic Physiology) - Dr. Srikant Kumar Panda
- Sharir Kriya – Part I & Part II – Dr. Ranade, Dr. Deshpande & Dr. Chobhe
- Human Physiology in Ayurveda - Dr Kishor Patwardhan
- Textbook of Physiology - Gyton & Hall
- Review of medical physiology – William Ganong
- Essentials of Medical Physiology - Sembulingam, K.
- Concise Medical Physiology - Chaudhari, Sujit. K.
- Fundamental of Anatomy & Physiology - Martini
- Principals of Anatomy & Physiology - Tortora & Grabowski
- Human Physiology - Richards, Pocock
- Samson Wrights Applied Physiology, Keele, Neil, joels
- Ayurveda Kriya Sharira - Yogesh Chandra Mishra
- Textbook of Medical Physiology - Indu Khurana
- Tridosha Theory - Subrahmanya Shastri
- Dosha Dhatu Mala vigyan – S. G. Vartak
- Purush Vichaya – Jayanad Thakar
- All Samhitas.
- Ayurvediya Shabda kosha.
- Vachaspatyam
- Shabdakalpadrum
- Monir Williams Sanskrit dictionary.

**COURSE CURRICULUM FOR FIRST PROFESSIONAL BAMS (PRESCRIBED BY  
NCISM)**

**शास्त्रं ज्योतिः प्रकाशार्थं दशशतं बुद्धिरात्मनिः।**



**PADARTHA VIJANANAM**

**(SUBJECT CODE- AyUG-PV)**

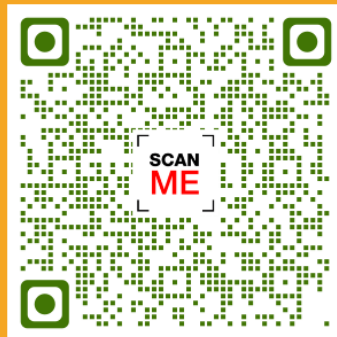
**FUNDAMENTAL PRINCIPLES OF AYURVEDA AND QUANTUM MECHANICS**

**(Applicable from 2021-22 batch onwards for 5 years or until further notification by  
NCISM, whichever is earlier)**



**BOARD OF AYURVEDA**

**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE NEW  
DELHI-110058**



NCISM

# I professional Ayurvedacharya (BAMS)

Subject Code: AyUG-PV

## Padartha Vijnanam

FUNDAMENTAL PRINCIPLES OF AYURVEDA AND QUANTUM MECHANICS

Total number of Teaching hours: 230			
<b>Lecture hours (LH) - Theory</b>		<b>90 Hours</b>	<b>90 Hours (LH)</b>
Paper I	45 Hours		
Paper II	45 Hours		
<b>Non-Lecture hours (NLH) – Theory</b>		<b>140 Hours</b>	<b>140 Hours (NLH)</b>
Paper I	70 Hours		
Paper II	70 Hours		
<b>Non-Lecture hours (NLH) - Practical</b>		<b>Hours</b>	

Examination (Papers & Mark Distribution)					
Item	Theory Component Marks	Practical Component Marks			
		Practical	Viva	Elective	IA
Paper I	100	100	60	10	30
Paper II	100			(Set-FB)	
Sub-Total	200	200			
Total marks	400				



## PREFACE

All Medical sciences whether ancient or modern, needs frequent updating. Acharya Vagbhata stresses upon reform of Ayurveda according to the present time (yuganurupasandarbha). The syllabus of Ayurveda also needs reformation for effective dissemination of principles of Ayurveda which is strongly based on Padartavijnanam. Acharya Vagbhata says one who seeks long life should respect Ayurveda by four strategies that are knowledge (Adhiti), comprehension(Bodha)skill(Acharana) and Attitude(pracharana).These teaching methodologies are evolved from the ancient upanishadic way of teaching(Adhyapanavidhi).The new principles of teaching strategies of blooms taxonomy correlate with the ancient way of teaching and the syllabus of Padarthavijnanam has been revamped according to the need of hour.

Padartha Vijnanam is a unique and mandatory subject needed for learning the stream of Ayurveda. It is the combination of science and philosophy. One can say that the science and philosophy are the two sides of the same coin. The search behind “existence of world/self” when progresses outward it travels the path of science and when this search is inwards it becomes philosophy. Thus, Padartha Vijnanam is an essential base of Ayurveda education. When the foundation becomes strong building also becomes strong.

Padartha Vijnanam not only provides the platform to understand Ayurveda better but it also helps the students to appreciate the moral values beneficiating them in developing the personality. As mentioned in graduate attributes this subject helps the student to become eloquent communicator and self-directed learner who constantly endeavors to advance knowledge and skills to improve healthcare and social well-being.

This syllabus reform of Padartha Vijnanam has taken care of adopting the modern teaching-learning methodology well-merging with the ancient one. This will definitely enhance the understanding of the subject in a better way.

Introduction of practicals is the zest for the subject. As we all know- “I hear, and I forget. I see and I remember. I do, and I understand”. The teaching learning process must be joyful along with lecture methods like group discussions, debate, roleplay and PBL. They are also mentioned and the flexibility is kept. Here in this syllabus, the activity book is introduced to induce activity-based learning. This will definitely create the interest in the subject. There are some self-learning activities also which will induce the thirst for the knowledge in the student. This will help the student to understand theoretical concepts in a lucid way and also provides hands on experience

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## Course Code and Name of Course

	Course code	Name of Course
	AyUG-PV	Padartha Vijnanam (Fundamental Principles of Ayurveda and Quantum Mechanics)

## AyUG-PV Course

Table 1- Course learning outcomes and matched PO.

CO	Course learning Outcomes (CO) AyUG-PV At the end of the course AyUG-PV, the student should be able to-	Course learning Outcome matched with program learning outcomes.
CO 1	Illustrate the scope and utility of Ayurveda	PO1
CO 2	Explain Philosophical foundation of Ayurveda, Principles (Siddhantha) of Darshana along with their similarities and relevance in Ayurveda and contemporary sciences.	PO1, PO2, PO6
CO 3	Analyse and interpret Padartha (Prameya) in Darshana and Ayurveda. Recognize their applications in Ayurveda.	PO1, PO2, PO9
CO 4	Distinguish, analyse and apply concept of Pramana shastra (Epistemology) in Darshana and Ayurveda. Demonstrate their applications in Ayurveda.	PO1, PO2, PO9
CO 5	Analyse and apply concept of Karya Karana Bhava in Ayurveda.	PO1, PO2, PO9

**Table 2 : Contents of Course AyUG-PV**

<b>Sr No</b>	<b>A2 List of Topics AyUG-PV</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non-Lecture hours</b>
	<b>Paper I</b>				
<b>1</b>	Ayurveda Nirupana 1.1 Lakshana of Ayu, composition of Ayu. 1.2 Lakshana of Ayurveda. Swaroop and Prayojana of Ayurveda 1.3 Lakshana and classification of Siddhanta. 1.4 Introduction to Basic Principles of Ayurveda and their significance.	<b>I</b>		<b>5</b>	<b>6</b>
<b>2</b>	Padartha and Darshana Nirupana 2.1 Padartha Lakshana, Enumeration and classification of Padartha, Bhava and Abhava Padartha, Padartha according to Acharya Charaka (Karana-Padartha). 2.2 Etymological derivation of the word “Darshana”. Classification and general introduction to 9 Schools of Indian Philosophy with an emphasis on: Nyaya, Vaisheshika, Sankhya, Yoga, Meemamsa and Vedanta darshana. 2.3 Ayurveda as unique and independent school of thought (philosophical individuality of Ayurveda). 2.4 Principles and examples in contemporary sciences which will enhance understanding concept of Padartha. 2.5 Relevance of Study of Darshana and Padartha Vignana in Ayurveda	<b>I</b>	<b>25</b>	<b>10</b>	<b>14</b>
<b>3.</b>	Dravya vijnaneeyam 3.1 Dravya: Lakshana, Classification and Enumeration 3.2 Panchabhuta: Various theories regarding the creation (theories of Taittiriyaopanishad, Nyaya-Vaisheshika, Sankhya-Yoga, Sankaracharya, Charaka and Sushruta), Lakshana and qualities of each Mahabhoota. 3.3 Kala: Etymological derivation, Lakshana, division/units and significance. 3.4 Dik: Lakshana, division and significance. 3.5 Atma: Lakshana, classification, seat, Gunas, Linga according to Charaka, the method / process of knowledge formation (atmanah jnasya pravrittih). 3.6 Purusha: According to Ayurveda - Ativahikapurusha/ Sukshmarsharira/ Rashipurusha/ Chikitsapurusha/ Karmapurusha/ Shaddhatvatmakapurusha. 3.7 Manas: Lakshana, Synonyms, Qualities, Objects, Functions, dual nature of mind (ubhayaatmakatvam), as a substratum of diseases, Influence of Panchabhoutika aahara and aushadha (penta-elemental diet) on manas. 3.8 Role of Panchamahabhuta and Triguna in Dehaprakriti and Manasaprakriti respectively. 3.9 Tamas as the tenth Dravya. 3.10 Practical study/Application and Importance of each Kaarana dravya in Ayurveda. 3.11 Principles and examples in contemporary sciences	<b>II</b>	<b>48</b>	<b>14</b>	<b>20</b>

	which will enhance understanding concept of Kaarana dravya.				
4.	Guna vijnaneeyam 4.1 Etymological Derivation, Classification and Enumeration according to various Darshana and Charaka, 4.2 Lakshana and Classification of Sartha Guna, Gurvadiguna, Paradiguna, Adhyatmaguna (41 Guna) 4.3 Gunapradhanyata (Importance of Guna) 4.4 Practical / clinical application of each Guna in Ayurveda 4.5 Principles and examples in contemporary sciences which will enhance understanding concept of Guna.	II		4	6
5.	Karma vijnaneeyam 5.1 – Introduction of concept of Karma According to Darshanaand Ayurveda – Classification of Karma 5.3 - Practical application of karma 5.4 - Principles and examples in contemporary sciences which will enhance understanding concept	II		2	4
6.	Samanya vijnaneeyam 6.1 – Introduction of concept of Saamaanya According to Darshana and Ayurveda. – Classification of Saamaanya 6.3 - Practical application of saamaanya 6.4 - Principle and examples in contemporary sciences which will enhance understanding theconcept of Saamanya.	III		3	6
7.	Vishesha vijnaneeyam 7.1 – Introduction of concept of Vishesha according to Darshana and Ayurveda 7.2 - Classification of Vishesha 7.3 - Practical Application of vishesha 7.4- Principles and examples in contemporary sciences which will enhance understanding the concept of Vishesha	III	27	3	6
8.	Samavaya vijnaneeyam 8.1 – Introduction of concept of Samavaaya According toDarshana and Ayurveda. 8.2 – Practical application of Samavaaya 8.3- Principles and examples in contemporary sciences which will enhanceunderstanding theconcept of Samavaya	III		2	4
9	Abhava vijnaneeyam 9.1 – Introduction of concept of Abhaava According to Darshana and Ayurveda. 9.2 – Classification of Abhaava. 9.3 – Practical application of Abhaava 9.4- Principles and examples in contemporary sciences which will enhance understanding the concept of Abhava.	III		2	4

<b>Paper II</b>					
	<b>A2 List of Topics – AyUG-PV</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non-Lecture hours</b>
<b>1</b>	<b>Pariksha</b> 1.1. Definition, Significance, Necessity and Use of Pariksha. 1.2. Definition of Prama, Aprama, Prameya, Pramata, Pramana. 1.3. Significance and importance of Pramana, Enumeration of Pramana according to different schools of Philosophy. 1.4. Four types of methods for examination in Ayurveda (Chaturvidha-Parikshavidhi), Pramana in Ayurveda. 1.5. Subsudation of different Pramanas under three Pariksha. 1.6. Practical application of methods of examination (Parikshavidhi) in Nidan and Chikitsa.	<b>I</b>	26	6	12
<b>2</b>	<b>2. Aptopadesha Pariksha/Pramana</b> 2.1. Lakshana of Aptopadesha, Lakshana of Apta. 2.2. Lakshana of Shabda, and its types. 2.3. Shabdavritti-Abhidha, Lakshana, Vyanjana and Tatparyakhya. Shaktigrahahetu. 2.4. Vaakya: Characteristics, Vaakyarthajnanahetu- Aakanksha, Yogyata, Sannidhi. 2.5. Importance of Aptopadesha in maintaining Health, Prevention of Diseases, Diagnostics, Therapeutics and Research.	<b>I</b>		6	10
<b>3.</b>	<b>3. Pratyaksha Pariksha/Pramana</b> 3.1. Lakshana of Pratyaksha, types of Pratyaksha- Nirvikalpaka- Savikalpaka with description, description of Laukika and Alaukika types and their further classification. 3.2. Indriya-prapyakaritvam, six types of Sannikarsha. 3.3. Indriyanam lakshanam, classification and enumeration of Indriya. Description of Panchapanchaka, Penta-elemental nature of Indriya ( <i>Panchabhautikatwa</i> of Indriya) and similarity in sources ( <i>Tulyayonitva</i> ) of Indriya. 3.4. Trayodasha Karana, dominance of Antahkarana. 3.5. Hindrances in direct perception ( <i>pratyaksha-anupalabdihikaarana</i> ), enhancement of direct perception (Pratyaksha) by various	<b>II</b>	42	8	14

	instruments/ equipments, necessity of other Pramanas in addition to Pratyaksha. 3.6. Practical study/ application of Pratyaksha in Sharir, Nidan (Diagnosis), Chikitsa (Treatment) and Anusandhan (Research).				
<b>4.</b>	<b>4. Anumanapariksha/Pramana</b> 4.1. Lakshana of Anumana. Introduction of Anumiti, Paramarsha, Vyapti, Hetu, Sadhya, Paksha, Drishtanta. Types of Anumana mentioned by Charaka and Nyayadarshana. 4.2. Characteristics and types of Vyapti. 4.3. Lakshana and types of Hetu, Description of Ahetu and Hetwabhasa. 4.4. Characteristics and significance of Tarka (logic). 4.5. Practical study/ application of Anumanapramana in Sharir, Nidan, Chikitsa and Anusandhan.	II		10	15
<b>5.</b>	<b>5. Yুক্তipariksha/Pramana</b> 5.1. Lakshana and description. 5.2. Importance in Ayurveda. 5.3. Practical study and utility in diagnostics, therapeutics and research.	III		2	2
<b>6.</b>	<b>6. UpamanaPramana</b> 6.1. Lakshana. 6.2. Application in Sharir, diagnostics, therapeutics and research.	III		2	4
<b>7.</b>	<b>Karya- Karana Siddhanta</b> 7.1. Lakshana of Karya and Kaarana. Types of Kaarana. 7.2. Significance of Karya and Kaarana in Ayurveda. 7.3. Different opinions regarding the manifestation of Karya from Kaarana: Satkaryavada, Parinamavada, Vivartavada, Asatkaryavada, Arambhavada, Paramanuvada, Kshanabhanguravada, Pilupaka, Pitharpaka, Anekantavada, Swabhavavada, Swabhavoparamavada. Importance/ Utility of each of these in Ayurveda 7.4 Study of cause effect relationship, causality, causation in Contemporary sciences.	III	32	11	13

**Table 3: Learning objectives (Theory) of Course AyUG-PV**

<b>Paper I</b>									
<b>A3 Course outcome</b>	<b>B3 Learning Objective  (At the end of the session, the students should be able to)</b>	<b>C3 Domain/sub</b>	<b>D3 Must to know/ desirable to know/Nice to know</b>	<b>E3 Level Does/ Shows how/ Knows how/ Know</b>	<b>F3 T-L method</b>	<b>G3 Assessment</b>	<b>H3 Format ive /summ ative</b>	<b>I3 Te rm</b>	<b>J3 Integ ration</b>
<b>Topic 1- Ayurveda Nirupana Time</b> (Lecture: - _5 hours Non lecture 6 hours)									
CO1	Describe the Nirukti (etymology) and Definition of Ayu	Cognitive/ Recall	Must Know	Knows	Lecture Group discussion	Written and Viva	F and S	I	
CO1	Describe the components of Ayu	Cognitive/ Recall	Must Know	Knows	Lecture Group Discussion Enquiry Based learning	Written and Viva	F and S	I	
CO1	Explain Synonyms of Ayu with their meaning and importance	Cognitive Recall	Must Know	Knows	Lecture Group Discussion	Written and Viva	F and S	I	
CO1	Distinguish between 4 types Ayu namely Sukhayu, Dukhayu, Hitayu, Ahitayu	Cognitive Comprehension	Must Know	Knows	Lecture Group Discussion/ Problem Based Learning	Written and Viva, Quiz	F and S	I	
CO1	Realises that the balance between hitayu	Affective	Must know	Knows	Group Discussion/	viva	F	I	



	and Sukhayu will offer better living				Debate				
CO1	Describe Lakshana of Ayurveda and Enlist Synonyms of Ayurveda	Cognitive Recall	Must Know	Knows	Lecture Group Discussion	Written and Viva	F and S	I	
CO1	Explain different Swarupa of Ayurveda and Discuss Ayurveda Prayojana	Cognitive Comprehension	Must Know	Knows	Lecture Group Discussion/Problem Based Learning	Written and Viva Open Book Test	F and S	I	
CO1	Explain Trisutra of Ayurveda and discuss Nityatva (eternity) of Ayurveda	Cognitive Comprehension	Must Know	Knows	Lecture Group Discussion/ Debate	Written and Viva	F and S	I	
CO1, CO 2	Define Siddhanta	Cognitive Recall	Must Know	Knows	Lecture Presentation Discussion	Written and Viva	F and S	I	
CO1, CO 2	Distinguish the types of Siddhanta	Cognitive Comprehension	Must Know	Knows	Lecture Group Discussion/ Enquiry Based Learning	Written and Viva, Puzzle	F and S	I	
CO1, CO 2	Elaborate the Basic Principles of Ayurveda like Lokapurusha Samya Siddhanta Panchamahabhoota Siddhanta Tridosha Siddhanta Samanya Vishesha Siddhanta Karya Karana Siddhant	Cognitive Comprehension	Must Know	Knows	Lecture/ Group Discussion /Problem Based Learning/ Flipped Classroom	Written and Viva, quiz PBA CBA	F and S	I	

CO1, CO 2	Justify the Application of Basic Principles in Ayurveda	Affective	Must know	Knows	Lecture Demonstration/ Group Discussion	Written and Viva	F and S	I	
CO1, CO 2	Recite the concern verses from Tarkasangraha and Charak Samhita	Cognitive Recall	Desirable to know	Knows	Audio clips, classroom recitation	Viva, recitation competition	F and S	I	
<b>Topic 2- Padartha and Darshana Nirupana Time</b> (Lecture:- _10__hours Non lecture __14_hours)									
CO1, CO 2	Classify padartha, differentiate bhava, abhava padartha and Appreciate Shat karana of Acharya Charaka.	Cognitive Recall	Must Know	Knows	Lecture/ Discussions PBL	Written and Viva, puzzle	F & S	I	
CO1, CO 2	Discuss similarity and dissimilarity of padartha	Cognitive Comprehension	Desirable to Know	Knows	Lecture/ Discussions/ Activity based learning	Written and Viva	F & S	I	
CO2	Explain nirukti and vyakhya (definition) of darshana	Cognitive Recall	Must Know	Knows	Lecture	Written and Viva	F & S	I	
CO2	Describe Origin of darshana and Explain Importance of darshana (prayojana)	Cognitive Comprehension	Must know	Knows how	Lecture / Group Discussion	Written and Viva, Quiz	F & S	I	
CO1, CO 2	Analyse terms viz - philosophy, metaphysics, aesthetics, epistemology, psychology in relation with darshana	Cognitive Comprehension	Nice to know	Knows	Lecture / Group Discussion/ Activity Based learning	Written and Viva	F & S	I	
CO2	Classify darshana and differentiate between asthika, nasthika, asthikanasthika	Cognitive Recall	Must Know	Knows	Lecture / Enquiry Based Learning	Written and Viva	F & S	I	

	darshana								
CO1, CO 2	Enumerate darshana relevant for Ayurveda study and mention the pioneers of each darshana	Cognitive Recall	Must Know	Knows	Lecture/ Role play/Group Discussion	Written and Viva, Puzzle	F & S	I	
CO1, CO 2	Outline the reason for study of darshana in Ayurveda and Comprehend Philosophical foundation of Ayurveda	Cognitive Comprehension	Must Know	Knows how	Lecture/ Problem Based Learning/ Group discussion/Tutorial	Written and Viva, Open Book Test	F & S	I	
CO2	Explain meaning of nyaya and synonyms of nyayadarshana	Cognitive Recall	Must Know	Knows	Lecture Group discussion	Written and Viva	F & S	I	
CO2	Enumerate nyayoktha 16 padarthas, 12 prameyas	Cognitive Recall	Desirable to Know	Knows	Lecture /Enquiry Based Learning	Written and Viva	F & S	I	
CO2	Recall the content of nyaya sutra	Cognitive Recall	Nice to know	Knows	Lecture	Written and Viva	F & S	I	
CO2	Outline salient features of nyayadarshana viz- chaturvida pramana, pitharapaka, arambhavada.	Cognitive comprehension	Must Know	Knows	Lecture/ Group discussion / Activity Based Learning	Written and Viva , Quiz	F & S	I	
CO2	Explain meanings of vaisheshika and synonyms	Cognitive Recall	Must Know	Knows	Lecture/	Written and Viva	F & S	I	
CO2	Recall the content of vaisheshika sutra	Cognitive Recall	Nice to Know	Knows	Lecture	Written and Viva	F & S	I	

CO2	Identify salient features of vaisheshika darshana viz-shatpadartha, paramanuvada, peelupakavada	Cognitive comprehension	Must Know	Knows	Lecture group discussion/Activity based learning	Written and Viva, quiz, puzzle	F & S	I	
CO2	Explain the meaning of sankhya	Cognitive Recall	Must Know	Knows	Lecture	Written and Viva		I	
CO2	Enumerate, define and categorise 25 tatvas	Cognitive Recall	Must Know	Knows	Lecture discussion	Written and Viva puzzle	F & S	I	
CO2	Recall the trividhadukha, triguna, satkaryavada	Cognitive Recall	Must Know	Knows	Lecture/ Inquiry based learning	Written and Viva	F & S	I	
CO2	Define yoga and explain ashtangayoga	Cognitive comprehension	Must Know	Knows	Lecture Group discussion/demonstration	Written and Viva, quiz	F & S	I	
CO2	Recall content of yoga sutra	Cognitive Recall	Nice to know	Knows	Lecture	Written and Viva	F & S	I	
CO2	Enumerate chittavrutti, panchaklesha, ashtasiddhi	Cognitive Recall	Must Know	Knows	Lecture Debate /Group Discussion	Written and Viva, quiz	F & S	I	
CO2	Recall different type of yoga	Cognitive Recall	Nice to know	Knows	Lecture Self-Directed learning/Activity based learning	Written and Viva, open book test	F & S	I	
CO1, CO 2	Outline the salient features of meemamsa darshana and Vedanta darshana Viz. karma siddhanta, atma, maya, vivartavada,	Cognitive comprehension	Must Know	Knows	Lecture Group Discussion/ Debate	Written and Viva, Quiz	F & S	I	

CO1, CO 2	Explain similarity between Nyaya, vaisheshika, Sankyha, yoga, meemamsa and Vedanta darshana with Ayurveda	Cognitive comprehension	Must Know	Knows how	Lecture discussion PBL/ Flip classroom	Written and Viva	F & S	I	
CO1, CO 2	Explain Charvaka, Jaina and Bouddha darshana and their influence in Ayurveda	Cognitive comprehension	Must Know	Knows	Lecture Group Discussion	Written and Viva	F & S	I	
CO1, CO 2	Demonstrate Ayurveda as unique and independent school of thought (philosophical individuality of Ayurveda).	Cognitive Comprehension Affective	Must Know	Knows how/	Lecture/ Group Discussions PBL	Written and Viva	F & S	I	
CO 1 CO 2	Compare the the Srishtiutpatti krama by different darshanas with contemporary theories like- Big Bang, The multiverse, brane world, the hylographic universe, Simulation theory etc	Cognitive Comprehension	Nice to Know	Knows	Lecture with Videos, Group discussion/ self learning	Puzzle, viva	F	I	
CO 1	Respect ancient philosophy and Ayurveda	Affective	Must know	Know	Discussion	Discussion Debate	F	I	
CO1, CO 2	Enumerate padartha according to different schools of thought	Cognitive Recall	Desirable to Know	Knows	Lecture Group Discussion	Written and Viva, Puzzle	F & S	I	
CO1, CO 2	Find principles and examples in contemporary sciences	Cognitive/ Comprehension	Nice to know	knows	Lecture/ Discussions/ Self-learning,	-	F	I	

	which will enhance understanding concept of Padartha. For ex-matter and energy.								
CO1, CO 2	Analyse role of padartha in darshana and in Ayurveda and Demonstrate the role of Padarthavijnana in Ayurveda	Cognitive / Comprehension	Must Know	Knows how	Lecture/ Seminars /PBL	Written and Viva, Open Book Test	F & S	I	
CO2	Recite concern verses	Cognitive Recall	Desirable to know	knows	Edutainment Audio clips, classroom recitation	Viva, recitation competition	F&S	I	
<b>Topic-3 Dravya vijnaneeyam Time</b> (Lecture:- __14_ hours Non lecture _20_ hours)									
CO3	Explain Nirukti and Paribhasha (definition) of Dravya	Cognitive Recall	Must Know	Knows	Lecture	Written and Viva	F and S	II	
CO3	Classify Dravya and Differentiate between Karana and Karya dravya	Cognitive Recall	Must Know	Knows	Lecture Group Discussion/ Enquiry Based Learning	Written and Viva, Puzzle	F and S	II	
CO3	Enumerate Darvya as per different schools of thoughts	Cognitive Recall	Must Know	Knows	Lecture Group Discussion	Written and Viva, puzzle	F and S	II	
CO3, CO1	Value Practical application of study of Dravya in Ayurveda	Affective	Desirable to know	Knows how	Lecture Group Discussion	Written and Viva	F and S	II	
CO3	Explain the various theories (theories of Taittiriyanopanishad, Nyaya-Vaisheshika,	Cognitive/ Comprehension	Must Know	Knows	Lecture Group Discussion /Activity Based	Written and Viva, Quiz	F and S	II	

	Sankhya-Yoga, Sankaracharya, Charaka and Sushruta) regarding creation of Panchamahabhoota				Learning				
CO3	Describe Prithvi Mahabhoota Explain qualities of Prithvi Mahabhoota	Cognitive / Comprehension	Must Know	Knows	Lecture Seminar/ Group Discussion	Written and Viva	F and S	II	
CO3	Describe Aap Mahabhoota Explain qualities of Ap Mahabhoota	Cognitive, Comprehension	Must Know	Knows	Lecture Seminar/ Group Discussion	Written and Viva	F and S	II	
CO3	Describe Teja Mahabhoota Explain qualities of Teja Mahabhoota	Cognitive, Comprehension	Must Know	Knows	Lecture Seminar/ Group Discussion	Written and Viva	F and S	II	
CO3	Describe Vayu Mahabhoota Explain qualities of Vayu Mahabhoota	Cognitive, comprehension	Must Know	Knows	Lecture Seminar/ Group Discussion	Written and Viva	F and S	II	
CO3	Describe Aakash Mahabhoota. Explain qualities of Aakash Mahabhoota	Cognitive, Comprehension	Must Know	Knows	Lecture Seminar/ Group Discussion	Written and Viva	F and S	II	
CO3, CO1	Value Practical application of Panchamahabhoota in Ayurveda	Affective	Must know	Knows	Lecture Group Discussion, Demonstration	Written and Viva, Open Book Test	F and S	II	

CO2	Compare elementary particles/subatomic particles with Tanmatra/triguna.	Cognitive/ Recall	NK	Know	Video clips, discussions SDL	Quiz	F	II	
CO3, CO1	Define the term <i>Kala</i> from various <i>darshanas</i> and <i>Ayurveda</i> .	Cognitive/ Recall	Must know	Knows	Lecture	Written and Viva	F & S	II	
CO3	Explain classification/types of <i>Kala</i>	Cognitive/ Recall	Must know	Knows	Lecture	Written and Viva	F & S	II	
CO3, CO1	Find illustrations of <i>kala</i> explained in <i>Ashtang Hridaya</i> .	Cognitive/ Comprehension	Must know	Knows	Lecture /Activity Based Learning	Written and Viva	F & S	II	
CO3, CO2 CO1	Give examples of importance of <i>Kala</i> in <i>Ayurveda</i> and time as per contemporary sciences	Cognitive/ Recall	Must know	Knows how	Problem Based Learning/ Group Discussion	Written and Viva, Quiz	F & S	II	
CO3	Define the term <i>Dik</i> . Explain classification/ division of <i>Dik</i> .	Cognitive/ Recall	Must know	Knows	Lecture /Activity Based Learning	Written and Viva, puzzle	F & S	II	
CO3, CO1	Illustrate significance of <i>Dishas</i> in <i>Ayurveda</i> with examples.	Cognitive/ Comprehension	Must know	Knows how	Lecture /Seminar	Written and Viva	F & S	II	
CO3	Find illustrations of <i>Dik</i> explained in <i>Ashtangahridaya</i> .	Cognitive/ Comprehension	Must know	Knows how	Group Discussion	Written and Viva, Open book test	F & S	II	
CO3	Define the term <i>Atma</i> ,	Cognitive/ Recall	Must know	Knows	Lecture	Written and Viva	F & S	II	
CO3	Explain <i>atma</i> at different levels, seat, <i>Gunas</i> of <i>Atma</i> ,	Cognitive/ Recall	Must know	Knows	Lecture	Written and Viva	F & S	II	



CO1 CO3	Explain Atma Linga according to Charaka Samhita.	Cognitive/ comprehension	Must know	Knows	Lecture / Flipped Classroom	Written and Viva	F & S	II	
CO3	Describe the method / process of knowledge formation ( <i>atmanah jnasya pravrittih</i> ).	Cognitive/ Comprehension	Must know	Knows how	Lecture/ Demonstration/	Written and Viva	F & S	II	
CO3	Describe Purusha as mentioned in Ayurveda	Cognitive/ Recall	Must know	Knows	Lecture	Written and Viva	F & S	II	
CO3	Differentiate Ativahikapurusha/ Sukshmasharira/ Rashipurusha/ Chikitsapurusha/ Karmapurusha/ Shad-dhatvatmaka-purusha.	Cognitive/ Comprehension	Must know	Knows how	Lecture / Group discussions	Written and Viva	F & S	II	
CO3	Recognize and state significance of Atmavijnanam	Affective	Desirable to know	Knows	Group Discussions/ Problem Based Learning	viva	F	II	
CO3	Define term Manas, Enlist synonyms,  Explain it's Guna. Karma, Vishay. Explain dual nature of mind. ( <i>ubhayaatmakatvam</i> ),	Cognitive/Recall and Comprehension	Must know	Knows	Lecture / Activity Based Learning/Debate	Written and Viva. Puzzle	F & S	II	
CO3	Explain influence of Panchabhoutika aahara and aushadha (penta-elemental diet) on manas	Cognitive/ Recall	Must know	Knows how	Lecture/ discussions/ PBL	Written and Viva. Open Book Test	F & S	II	

CO3	Recognizes the utility of Knowledge of Mana	Affective	Must Know	Knows	Case Based learning	viva	F & S	II	
CO3, CO1	Explain Concept of mind in other sciences.	Cognitive/ Recall	Nice to know	Knows	Discussions/ Videos	Written and Viva	F	II	
CO1	Explain Role of Panchamahabhuta and Triguna in Dehaprakriti and Manasaprakriti respectively.	Cognitive/ Comprehension	Must know	Knows how	Lecture / discussions/ C B L	Written and Viva	F & S	II	
CO3	Discuss the role of Tamas as the tenth Dravya	Cognitive/Comprehension	Desirable to know	Know	Lecture Edutainment Role Play	Written and Viva	F & S	II	
CO3	Realize Practical application of study of dravya in Ayurveda	Affective	Desirable to know	Know	Group Discussions/ Case Base Learning/ Demonstration.	Written and Viva, quiz	F & S	II	
CO3	Recite Dravya Granth of Tarka Sangrah& defn from Charak	Cognitive Recall	Desirable to know	knows	Audio clips/ classroom recitation	Viva, Recitation Competetion	F&S		
CO3. CO2	Discuss principles and examples in contemporary sciences which will enhance understanding the concept of Karana dravya. For ex- Quantum Physics	Cognitive/Comprehension	Nice to know	Know	Lecture/ Discussions/ Self-learning activity	Open book testh	F	II	
<b>Topic -4 Guna vijnaneeyam Time</b> (Lecture:-4 hours Non lecture 6 hours)									
CO3	Define Guna and classify Guna according to various Darshanas and Charaka Samhita	Cognitive Recall	Must know	knows how	Lecture /Demonstration	Written and Viva	F&S	II	

CO3	Explain the Lakshana of indriyartha Gunas with examples.	Cognitive Comprehension	Must know	Knows how	Lecture / Group Discussion	Written and Viva	F&S	II	
CO3	Discuss the Lakshana of Gurvadi Guna with examples.	Cognitive Comprehension	Must know	Knows how	Lecture /Seminar/ Group Discussion	Written and Viva, puzzle	F&S	II	
CO3	Explain the Lakshana of Paradi Guna with examples.	Cognitive Comprehension	Must know	Knows how	Lecture /Seminar/ Group Discussion	Written and Viva, Puzzle	F&S	II	
CO3	Describe the Lakshana of Adhyatma Guna with examples.	Cognitive Comprehension	Must know	Knows how	Lecture /Seminar/ Group Discussion	Written And Viva	F&S	II	
CO3	Appreciate the importance of Guna (Gunapradhanyata)	Affective	Must know	Knows	Discussion	Written Discussion viva	F&S	II	
CO3	Describe the practical application of Indriyartha Gunas in diagnosis of disease and Treatment	Cognitive Comprehension	Must know	Knows how	Lecture / Demonstration/ Case based learning	Written And Viva	F&S	II	
CO3	Describe the practical application of Gurvadi Guna in diagnosis of disease and Treatment	Cognitive Comprehension	Must know	Knows how	Lecture / Demonstration/ Case based learning	Written And Viva	F&S	II	
CO3	Describe the practical application of Paraadi Gunas.	Cognitive Comprehension	Must know	Knows how	Lecture / Demonstration/ Activity based learning	Written And Viva	F&S	II	

CO3	Describe the practical application of Adhyatma Guna .	Cognitive Comprehension	Must know	knows how	Lecture / Demonstration/ Problem Based Learning	Written And Viva	F&S	II	
CO3	Recite the concern verses from TarkaSangrah and Charak Samhita	Cognitive Recall	Desirable to know	knows	Audio clip/ classroom recitation	viva	F&S Recitation competition	II	
CO1 CO2	Discuss Principles and examples in contemporary sciences which will enhance understanding the concept of Guna.	Cognitive Comprehension	Nice to know	Knows	Lecture/ Discussions/ Self-learning activity	-	F	II	
<b>Topic - 5. Karma vijñaneeyam Time</b> (Lecture:- <u>2</u> hours Non lecture <u>4</u> hours)									
CO3	Define <i>Karma</i> acco. to various <i>Darshana</i> and <i>Ayurveda</i> .	Cognitive Recall	Must know	Knows	Lecture	Written And Viva	F&S	II	
CO3	Compare the <i>Karma Lakshana</i> (characteristics) from <i>Charaka Samhita</i> and <i>Darshana</i>	Cognitive Comprehension	Must know	Knows	Lecture/ Group discussion/ Flipped Classroom	Written And Viva	F&S	II	
CO3	Explain the types of <i>Karma</i>	Cognitive Comprehension	Must know	Knows	Lecture and discussion, demonstration	Written And Viva	F&S	II	
CO3	Describe the process of production and destruction of <i>Laukika Karma</i> with one	Cognitive Comprehension	Desirable to know	Knows how	Lecture and demonstration	Written And Viva	F&S	II	

	example.								
CO3	Describe the <i>Adhyaatmika</i> karma and its causal relationship with health and disease.	Cognitive Comprehension	Must know	Knows how	Lecture and discussion	Written And Viva	F&S	II	
CO3	Enlist the other types of processes or pharmacological actions which came under the title of <i>Karma</i> in <i>Ayurveda</i> . Viz: <i>Panchakarma</i> , <i>Shastrakarma</i> , <i>Lekhana</i> , <i>Bruhana</i> etc.	Cognitive Recall	Must know	Knows how	Lecture and discussion/ Self Directed Learning	Written And Viva	S	II	
CO3	Recite the concern verses from TarkaSangrah and Charak Samhita	Cognitive Recall	Desirable to know	knows	Audio clip/ classroom recitation/ Edutainment	viva	F&S Recitation competition	II	
CO1 CO2	Discuss principles and examples in contemporary sciences which will enhance understanding the concept of Karma.	Cognitive Recall	Nice to know	Knows	Lecture/ Discussions/ Self-learning	-	F	II	
<b>Topic - 6 . Samanya vijnaneeyam</b>									
Time (Lecture:- _3 hours Non lecture _6 hours)									
CO3	Explain the Samanya(According to <i>Ayurveda &amp; Darshana</i> )	Cognitive Comprehension	Must know	Knows	Lecture	Written And Viva	F&S	III	
CO3	Distinguish the <i>Samanya</i> concept of <i>Ayurveda</i> from	Cognitive Comprehension	Must know	Knows	Lecture and discussion	Written And Viva	F&S	III	

	<i>Darshana.</i>								
CO3	Describe the <i>Anuvrutti Buddhi</i>	Cognitive Recall	Desirable to know	knows	Lecture and discussion	Written	F & S	III	
CO3	Explain the types of <i>Samanya</i> (Acc. To <i>Ayurveda</i> and <i>Darshana</i> )	Cognitive Recall	Must know	Knows	Lecture and discussion/ Flipped Classroom	Written And Viva	F & S	III	
CO3	Explain the importance of <i>samanya</i> in diagnosis and treatment	Cognitive Comprehension	Must know	Knows	Lecture and discussion/ Case Based Learning	Written And Viva , Quiz	S	III	
CO3	Identify the examples of <i>Dravya-guna-karma Samanya</i> with each <i>DOSHA-DHATU-MALA</i>	Cognitive Comprehension	Must know	Knows how	Lecture and Demonstration/ Group Discussion	Written And Viva , Open Book Test	S	III	
CO3	Recite the concern verses from <i>TarkaSangrah</i> and <i>Charak Samhita</i>	Cognitive Recall	Desirable to know	knows	Audio clip/ classroom recitation	viva	F&S Recitation competition		
CO1	Discuss principle and examples in contemporary sciences which will enhance understanding the concept of <i>Samanya</i> . For ex-system biology	Cognitive Comprehension	Nice to know	knows	Self -Directed learning	-	F	III	
<b>Topic - 7 . Vishesh vijñaneeyam</b>									
<b>Time</b> (Lecture:- 3_ hours Non lecture 6_hours)									
CO3	Explain <i>Vishesha</i> According to <i>Ayurveda &amp; Darshana</i>	Cognitive Comprehension	Must know	Knows	Lecture and Group Discussion	Written And Viva	F&S	III	

CO3	Distinguish <i>Vishesha</i> concept of <i>Ayurveda</i> from <i>Darshana</i> .	Cognitive Comprehension	Must know	Knows	Lecture and Group Discussion	Written and Viva	F&S	III	
CO3	Describe the <i>Vyavrutti Buddhi</i>	Cognitive Recall	Desirable to know	knows	Lecture and discussion	Written	F & S	III	
CO3	Explain <i>Vishesha</i> in the context of <i>Mahabhoota Paramanu</i>	Cognitive Recall	Nice to know	knows	Lecture	Written	F & S	III	
CO3	Discuss the <i>Viruddha Vishesha</i> and <i>Aviruddha Vishesha</i> and other types of <i>Vishesha</i>	Cognitive Comprehension	Must know	Knows how	Lecture and discussion, demonstration	Written And Viva	F&S	III	
CO3	Explain the statement “ <i>Pravruttirubhayasyatu</i> ”	Cognitive Comprehension	Must know	Knows how	Lecture, Problem Based Learning	Written Viva	F&S	III	
CO3	Provide different classifications of <i>vishesha</i> and their utility in Diagnosis and Treatment.	Cognitive recall	Must know	Knows how	Lecture/ Activity Based Learning	Written, Viva, Open Book Test	F&S	III	
CO3	Identify the examples of <i>Dravya-guna-karma Vishesha</i> with each <i>DOSHA-DHATU-MALA</i>	Cognitive Comprehension	Must know	Knows how	Lecture and demonstration/ Game Based Learning	Written And Viva Quiz	S	III	
CO1, CO2	Describe principles and examples in contemporary sciences which will enhance understanding the concept of <i>Vishesha</i> For ex- System Biology	Cognitive Comprehension	Nice to know	knows	Lecture/ Discussions/ Self-learning activity	viva-	F	III	

CO3	Recite the concern verses from TarkaSangrah and Charak Samhita	Cognitive Recall	Desirable to know	knows	Audio clip/ classroom recitation	viva	F&S Recitation on competition	III	
<b>Topic - 8. Samavay vijnaneeyam</b>									
<b>Time</b> (Lecture:- 2_ hours Non lecture 4_ hours)									
CO3	Explain Samavaya (Acc. To <i>Ayurveda</i> and <i>Darshana</i> )	Cognitive Recall	Must know	Knows	Lecture	Written And Viva	F&S	III	
CO3	Describe the eternal relation between ayutasiddhavritti	Cognitive Comprehension	Must know	Knows how	Lecture and demonstration	Written And Viva	F&S	III	
CO1 CO2	Discuss principles and examples in contemporary sciences which will enhance understanding the concept of Samavaya	Cognitive Recall	Nice to know	knows	Lecture/ Discussions/ Self-learning activity	-	F	III	
CO3	Recite the concern verses from TarkaSangrah and Charak Samhita	Cognitive Recall	Desirable to know	knows	Audio clip/ classroom recitation	Viva, Recitation competition	F&S		
<b>Topic - 9. Abhav vijnaneeyam</b>									
<b>Time</b> (Lecture:- 2_ hours Non lecture 4_ hours)									
CO3	Define <i>Abhava</i>	Cognitive Recall	Must know	Knows	Lecture and discussion	Written And Viva	F&S	III	
CO3	Discuss the supportive and contradictory views for the acceptance of <i>Abhava</i> as a <i>Padartha</i>	Cognitive comprehension	Must know	Knows How	Lecture Group Discussion/ debate	Written And Viva	F&S	III	
CO3	Explain the view of <i>Ayurveda</i> about <i>Abhava</i>	Cognitive Recall	Must know	Knows	Lecture demonstration	Written And Viva	F&S	III	



CO3	Explain the four types of <i>Abhava</i>	Cognitive Recall	Must know	Knows	Lecture ,Activity Based Learning	Written And Viva , Puzzle	F&S	III	
CO3	Demonstrate the utility of the knowledge of <i>Abhava</i> in Ayurveda	Cognitive Comprehension	Must know	Knows how	Lecture, Group discussions Problem Based Learning	Written And Viva	F&S	III	
CO1 CO2	Discuss principles and examples in contemporary sciences which will enhance understanding the concept of <i>Abhava</i>	Cognitive Recall	Nice to know	knows	Lecture/ Discussions/ Self-learning activity	-	F	III	
CO3	Recite the concern verses from TarkaSangrah and Charak Samhita	Cognitive Recall	Desirable to know	knows	Audio clip/ classroom recitation	viva	F&S Recitation competition		

## Paper II

**Topic 1- (Pariksha) Time** (Lecture:- 6 hours Non lecture 12 hours)

CO4	Describe Pariksha	Cognitive/ Recall	Must know	Knows	Lecture/Group Discussion	Written And Viva	F&S	I	
CO4	Explain the necessity & significance of pariksha	Cognitive Comprehension	Must know	Knows how	Lecture/Problem Based Learning/Debate	Written And Viva	F&S	I	
CO4	Describe Buddhi and its classification	Cognitive / Recall	Must know	Knows	Lecture/Activity based learning	Written And Viva	F&S	I	
CO4	Describe Prama, Prameya, Pramata, Pramana and differentiate Prama and Aprama	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva, open book test	F&S	I	

CO4	Describe the Significance of Pramana	Cognitive / comprehension	Must know	Knows how	Problem based learning	Written And Viva	F&S	I	
CO4	Enumerate Pramana according to different schools of philosophy.	Cognitive / Recall	Must know	Knows	Lecture	Written And Viva, puzzle	F&S	I	
CO4	Enumerate Pariksha as per Ayurveda.	Cognitive / Recall	Must know	Knows	Lecture/ Enquiry based learning	Written And Viva	F&S	I	
CO4	Describe the Pramana accepted by different schools of Philosophy with one example each.	Cognitive / Recall	Must know	Knows	Lecture/ group discussion	Written And Viva, quiz	F&S	I	
CO4	Describe 4 Pariksha explained by Ayurveda with one example each	Cognitive / Recall	Must know	Knows	Lecture/ activity based learning	Written And Viva, puzzle	F&S	I	
CO4	Justify the inclusion of Pramanas under three Pariksha	Cognitive / Comprehension	Must know	Knows how	Problem based learning and flipped classroom	Written And Viva	F&S	I	
CO4	Describe the practical application of Pariksha Vidhi in Diagnosis and Treatment.	Cognitive / Recall	Must know	Knows	Case based learning/ Group discussion	Written, open book test And Viva	F&S	I	
CO4	Establish that the Pramanas are tool to gain the knowledge	Affective	Must know	knows	Group discussion	Viva	F&S	I	
CO4	Recite the concern Verses from Tarkasangrah & CharakSamhita	Cognitive Recall	Desirable to know	knows	Audio clips, classroom Recitation	Viva, Recitation competetion	F&S	I	

<b>7. Topic 2- (Aptopdesha Pariksha/Pramana) Time</b> (Lecture:- __6_ hours Non lecture _10__hours)I									
CO 4	Describe Apta and Aptopadesha	Cognitive / Recall	Must know	Knows	Lecture	Written And Viva	F&S	I	
CO 4	Describe the significance of Aptopadesha in Chikitsa	Cognitive / Recall	Must know	Knows	Case based learning/ Group discussion	Written And Viva	F&S	I	
CO 4	Define the term Shabda	Cognitive / Recall	Must know	Knows	Lecture	Written And Viva	F&S	I	
CO 4	Describe types of Shabda	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	I	
CO 4	Define the term Shaba artha bodhaka Vrutti	Cognitive / Recall	Must know	Knows	Lecture/ group discussion	Written And Viva	F&S	I	
CO 4	Enumerate Shabaartha bodhaka vrutti	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva, quiz	F&S	I	
CO 4	Define Abhidha Vrutti with illustration	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	I	
CO 4	Define Lakshana Vrutti with examples	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	I	
CO 4	Enumerate the types of Lakshanavrutti and define each of them with example	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	I	
CO 4	Define Vyanjana vrutti with example	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	I	
CO 4	Define Tatparyakhya vrutti with	Cognitive / Recall	Must know	Knows	Lecture/ Activity based	Written And Viva	F&S	I	

	example				learning				
CO 4	Define the term Pada with specification to Shakti and enumerate the types of Pada	Cognitive / Recall	Must know	Knows	enquiry based learning	Written And Viva	F&S	I	
CO 4	Enumerate Shaktigraha hetu	Cognitive / Recall	Must know	Knows	Lecture/ group discussion/ Problem based learning	Written And Viva, puzzle	F&S	I	
CO 4	Describe Shakti graha hetu	Cognitive / Recall	Must know	Knows	Lecture/ Tutorial/ Problem based learning	Written And Viva	F&S	I	
CO 4	Enumerate Vaakyarthajnana hetu	Cognitive / Recall	Must know	Knows	Lecture/ group discussion/ Problem based learning	Written And Viva, quiz	F&S	I	
CO 4	Define Akanksha with example	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning/ Problem based learning	Written And Viva	F&S	I	
CO 4	Define Yogyata with example	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning/ Problem based learning	Written And Viva	F&S	I	
CO 4	Define Sannidhi with example	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning/ Problem based learning	Written And Viva	F&S	I	

CO 4	Describe importance of Aptopadesha in maintaining Health, Prevention of diseases, diagnostics, therapeutics and research.	Cognitive/ Comprehension	Must know	knows	Lecture/ Activity based learning/ Problem based learning	Written And Viva, open book test	F&S	I	
CO4	Recite the concern Verses from Tarkasangrah & CharakSamhita	Cognitive Recall	Desirable to know	knows	Audio clips, classroom Recitation	Viva, Recitation competetion	F&S	I	

**Topic 3- Pratyaksha Pariksha/Pramana Time** (Lecture:- \_\_8\_ hours Non lecture \_14\_\_hours)

CO4	Define Pratyaksha	Cognitive / Recall	Must know	Knows	Lecture/ Tutorial/Activity based learning	Written And Viva	F&S	II	
CO4	Enumerate the types of Pratyaksha	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	II	
CO4	Describe types of Pratyaksha	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning/ Problem based learning	Written And Viva, quiz	F&S	II	
CO4	Describe Indriya Prapyakaritva Mechanism of sensory perception)	Cognitive / comprehension	Must know	Knows	Lecture/ Flip classroom/ Problem based learning	Written And Viva,	F&S	II	
CO4	Define Sannikarsha	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	II	

CO4	Describe the types of Sannikarsha	Cognitive / comprehension	Must know	Knows how	Lecture/ Problem based learning	Written And Viva, puzzle	F&S	II	
CO4	Define Indriya	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	II	
CO4	Enumerate the types of Indriya	Cognitive / Recall	Must know	Knows	Lecture/ role play	Written And Viva	F&S	II	
CO4	Define Jnanendriya	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	II	
CO4	Enlist the functions of Karmendriya	Cognitive / Recall	Must know	Knows	Problem based learning	Written And Viva	F&S	II	
CO4	Describe the function of Manas in relation to Jnanotpatti	Cognitive / Recall	Must know	Knows	Lecture/ Problem based learning	Written And Viva	F&S	II	
CO4	Justify the role of Manas as ubhayendriya in relation with Jnanotpatti and Karma.	Cognitive / Comprehension	Must know	Knows how	Problem based learning / Group discussion/Debate	Written And Viva, open book test	F&S	II	
CO4	Enumerate Panchapanchaka and describe its significance with respect to Pratyaksha Jnana	Cognitive / Recall	Must know	Knows	Lecture/ Problem based learning / Group discussion	Written And Viva, quiz	F&S	II	
CO4	Enumerate and describe briefly the various theories of Darshana and Ayurveda, which highlight the relationship of Indriya	Cognitive / Comprehension	Must know	Knows	Group discussion/ role play/debate	Written And Viva, open book test	F&S	II	

	and Panchamahabhuta.								
CO4	Justify the specificity of Indriya for perceiving specific Artha	Cognitive / Comprehension	Must know	Knows how	Activity based learning/ Problem based learning / Group discussion	Written And Viva	F&S	II	
CO4	Enumerate Trayodasha Karana	Cognitive / Recall	Must know	Knows	Lecture/Tutorial / Activity based learning	Written And Viva, puzzle	F&S	II	
CO4	Enumerate Antahkarana	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	II	
CO4	Enumerate the functions of Antahkarana	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	II	
CO4	Illustrate the role Antahkarana in Jnanotpatti with example to highlight the significance	Cognitive / Comprehension	Must know	Knows how	Lecture/ Problem based learning / Group discussion	Written And Viva, open book test	F&S	II	
CO4	Describe the factors which create hindrance for perception with an illustration (pratyaksha-anupalabdhihaarana)	Cognitive / Comprehension	Must know	Knows	Activity based learning/ Problem based learning / Group discussion	Written And Viva, puzzle	F&S	II	
CO4	Enumerate a few equipments or aids which help in enhancing the direct perception	Cognitive / Recall	Must know	Knows	demonstrations/ Problem based learning / Group discussion	Written And Viva, quiz	F&S	II	
CO4	Justify the necessity of other pramana with textual references and	Cognitive / Application	Must know	Knows how	Lecture/ Activity based learning/	Written And Viva, open book	F&S	II	

	illustrations				Problem based learning / Group discussion	test			
CO4	Describe the practical application of Pratyaksha in Sharir, Nidan, Chikitsa and Anusandhan (research).	Cognitive / comprehension	Must know	Knows	Lecture/ case-based learning / Group discussion	Written And Viva	F&S	II	
CO4	Justify the role Pratyaksha (Observation and interpretation skills for generalization of results) in research	Cognitive / Application	Must know	Knows how	Lecture/ Activity based learning/ Problem based learning / Group discussion	Written And Viva	F&S	II	
CO4	Realizes importance as well as limitation of Pratyaksha	Affective	Must know	Knows	Group discussion	Viva	F&S	II	
CO4	Recite the concern Verses from Tarkasangrah & CharakSamhita	Cognitive Recall	Desirable to know	knows	Audio clips, classroom Recitation	Viva, Recitation competetion	F&S	II	
<b>Topic 4 - Anumana pariksha/Pramana Time</b> (Lecture:- _10__hours Non lecture _15__hours)									
CO4	Describe Anumana	Cognitive / Recall	Must know	Knows	Lecture	Written And Viva	F&S	II	
CO4	Define the terms with an example (Anumiti, Paramarsha, Vyapti, Hetu, Sadhya, Paksha, Drishtanta)	Cognitive / Recall	Must know	Knows	Lecture/ enquiry based learning	Written And Viva, quiz	F&S	II	
CO4	Describe the types of anumana	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning/ group discussion	Written And Viva,	F&S	II	



CO4	Describe Pancha Avayava Vakya	Cognitive / Recall	Must know	Knows	Lecture/ gamification/ Problem based learning / Group discussion	Written And Viva	F&S	II	
CO4, CO2	Associate Contemporary method of carrying out research with Pancha Avayava Vakya	Cognitive / Comprehension	Desirable to know	Knows how	Self directed learning, / Problem based learning / Group discussion	Written And Viva, open book test	F&S	II	
CO4	Define vyapti	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	II	
CO4	Describe the types of vyapti	Cognitive / Recall	Must know	Knows	Lecture/ Problem based learning	Written And Viva	F&S	II	
CO4	Define hetu	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	II	
CO4	Describe the types of hetu	Cognitive / Recall	Must know	Knows	group discussion	Written And Viva	F&S	II	
CO4	Enlist Sad-hetu Lakshana	Cognitive / Recall	Must know	Knows	Lecture/ Problem based learning	Written And Viva, quiz	F&S	II	
CO4	Define Hetwabhasa	Cognitive / Recall	Must know	Knows	Lecture/ Problem based learning	Written And Viva	F&S	II	
CO4	Explain the types of Hetwabhasa	Cognitive / Comprehension	Must know	Knows	Lecture/Tutorial group discussion	Written And Viva, puzzle, quiz	F&S	II	
CO4	Describe Ahetu	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning	Written And Viva	F&S	II	

CO4	Describe Tarkaas per Nyaya Sutra and Tarka Sangraha	Cognitive / Recall	Must know	Knows	Lecture Tutorial/ Problem based learning	Written And Viva, quiz	F&S	II	
CO4	Distinguish between Tarka as Aprama and tool in Anumana	Cognitive / Comprehension	Must know	Knows how	Enquiry based learning/ group discussion/debate	Written And Viva	F&S	II	
CO4	Justify the role of Tarka in Anumana	Cognitive / Comprehension	Must know	Knows how	Activity based learning/ Problem based learning / Group discussion	Written And Viva, open book test	F&S	II	
CO4	Demonstrate the practical applications of Anumana Pariksha (with few examples) in Sharir, Nidan, Chikitsa and Anusandhan (research).	Cognitive / Application	Must know	Knows how	Role play/ Game based learning / Group discussion	Written And Viva, open book test	F&S	II	
CO4	Recite the concern Verses from Tarkasangrah & CharakSamhita	Cognitive Recall	Desirable to know	knows	Audio clips, classroom Recitation	Viva, Recitation competetion	F&S	I	
<b>Topic 5 - Yukti pariksha/Pramana Time</b> (Lecture:- _2__hours Non lecture _2__hours)									
CO4	Describe Yukti	Cognitive / Recall	Must know	Knows	Lecture/ Activity based learning/ Group discussion	Written And Viva	F&S	III	
CO4	Compare Yukti as an independent Pariksha and as a part of Anumana	Cognitive / Comprehension	Must know	Knows how	Lecture/ Activity based learning/ Problem based	Written And Viva, open book test	F&S	III	

					learning / Group discussion				
CO4	Describe the Importance of Yukti in Ayurveda	Cognitive / Recall	Must know	Knows how	Lecture / Activity based learning / Problem based learning / Group discussion	Written And Viva	F&S	III	
CO4	Describe the practical application of Yukti in Sharir, Nidan, Chikitsa and Anusandhan (research).	Cognitive Recall	Must know	Knows how	Lecture / Activity based learning / Problem based learning / Group discussion	Written And Viva	F&S	III	
CO4	Recite the concern Verses from CharakSamhita	Cognitive Recall	Desirable to know	knows	Audio clips, classroom Recitation	Viva, Recitation competition	F&S	III	
<b>8. Topic 6 – Upamana Pramana Time</b> (Lecture:- __2_ hours Non lecture _4_ hours)									
CO4	Define Upamana..Enlist the types of Upaman	Cognitive / Recall	Must know	Knows	Lecture / Activity based learning	Written And Viva	F&S	III	
CO4	Describe the Importance of Upamana in Ayurveda	Cognitive / Recall	Must know	Knows	Lecture / Problem based learning / Group discussion	Written And Viva	F&S	III	
CO4	Describe the practical applications of Upamana in Sharir, Nidan, Chikitsa and Anusandhan.	Cognitive / Comprehension	Must know	Knows	Lecture / Game based learning / Problem based learning / Group discussion	Written And Viva, quiz	F&S	III	
CO4	Recite the concern Verses from Tarkasangrah & Charak	Cognitive Recall	Desirable to know	knows	Audio clips, classroom Recitation	Viva, Recitation competition	F&S	III	

<b>Topic 7 - Karya- Karana Siddhanta Time</b> (Lecture:- _11__hours Non lecture _13__hours)									
CO5 CO2	Define Karya and Karana. List types of Karana. Charakokta Dashvidha Parikshya Bhava.	Cognitive/ Recall	Must know	Knows	Lecture Tutorial	Written and Viva	F & S	III	
CO5	Explain Charakokta Dashvidha Parikshya Bhava.	Cognitive/Co mprehension	Must know	Knows	Lecture/Problem Based learning	Written and Viva	F & S	III	
CO5 CO2	Describe the significance of Karya and Kaarana in Ayurveda	Cognitive/ Comprehension	Must know	Knows how	Lecture/problem based activity	Written and Viva	F & S	III	
CO5 CO2	Realises the utility of Charakokta Dashvidha Parikshya Bhav in understanding situations and taking decisions	Affective	Must know	Knows	Group discussion/ Role play/ Debate		F	III	
CO5 CO2	Distinguish different opinions regarding the manifestation of Karya from Karana	Cognitive / Application	Must know	Knows how	Edutainment Role play/ Debate group discussion/debate	Written and Viva, quiz	F & S	III	
CO5 CO2	Analyse Satkaryavada and relate it with Ayurveda Siddhanta	Cognitive / Application	Must know	Knows how	Lecture & Group Discussion/debate	Written and Viva	F & S	III	
CO5 CO2	Analyse Asatkaryavada & relate it with Ayurveda Siddhanta	Cognitive / Application	Must know	Knows how	Lecture & Group Discussion/debate	Written and Viva	F & S	III	

CO5 CO2	Analyse Parinamavada & relate it with Ayurveda Siddhanta	Cognitive / Application	Must know	Knows how	Lecture & Group Discussion	Written and Viva	F & S	III	
CO5 CO2	Analyse Arambhavada & relate it with Ayurveda Siddhanta	Cognitive / Application	Must know	Knows how	Lecture & Group Discussion	Written and Viva	F & S	III	
CO5 CO2	Analyse Paramanuvada and relate it with Ayurveda Siddhanta	Cognitive / Application	Must know	Knows how	Lecture & Group Discussion	Written and Viva	F & S	III	
CO5 CO2	Explain Vivartavada and relate it with Ayurveda Siddhanta	Cognitive/ Comprehension	Must know	Knows how	Lecture & Group Discussion	Written and Viva	F & S	III	
CO5 CO2	Explain Kshanabhangurvada and relate it with Ayurveda Siddhanta	Cognitive/ Comprehension	Must know	Knows how	Lecture & Group Discussion	Written and Viva	F & S	III	
CO5 CO2	Explain Swabhavavada and relate it with Ayurveda Siddhanta	Cognitive/ Comprehension	Must know	Knows how	Lecture & Group Discussion	Written and Viva	F & S	III	
CO5 CO2	Explain Peelupakavada and relate it with Ayurveda Siddhanta	Cognitive/ Comprehension	Must know	Knows how	Lecture & Group Discussion/debate	Written and Viva	F & S	III	
CO5	Explain Pitharapakavada and relate it with Ayurveda Siddhanta	Cognitive/ Comprehension	Must know	Knows how	Lecture & Group Discussion/debate	Written and Viva	F & S	III	
CO5	Explain Anekantavada and relate it with Ayurveda Siddhanta	Cognitive/ Comprehension	Must know	Knows how	Lecture & Group Discussion	Written and Viva	F & S	III	
CO5 CO2	Explain Swabhavoparamavada.	Cognitive/ Comprehension	Must know	Knows how	Lecture & Group Discussion	Written and Viva	F & S	III	

CO5 CO2	Recite the concern Verses from Tarkasangrah & CharakSamhita	Cognitive Recall	Desirable to know	knows	Audio clips, classroom Recitation	Viva, Recitation competition	F&S	III	
CO5, CO2	Value cause and effect theory	Affective	Must know	Knows	Debate/Group Discussion	Viva	F	III	
CO 5, CO2	Analyse cause effect relationship, causality, causation in contemporary sciences	Cognitive / Comprehension	Nice to know	Knows	Self directed learning , Flipped classroom, Group Discussions.	-	-	III	

## List of Practicals

### Course AyUG-PV : Practical List

Marks: 100

Hours:- 45 (included in non Lecture hours)

SN	Name of Topic/ Name of Practical	Term	Activity / Practical
P1	Ayurved Nirupan	I	Ayurved Perception identification: Ask the meaning of Ayurveda to your parents, friends and family members (min 10) and write it, give your opinion on it. Introduction to communication skills. Conduct of survey.
P2	Darshana and Padartha	I	<ul style="list-style-type: none"><li>• Darshan concept development: Find and write names of different philosophies?</li><li>• Discussions: meanings of philosophy, darshana, spirituality, religion. Are they same or different? Write in Activity Book.</li></ul>
P3	Hitayu/ Sukhayu lakshanas	I	<ul style="list-style-type: none"><li>• Identification of characters of Hitayu, &amp; Sukhayu in Healthy individuals.</li></ul>
P4	Dravya	I	<ol style="list-style-type: none"><li>1. <b>Identification of Guna and Karma.</b> Make a list of 10 dravyas surrounding you and identify Guna and Karma in it.</li><li>2. <b>Panchbhautik nature identification:</b> Demonstrate the Panchamahabhuta in any five ahara dravya and five sharira dravya/ avayava with a neat labeled diagramme. (ex-cell, blood, vata, pitta, kapha etc).</li><li>3. <b>Determination of Directions:</b> Identify the directions in and enlist the content in each direction in your campus.</li><li>4. <b>Conceptualize Time :</b> Discussion and understanding of Kala as per Ayurved and contemporary sciences.</li><li>5. <b>Categorization</b> of Aushadhi dravya by dominance of Mahabhoot e.g. Parthiv / Jaleeya/ Agney/ Vayaveey/ Akasheey dravya with reasons.</li><li>6. <b>Early Clinical Exposure(ECE):</b> Visit the OPD, find the diseases common for different age groups ( balyavastha/ tarunyavastha/ vrudhdhavastha)</li></ol>

P5	Guna	II	<p><b>Identification:</b></p> <p><b>Sartha Guna :</b> Identify concept of Shabda, Sparsha, Rupa, Rasa, Gandha in Dravya.</p> <p><b>Application and demonstration</b> find the different therapies based on 5 Sartha Gunas. e.g. Gandha. Shabda, Sparsha.</p> <p>Observe /Experience/ Study / Read book or article <b>present</b> on (any one)</p> <p>Aromatherapy- Gandha Chikitsa. Music therapy/ Mamtra Chikitsa -Shabda guna.</p> <p>Sparsha- Touch therapy.</p> <p><b>Gurvadi Guna:</b> Identify guna in any five ahara dravya : different vargas.</p> <p>in Sharir dravya: dosha, dhatu mala.</p> <p><b>Comparison</b> Gurvadi gunas and corelate with concepts learned in Physics, Chemistry and Biology.</p> <p>Observation(<b>survey</b>) of the effects of Seasons on Gurvadi gunas in body, nature etc.</p> <p><b>Paradi Guna</b> and their application in five examples.</p> <p><b>Atma Guna identification:</b> Making or Framing their real life situations related to Atma Guna(sukha, dukkha etc)</p>
P6	Karma	II	<p><b>Conceptualization</b> Karma, its application in branch of Ashtanga Ayurveda.( panchakarma/ Shastrakarma etc</p> <p><b>Illustration:</b> Make a collage of pictures/ photos depicting five types of karma and their similarity with concepts learned in Physics, Chemistry etc.</p>
P7	Pratyaksha Praman	II	<b>Observation:</b> Note down the factors from Prakruti analysis which you can



			<p>understand through pratyaksh ( like- colour, dry skin)</p> <p><b>Identification:</b> Find few identification marks for identification of herbs/ minerals which need Pratyaksha.</p> <p><b>ECE:</b> Pramans in examination of patient and Diagnosis of disease.</p> <p>Identifies the gunas which can be perceived by one sense (ekendriya) organ and more than one sense organ (Dwiendriya etc).</p> <p>Demonstrate with examples of Shabda,(snigdha/ ruksha etc) Sparsha (snigdha/ ruksha etc), Rupa, Rasa(taste threshold video), Gandha. (5 examples)</p>
P8	Pratyaksha Praman Limitations	II	<p><b>Observation:</b> Find out how one can overcome limitations of Pratyaksha by advances in equipment. (microscope, telescope etc)</p> <p><b>Justification</b> of use of various equipment in examination of patient and Diagnosis of disease. (X ray, USG etc)</p>
P9	Anuman Praman	II	<p><b>Application in Real life situation</b></p> <p>Write 3 examples of Vyapti (associations)in real life.</p> <p>Find and explain 5 examples of Anumana pramana as per types.</p> <p>Write 3 examples of panchavayava vakya. Correlate it with practicals that you have conducted.</p> <p>Examples of Hetvabhas.(Any three)</p> <p>Study use of inference in various sciences.</p>
P10	Samanya Vishesh Siddhant	III	<p><b>Identification:</b> Visit vanaushadhi udyan of your college. Find samanyatva and visheshatva among plants.</p> <p><b>Illustration :</b> Make a chart of food articles and activities to illustrate the relationship of samanya/vishesha with dosha-dhatu-malas.</p> <p><b>Application:</b> Make a list/ collection of seasonal vegetables and fruits which are</p>

			Samanya/Vishesha with the dosha.(five examples)
P11	Samvay	III	<b>Conceptualization</b> Mention five real life examples of Nitya and anitya sambandha.
P12	Abhav	III	<b>Application:</b> Write five real life experiences of pragabhava, pradhwamsabhava, atyantabhava and anyonyabhav.
P13	Upman Praman	III	<b>Illustration :</b> Upamana in practical life or with your prior learning. (Examples of upamana from Ashtang Hridaya and Charak samhita)and prior learning (Examples in Physics, chemistry etc)
P14	Yukti Praman	III	<b>Conceptualization:</b> How various factors influence the process of the decision making? <b>Application :</b> Write 5 examples of Yukti in practical life or with your prior learning. <b>ECE:</b> Role of Yukti in Sharir, Nidan, Chikitsa and Anusandhan.
P15	Satkaryavad and other vadas	III	<b>Justification :</b> Parinama vada: Describe 3 real life or with your prior learning examples (Physics, Chemistry etc). Justification of Satkarya vada.: Describe 3 real life or with your prior learning examples. Swabhavoparama vada : Describe 3 real life or with your prior learning examples. Pakajotpatti siddhanta.: Write 3 examples of real life or with your prior learning. Justification of Arambhavada Describe 3 real life or with your prior learning examples
P16	Cause and effect theory	III	<b>Illustration:</b> Karya Karan Bhav: Write Samavayi, asamavayi and Nimitta Karana of a karya in real life examples (5 examples). Examples learned in Physics, Chemistry, Biology. <b>Search</b> Find out use of cause effect theory in other sciences. <b>Schematic representation</b> of cause effect in any examples.

			<p><b>Application:</b> Assess the 10 factors of Charakokta Karyakarana bhava regarding any task consider the task as karya Remember and write theories of evolution you learned within and other than syllabus.</p>
A1	<b>Other Activities in Journal.</b>	<b>I, II, III.</b>	<ol style="list-style-type: none"> <li>1. <b>Oral presentation:</b> on allotted topic, PPT slides be made and Copy of slides be pasted in activity book</li> <li>2. <b>Quiz:</b> Participation of all students in Quiz on some topic of Padartha vijnana.</li> <li>3. <b>Recitation:</b> Important shloka of padartha vijnana recitation everyday or alternate days by students and written in diary.</li> <li>4. Each student will do Pick and speak on topics of Padartha Vijnana.</li> <li>5. e charts / animations etc.</li> </ol>

**Table 4: Learning objectives (Practical) of AyUG-PV**

Practical									
<b>A4</b> Course outcome	<b>B4</b> Learning Objective  (At the end of the session, the Students should be able to)	<b>C4</b> Domain/ sub	<b>D4</b> Must to know/ desirab le to know/ Nice to know	<b>E4</b> Level Does/ Shows how/ Knows how/ Know	<b>F4</b> T-L method	<b>G4</b> Assessmen t	<b>H4</b> Formativ e /summati ve	<b>I4</b> Ter m	<b>J4</b> Integrati on
<b>Practical1-Ayurved Nirupan Time (practical- 2 hours)</b>									
<b>CO1</b>	Define Ayurved	Cognitive Recall	MK	knows	discussion	Viva	<b>F &amp; S</b>	<b>I</b>	
<b>CO1</b>	Conduct the survey to identify the perception about Ayurved in the society	Psychom otor	MK	Shows	Demonstration/ discussion	Viva	<b>F&amp;S</b>	<b>I</b>	
<b>Practical2-Darshan and Padarth (Practical- 1hour)</b>									
CO2	Discuss and compare the meanings of philosophy, darshana, spirituality, religion.	Cognitive / Recall	MK	Knows how	Demonstration/ discussion/ brainstorming	Viva	F &S	I	
CO2	Find and write names of different philosophies?	Cognitiv e/Recall	MK	Knows how	Demonstration/ discussion/ brainstorming	Viva	F&S	I	
<b>Practical - 3(hitayu/Sukhayu) Time (Practical/ Clinical 2 hours) :</b>									

CO 1	Discuss characters of hitayu, & Sukhayu	Cognitive /Recall	MK	Knows how	Demonstration/ discussion/ brainstorming	Viva	F&S	I	
CO 1	Identifies characters of hitayu, & Sukhayu in healthy individuals	Cognitive / Comprehension	MK	Knows How	Demo/Practical	Viva	F& S	I	
<b>Practical 4- Dravya Time (Practical/ Clinical 6 hours)</b>									
CO1,3	Define dravya, discuss nature of dravya	Cognitive Recall	MK	Knows how	Demonstration/ discussion/ brainstorming	Viva	F&S	I	
CO1,3	Identify pentaelemental nature of Ahar Dravya Aushadh Dravya in given examples	Cognitive/ Comprehension	MK	Shows	Practical/Demonstration	Viva/ Practicals	F& S	I	
CO1,3	Identify the Guna and Karma in the given dravya	Cognitive/ Comprehension	MK	Knows how	Practical/Demonstration	Viva/ Practicals	F&S	I	
CO1,3	Categorize the Aushadhi dravya by dominance of Mahabhoot e.g. Parthiv /Jaleeya/ Agney/ Vayaveey/ Akasheey dravya with reasons	Cognitive/ Comprehension	MK	Knows how	Practical/Demonstration	Viva/ Practicals	F&S	I	
CO1,3	Identify the directions in and enlist the content in each direction in your campus.	Cognitive/ Comprehension	MK	Knows how	Practical/Demonstration	Viva/ Practicals	F&S	I	
CO1,3	Discus the concept of Kala as per Ayurved and	Cognitive/ Recall	MK	Knows	Demonstration/ discussion/	Viva	F&S	I	

	contemporary sciences.				brainstorming				
CO1,3	find the diseases common for different age groups (balyavastha/tarunyavastha/vruddhavastha)	Cognitive/Comprehension	MK	Knows how	Early Clinical Exposure.	Viva/Practicals	F&S	I	
Practical - 5(Guna) Time (Practical/ Clinical 5 hours )									
CO 3	Discuss Guna,	Cognitive/Recall	MK	Knows how	Demonstration/discussion/brainstorming	Viva	F&S	II	
CO 3	Identify Gunas in given Ahar dravya.	Cognitive/Comprehension	MK	Knows How	Demo/Practical	Viva/Practicals	F&S	II	
CO 3	Identify Gunas in given Sharir dravya.	Cognitive/Comprehension	MK	Knows how	Practical/Demonstration	Viva/Practicals	F&S	II	
CO 3	Identify the specification of Shabda, Sparsha, Rupa, Rasa, Gandha in Dravy	Cognitive/Comprehension	MK	Knows how	Demonstration of Dravyas like-kutki, gojihva, guduchi, yashtimadhu, sariva etc.	Viva/Practicals	F&S	II	
CO 3	find the different therapies based on 5 Sartha Gunas. e.g.Gandha. Shabda, Sparsha.	Cognitive/Comprehension	DK	knows	Demonstration/discussion/brainstorming	Viva/Practicals	F&S	II	

CO 3	Observe and record the effects of Seasons on Gurvadi gunas in body and nature	Cognitive/analysis	MK	Knows how	Practical/Demonstration	Viva/Practicals	F&S	II	
CO 3	Correlate Gurvadi gunas with concepts learned in Physics, Chemistry and Biology.	Cognitive/comprehension	MK	Knows how	Demonstration/discussion/brainstorming	Viva/Practicals	F&S	II	
CO 3	Identify the paratva-aparatva in five examples	Cognitive/Comprehension	MK	Knows how	Practical/Demonstration	Viva/Practicals	F&S	II	
CO 3	Perform the Sanskar (toyasannikarsha/vasan/Bhavana)	Psychomotor	MK	Shows	Practical/Demonstration	Viva/Practicals	F&S	II	
CO 3	Frame the real life situations related to Atma Guna(sukha, dukkha etc)	Cognitive/Comprehension	MK	Knows how	Demonstration/discussion/brainstorming	Viva/Practicals	F&S	II	
<b>Practical -6 Karma Time</b> (Practical/ Clinical 3 hours)									
CO 3	Discuss Karma	Cognitive/Recall	MK	<b>Knows how</b>	Demonstration/discussion/brainstorming	Viva	F&S	II	
CO 3	Classify Karma in given	Cognitive/Comprehe	MK	Knows how	Demonstration/Practical	Viva/Practicals	F&S	II	

	examples ( panchakarma/Shastrakarma)	nsion							
CO 3	Illustrate five types of Karma in collage of pictures/ photos	Cognitive/ Comprehe nsion	MK	Knows how	Practical/Demon stration	Viva/ Practicals	F&S	II	
CO 3	compare Karma with concepts learned in Physics, Chemistry etc.	Cognitive/ Comprehen sion	MK	Knows	Practical/Demon stration	Viva/ Practicals	F&S	II	
<b>Practical – 7 Pratyaksha Praman Time (Practical/ Clinical 5 hours)</b>									
CO4	Discuss Pratyaksha Praman	Cognitive/ Recall	MK	<b>Knows how</b>	Demonstration/ discussion/ brainstorming	Viva	F&S	II	
CO4	Find identification marks for identification of herbs/ minerals which need Pratyaksha.	Cognitive/ Comprehe nsion	MK	Knows how	Demonstration/ Practical	Viva/ Practicals	F&S	II	
CO4	Note down the factors from Prakruti analysis which need pratyaksh ( like- colour, dry skin)	Cognitive/ Comprehe nsion	MK	Knows how	Practical/Demon stration	Viva/ Practicals	F&S	II	
CO4	Discuss the use of pratyaksha in examination of patient and Diagnosis of disease.	Cognitive/ Comprehe nsion	MK	Knows how	ECE/ discussion	Viva/ Practicals	F&S	II	
CO4	identifies with examples of Shabda,(snigdha/ ruksha etc) Sparsha (snigdha/ ruksha etc),	Cognitive/ Comprehe nsion	MK	Knows how	Practical/Demon stration/ Shabd from recordings, (snigdha/	Viva/ Practicals	F&S	II	



	Rupa, Rasa(taste threshold video), Gandha.				ruksha etc) Sparsha by touching or instruments. (snigdha/ruksha etc), Rupa, Rasa(taste threshold video), Gandha.(intensity of Smell)				
CO4	Identifies the gunas which can be perceived by one sense (ekendriya) organ and more than one sense organ (Dwiendriya etc).	Cognitive/Comprehension	MK	Knows how	Demonstration/discussion/brainstorming	Viva/Practicals	F&S	II	
<b>Practical -8 Pratyaksha Badhakar Bhav Time</b> (Practical/ Clinical 2 hours)									
CO4	Discuss Pratyaksha Badhakar Bhav (limitations of pratyaksha.)	Cognitive/recall	MK	Knows	Lecture	Viva	F&S	II	
CO4	Identify and classifies Pratyaksha badhakar Bhav in given examples.	Cognitive/Comprehension	MK	Knows how	Demonstration/Practical. Ask examples or encourage to identify examples.	Viva/Practicals	F&S	II	

CO4	Justify the use of various equipment in examination of patient and Diagnosis of disease.	Cognitive/Comprehension	MK	Knows how	Demonstration/discussion/brainstorming/Video Clips	Viva/Practicals	F&S	II	
<b>Practical -9 Anuman praman Time (Practical/ Clinical 5 hours )</b>									
CO4	Discuss Anuman praman	Cognitive/Recall	MK	Knows	Demonstration/discussion/brainstorming	Viva	F&S	II	
CO4	Identify and classify Anuman praman with type in given examples.	Cognitive/Comprehension	MK	knows	Demonstration/Practical, Ask examples or encourage to identify examples.	Practical/Demonstration	F&S	II	
CO4	Find and discuss examples of Vyapti (associations)in real life.	Cognitive/Comprehension	MK	Knows how	Practical/Demonstration. Ask examples or encourage to identify examples.	Practical/Demonstration	F&S	II	
CO4	Apply panchavayava vakya for drawing inference in practicals conducted	Cognitive/Comprehension	MK	Knows how	Practical/Demonstration	Practical/Demonstration	F&S	II	
CO4	Identify and discuss Hetvabhas in given examples	Cognitive/Comprehension	MK	Knows how	Practical/Demonstration. Ask examples or encourage to identify	Practical/Demonstration	F&S	II	

					examples.				
CO4	Draw inference in various sciences on the basis of Vyapti.	Cognitive/ recall	MK	<b>knows</b>	Demonstration/ discussion/ brainstorming	Practical/De monstration	F&S	II	
<b>Practical -10 Samanya Vishesh Siddhant Time</b> (Practical/ Clinical 5 hours)									
CO 3	Discuss Samanya vishesh Siddhant	Cognitive/ Rcall	MK	<b>Knows</b>	Demonstration/ discussion/ brainstorming	Viva	F&S	III	
CO 3	Identify and classifies Samanya vishesh Siddhant with type in given examples.	Cognitive/ Comprehe nsion	MK	<b>Knows how</b>	Demonstration/ Practical/ Ask examples or encourage to identify examples.	Viva/ Practical	F&S	III	
CO 3	Identify samanyatva and visheshatva among plants in Vanaushadhi udyan	Cognitive/ Comprehe nsion	MK	Knows how	Practical/Demon stration.	Viva/ Practicals	F&S	III	
CO 3	Make a chart/ eChart of food articles and activities to illustrate the relationship of samanya/vishesha with dosha-dhatu-malas.	Cognitive/ Comprehe nsion	MK	Knows how	Practical/Demon stration	Presentation/ Viva/ Practicals	F&S	III	
CO 3	Make a poster seasonal vegetables and fruits which are Samanya/Vishesha with the dosha.	Cognitive/ Comprehe nsion	MK	Knows how	Practical	Presentation /Viva/ Practicals	F&S	III	
<b>Practical -11 Samavay Time</b> (Practical/ Clinical 1 hour)									

CO 3	Discuss Samavay	Cognitive/ Recall	MK	<b>Knows</b>	Demonstration/ discussion/ brainstorming	Viva	F&S	III	
CO 3	Mention five real life examples of Nitya and anitya sambandha.	Cognitive/ Comprehe nsion	MK	<b>Knows how</b>	Demonstration/ Practical/ Ask examples or encourage to identify examples.	Viva/ Practical	F&S	III	
<b>Practical -12 Abhav Time</b> (Practical/ Clinical 1 )									
CO 3	Discuss Abhav	Cognitive/ Recall	MK	<b>Knows how</b>	Demonstration/ discussion/ brainstorming	Viva	F&S	III	
CO 3	Write real life experiences of pragabhava, pradhwamsabhava, atyantabhava and anyonyabhav.	Cognitive/ Comprehe nsion	MK	<b>Shows</b>	Demonstration/ Practical/ Ask examples or encourage to identify examples.	Viva	F&S	III	
<b>Practical - 13 Upman Praman Time</b> (Practical/ (Practical/ Clinical 1 hour)									
CO4	Discuss Upaman Praman	Cognitive/ Recall	MK	<b>Knows how</b>	Demonstration/ discussion/ brainstorming	Viva/ Practical	F&S	III	
CO4	Illustrate Upamana in practical examples and real life situation.	Cognitive/ Comprehe nsion	MK	Knows how	Demonstration/ Practical/ Ask examples or encourage to identify examples.	Viva/ Practicals	F&S	III	
CO4	Identify Examples of upamana from Ashtang	Cognitive/ Comprehe	MK	Knows how	Demonstration/ discussion/	Viva/ Practicals	F&S	III	

	Hridaya and Charak Samhita	nsion			brainstorming.				
CO4	Identify examples in Physics, chemistry biology where Upaman is used	Cognitive/ Comprehension	MK	Knows how	Demonstration/ discussion/ brainstorming/ Ask examples or encourage to identify examples.	Viva/ Practicals	F&S	III	
<b>Practical -14 Yukti Praman Time (Practical/ Clinical 1 hour</b>									
CO4	Discuss Yukti Praman	Cognitive/ Recall	MK	<b>Knows</b>	Demonstration/ discussion/ brainstorming	Viva	F&S	III	
CO4	Illustrate examples of Yukti in practical life or with your prior learning.	Cognitive/ Comprehension	MK	Knows how	Demonstration/ Practical/ Ask examples or encourage to identify examples.	Viva/ Practicals Quiz	F&S	III	
CO4	Identify Role of Yukti in Nidan, Chikitsa and Anusandhan (research).	Cognitive/ Comprehension	MK	Knows how	ECE/ Demonstration/	Viva/ Practicals/ PBL	F&S	III	
<b>Practical -15 Various Vadas Time (Practical/ Clinical 3 hour )</b>									
CO5 CO2	Discuss Satkaryavad	Cognitive/ Recall	MK	<b>Knows how</b>	Demonstration/ discussion/ brainstorming	Viva	F&S	III	
CO5 CO2	Justify Satkaryavad through real life	Cognitive/ comprehension	MK	Knows how	Demonstration/ Practical/ /Ask examples or	Viva/ Practicals/ PBL	F&S	III	

	examples/ examples from prior learning				encourage to identify examples.				
CO5 CO2	Justify Parinamvad through real life examples/ examples from prior learning	Cognitive/ comprehension	MK	Knows how	Practical/Demonstration/ /Ask examples or encourage to identify examples.	Viva/ Practicals	F&S	III	
CO5 CO2	Justify Pakajotpatti through real life examples/ examples from prior learning	Cognitive/ comprehension	MK	Knows how	Practical/Demonstration/ /Ask examples or encourage to identify examples.	Viva/ Practicals	F&S	III	
CO5 CO2	Justify Swabhavoparamvad through real life examples/ examples from prior learning	Cognitive/ comprehension	MK	<b>Knows how</b>	Demonstration/ discussion/ brainstorming/ /Ask examples or encourage to identify examples.	Viva/ Practicals	F&S	III	
CO5 CO2	Justify Arambhavad through real life examples/ examples from prior learning	Cognitive/ comprehension	MK	Knows how	Demonstration/ Practical//Ask examples or encourage to identify examples.	Viva/ Practicals	F&S	III	
<b>Practical -16 Cause and Effect theory Time (Practical/ Clinical 2 hours)</b>									
CO5, CO2	Discuss Cause and effect theory	Cognitive/ comprehend	MK	<b>Knows</b>	Demonstration/ discussion/ brainstorming	Viva/ Quiz	F&S	III	
CO5 CO2	Identify Samavayi, Asamavayi and Nimitta	Cognitive/ Comprehe	MK	Knows How	Demonstration/ Practical/Ask	Viva/ Practicals	F&S	III	

	karan of a Karya in real life examples/ examples with prior learning	nsion			examples or encourage to identify examples.				
CO5	Find out use of cause effect theory in other sciences.	Cognitive/ comprehension	MK	Knows how	Practical/Demonstration	Viva/ Practicals/ Debate	F&S	III	
CO5	Represent cause and effect schematically in any examples	Cognitive/ comprehension	MK	Knows how	Practical/Demonstration	Viva/ Practicals	F&S	III	
CO5	Assess the 10 factors of Charakokta Karyakarana bhava regarding any task consider the task as karya	Cognitive/ analysis	MK	Knows how	Practical/Demonstration	Viva/ Practicals	F&S	III	
CO5	Write theories of evolution you learned within and other than syllabus.	Cognitive/ comprehension	MK	Knows how	Practical/Demonstration	Viva/ Practicals	F&S	III	

**Table 5: Non Lecture Activities Course AyUG-PV**

**Table 5- Course AyUG-PV Non Lecture Activities- 140**

	<b>List non lecture Teaching-Learning methods *</b>	<b>No of Activities</b>
1	GROUP DISCUSSION	20
2	<b>PRACTICALS AND DEMONSTRATIONS</b>	45
3	ACTIVITY BASED LEARNING	10
4	PROBLEM BASED LEARNING	10
5	ENQUIRY BASED LEARNING	8
6	CASE BASED LEARNING	6
7	GAME BASED LEARNING	8
8	FLIPPED CLASSROOMS	6
9	DEBATE	8
10	SEMINARS	6
11	TUTORIALS	5
12	ROLE PLAY	5
13	SELF DIRECTED LEARNING	3
		140

**Table 6: Assessment Summary AyUG-PV**

**6 A - Number of Papers and Marks Distribution**

S.No.	Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand Total
				Practical/ Clinical	Viva	Electives	IA	Sub Total	
1.	AyUG-PV	2	200	100	60	10 (Set-FB)	30	200	400

**6 B - Scheme of Assessment (formative and Summative)**

SR.NO.	PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
		First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
1	First	3 PA & First TT	3 PA & Second TT	3 PA & UE

PA: Periodical Assessment; TT: Term Test; UE: University Examinations



### 6 C - Calculation Method for Internal assessment Marks (30 Marks)

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 30 Marks (D/15)*30)	Term Test (Marks converted to 30)	Sub Total _/60 Marks	Term Assessment (.../30)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert to 30 marks.							

### 6 D -Evaluation Methods for Periodical Assessment

S. No.	Evaluation Methods
1.	Activities Indicated in Table 3 - Column G3 as per Indicated I, II or III term in column I3.
2.	Practical / Clinical Performance
3.	Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
4.	Open Book Test (Problem Based)
5.	Summary Writing (Research Papers/ Samhitas)
6.	Class Presentations; Work Book Maintenance
7.	Problem Based Assignment
8.	Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)
9.	Extra-curricular Activities, (Social Work, Public Awareness, Surveillance Activities, Sports or Other Activities which may be decided by the department).
10.	Small Project
11.	<b>AyUG-PV Specific</b> Test on Topics in list of practicals.

## 6 E- Paper Layout

### I PROFESSIONAL BAMS EXAMINATIONS

#### AyUG-PV

#### Paper-I

Time: 3 Hours      Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

TOTAL MARKS 100

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ)	20	1	20
Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Long answer questions (LAQ)	4	10	40
				100

### I PROFESSIONAL BAMS EXAMINATIONS AyUG

#### PV

#### Paper-II

Time: 3 Hours      Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

TOTAL MARKS 100

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ)	20	1	20
Q 2	Short answer questions (SAQ)	8	5	40
Q 3	Long answer questions (LAQ)	4	10	40
				100

6 F- Disribution of Theory Exam

Paper I				D Type of Questions "Yes" can be asked. "No" should not be asked.		
A List of topics	B Term	C Marks	MCQ (1 mark)	SAQ (5 marks)	LAQ (10 marks)	
1	Ayurveda nirupana	I	25	Yes	Yes	Yes
2	Padartha and darshana nirupana	I		Yes	Yes	Yes
3.	Dravya vijnaneeyam	II	48	Yes	Yes	Yes
4.	Guna vijnaneeyam	II		Yes	Yes	Yes
5.	Karma vijnaneeyam	II		Yes	Yes	Yes
6.	Samanya vijnaneeyam	III	27	Yes	Yes	Yes
7.	Vishesha vijnaneeyam	III		Yes	Yes	Yes
8.	Samavaya vijnaneeyam	III		Yes	Yes	No
9	Abhava vijnaneeyam	III		Yes	Yes	No

Paper II				D Type of Questions "Yes" can be asked. "No" should not be asked.		
A List of Topics	B Term	C Marks	MCQ (1 Mark)	SAQ (5 Marks)	LAQ (10 Marks)	
1	Pariksha	I	26	YES	YES	YES
2	Aptopdesha Pariksha/Pramana	I		YES	YES	YES
3.	Pratyaksha Pariksha/Pramana	II	42	YES	YES	YES
4.	Anumanapariksha/Pramana	II		YES	YES	YES
5.	Yuktipariksha/Pramana	III	32	YES	YES	NO
6.	UpamanaPramana	III		YES	YES	NO
7.	Karya- Karana Siddhanta	III		YES	YES	YES

## 6 G- Question paper blue print Paper

I –

A Question Sr. No	B Type of Question	C Question Paper Format
.Q1	<p><b>Multiple choice Questions (MCQ)</b></p> <p>20 Questions</p> <p>1 mark each</p> <p>All compulsory</p> <p>(Must Know 15 MCQ Desirable to know 3 MCQ Nice to know 2 MCQ)</p>	<ol style="list-style-type: none"> <li>1. Topic number 1</li> <li>2. Topic number 2</li> <li>3. Topic number 3</li> <li>4. Topic number 4</li> <li>5. Topic number 5</li> <li>6. Topic number 6</li> <li>7. Topic number 7</li> <li>8. Topic number 8</li> <li>9. Topic number 9</li> <li>10. Topic number 2</li> <li>11. Topic number 3</li> <li>12. Topic number 4</li> <li>13. Topic number 5</li> <li>14. Topic number 6</li> <li>15. Topic number 7</li> <li>16. Topic number 9</li> <li>17. Topic number 1</li> <li>18. Topic number 2</li> <li>19. Topic number 3</li> <li>20. Topic number 4</li> </ol>
Q2	<p><b>Short answer Questions (SAQ)</b></p> <p>Eight Questions</p> <p>5 Marks Each</p> <p>All compulsory</p> <p>(Must know 7 . Desirable to know 1 No Questions on Nice to know.)</p>	<ol style="list-style-type: none"> <li>1. Topic no.1</li> <li>2. Topic no.2</li> <li>3. Topic no.3</li> <li>4. Topic no.4</li> <li>5. Topic no.5</li> <li>6. Topic no.6/ Topic no.7</li> <li>7. Topic no.8/ Topic no.9</li> <li>8. Topic no.3/ Topic no.4</li> </ol>
Q3	<p><b>Long answer Questions (LAQ)</b></p> <p>Four Questions</p> <p>10 marks each</p> <p>All compulsory</p> <p>(All questions on Must to know. No Questions on Nice to know and Desirable to know.)</p>	<ol style="list-style-type: none"> <li>1. Topic no.1/ Topic no.2</li> <li>2. Topic no.3</li> <li>3. Topic no.4/Topic no.5</li> <li>4. Topic no.6/ Topic no.7</li> </ol>

## Paper II

A Question Sr. No	B Type of Question	C Question Paper Format
Q1	<p><b>Multiple choice Questions (MCQ)</b></p> <p>20 Questions</p> <p>1 mark each</p> <p>All compulsory</p> <p>(Must know 15 MCQ Desirable to know 3 MCQ Nice to know 2 MCQ)</p>	<ol style="list-style-type: none"> <li>1. Topic number 1</li> <li>2. Topic number 2</li> <li>3. Topic number 3</li> <li>4. Topic number 4</li> <li>5. Topic number 5</li> <li>6. Topic number 6</li> <li>7. Topic number 7</li> <li>8. Topic number 1</li> <li>9. Topic number 2</li> <li>10. Topic number 3</li> <li>11. Topic number 4</li> <li>12. Topic number 5</li> <li>13. Topic number 6</li> <li>14. Topic number 7</li> <li>15. Topic number 1</li> <li>16. Topic number 2</li> <li>17. Topic number 3</li> <li>18. Topic number 4</li> <li>19. Topic number 7</li> <li>20. Topic number 4</li> </ol>
Q2	<p><b>Short answer Questions (SAQ)</b></p> <p>Eight Questions</p> <p>5 Marks Each</p> <p>All compulsory</p> <p>(Must know 7 . Desirable to know 1 No Questions on Nice to know.)</p>	<ol style="list-style-type: none"> <li>1. Topic no.1</li> <li>2. Topic no.2</li> <li>3. Topic no.3</li> <li>4. Topic no.4</li> <li>5. Topic no.5</li> <li>6. Topic no.6</li> <li>7. Topic no.7</li> <li>8. Topic no.3/ Topic no.4</li> </ol>
Q3	<p><b>Long answer Questions (LAQ)</b></p> <p>Four Questions</p> <p>10 marks each</p> <p>All compulsory</p> <p>(All questions on must know No Questions on Nice to know and Desirable to know)</p>	<ol style="list-style-type: none"> <li>1. Topic no.1/ Topic no.2</li> <li>2. Topic no.3</li> <li>3. Topic no.4</li> <li>4. Topic no.7</li> </ol>

## 6 H Distribution of Practical Exam

Practical – (Practical 100 +Viva 60+Elective 10+ IA 30) =(Total 200 Marks)

SN	Heads	Marks
<b>1</b>	Practical (Total Marks 100)	<b>100</b>
<b>a.</b>	Spotting ( 4 Spots) Problem based on Principles in PV. Topics 1. Pratyaksha praman/Pratyaksha Badhakar Bhav 2. Vada (Any one) 3. Abhav/Samavay 4. Upaman/Yukti	20
<b>b.</b>	Journal of Activity book/ Projects. (Viva on journal and communication skill)	20
<b>c.</b>	Practical I (10 Marks Each) 1. Identify panchamahabhoot dominance in the given dravya 2. Identify Samanya- Vishesh in the given dravyas 3. Identify the Gunas in the given dravyas  (Use different dravys for different students.)	30
<b>d.</b>	Practical II (Problem based questiones/ Situations)(10 Marks Each)(Any three) 1. Identify and explain the Karya Karan with types in given problem 2. Frame and Write Panchavayav vakya for the given anumana. 3. Identify Vyapti, Paksh, Sadhya, Hetu, Pakshadharmata, Sapaksha, Vipaksha in the give example. 4. Identify and explain Hetvabhas in given example. 5. Identify the vada applicable in given example.(any one vada.) 6. Identify Upama, Sajna- sajni sambhandha in given example.	30
<b>2</b>	Viva Voce	<b>60</b>
	Recitation of Shloka: 10 marks (sutras in Tarka sangraha, Samhitas, other)	
	Questions on Darshan 10 marks	
	Question on Dravya/ Guna/ Karma. 10 marks	
	Question on Samany/vishesh/samavaya/ Abhav 10 Marks	
	Question on one Praman 10 Marks	

	Question on Karya karan bhav 10 Marks.	
3	Internal Assessment	30
4	Electives	10
		200



## 7. References /Resources

### Reference Books

#### PadarthaVignana books

1. Padarthavigyan
2. AyurvediyaPadarthaVigyana
3. Ayurved Darshana
4. PadarthaVigyana
5. PadarthaVigyana
6. SankhyatantwaKaumadi
7. Psycho Pathology in Indian Medicine
8. CharakEvumSushrutkeDarshanik Vishay
9. AyurvediyaPadarthaVigyana
10. PadarthaVigyana
11. Post graduate text book of Samhitha&Sidhanta
12. Padartha Vigyana
13. AyurvediyaPadarthaVigyana
14. AyurvediyaPadartha Vignan Parichaya
15. AyurvediyaPadartha Darshan
16. Scientific Exposition of Ayurveda
17. Padarthavignana and Ayurveda itihasa
18. Essentials of padarthavignana
19. Padarthavignanevam Ayurveda Itihasa
20. AyurvediyaPadarthavignana
21. AyurvediyaMoulikaSiddhanta

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## COURSE CURRICULUM FOR FIRST PROFESSIONAL BAMS (PRESCRIBED BY NCISM)

शास्त्रं ज्योतिः प्रकाशार्थं दृशन् बुद्धिरात्मनिः/



**SAMSKRITAM EVAM AYURVED ITHIHAS**

(SUBJECT CODE-AyUG-SN & AI)

**SANSKRIT AND HISTORY OF AYURVEDA**

(Applicable from 2021-22 batch onwards for 5 years or until further notification  
by NCISM, whichever is earlier)

**BOARD OF AYURVEDA**

**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE  
NEW DELHI-110058**



## NCISM

# I professional Ayurvedacharya (BAMS)

## SAMSKRITAM EVAM AYURVED ITHIHAS

(SUBJECT CODE-AyUG-SN & AI)

## SANSKRIT AND HISTORY OF AYURVEDA

(Applicable from 2021-22 batch onwards for 5 years or until further notification by NCISM, whichever is earlier)

### Summary

AyUG-SN & AI Total number of Teaching hours: 300			
<b>Lecture hours (LH) – Theory</b>		<b>100 Hours</b>	<b>100 Hours (LH)</b>
Paper I	50 Hours		
Paper II ( Sanskrit 40+ AI 10)	50 Hours		
<b>Non-Lecture hours (NLH) – Theory</b>		<b>140 Hours</b>	<b>200 Hours (NLH)</b>
Paper I	74 Hours		
Paper II (Sanskrit 46+ AI 20)	66 Hours		
<b>Non-Lecture hours (NLH) – Practical</b>		<b>60 Hours</b>	

Examination (Papers & Mark Distribution)					
Item	Theory Component Marks AyUG-SN & AI	Practical Component Marks			
		Practical	Viva	Elective	IA
<b>Paper I</b>	<b>100</b> Sanskrit 100 Marks	--	<b>75*</b>	<b>10</b> (Set-FA)	<b>15</b>
<b>Paper II</b>	<b>100</b> Sanskrit 80 Marks and Ayurved Itihas 20 Marks				
<b>Sub-Total</b>	<b>200</b>	<b>100</b>			
<b>Total marks</b>	<b>300</b>				
	*Viva voce examination shall be for Sanskrit and not for Ayurved Itihasa				

## Preface

Sanskrit is an ancient still most scientific language of India. The ancient literature created about various subjects in this region is in Sanskrit. The richness of Sanskrit language is accepted by intellectuals across the world. The literature of Ayurveda is also found in Sanskrit. Without understanding the language of the science, it is really hard to read and understand the terminologies, theories, principles of the science given in the Samhitas. Many of the students coming for the course partly introduced or not at all introduced to the Sanskrit language previously. Hence for understanding Ayurveda in its originality, Sanskrit is one of subject in First year BAMS curriculum. Similar to any language Listening, Reading, Writing and Speaking are the four pillars of a Sanskrit. Reading, writing and understanding Samhitas will be emphasized and listening and speaking can give confidence to the student and enhance the study.

Learning a language just by studying the theory is not enough hence curriculum of Sanskrit is designed by combining traditional Sanskrit teaching with new teaching health science education technologies.

This changed curriculum involves many new teaching learning techniques and assessment methods. Based on the course outcomes, curriculum is divided in papers. Important objectives are appropriately planned as per domains of learning. Supported by interactive methods of teaching and learning by using Audio-visual aids. There will be practicals and demonstrations based on Language Lab activities for enhancement of practical use of Sanskrit. Practical can give a chance of acquiring skills by practice of use of Sanskrit in Samhitadhyayan. Application of learned Sanskrit will be practically ensured by reading newly introduced Ashtang Hrudayam. Students can experience of application of Sanskrit Grammar in Samhitadhyayan. Introduction to Niruktis, dictionaries and Shabdakoshas can motivate students to derive and understand meanings from Sanskrit verses on their own. As this is a language, learning to communicate in this language is very much essential. Addition of Sanskrit communication as a part of curriculum is for overcoming the fear of learning a new language.

History of Ayurved is also added in second part of the Sanskrit. As an ancient science, its gradual development. Important milestones, different Schools of thoughts, important traditions, followers in traditions, their contribution etc will be introduced in History. Contribution of Scholars of modern era, Important institutes and globalization are few more points for history. Activity based learning and objective assessment are the most important changes to change perception towards study of history.

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## Course Code and Name of Course

	Course code	Name of Course
	<b>AyUG SN &amp; AI</b>	<b>Sanskrit and Ayurved Itihas</b>

### AyUG SN & AI Course

**Table 1- Course learning outcomes and matched PO.**

<b>SRI</b>	<b>A1</b>	<b>B1</b>
<b>CO</b>	<b>Course learning Outcome (CO) AyUG SN &amp; AI</b>	<b>Course learning outcomes matched with program learning outcomes.</b>
<b>No</b>	<b>At the end of the course AyUG SN &amp; AI, the student should be able to-</b>	
<b>Sanskrit</b>		
<b>CO1</b>	Read and recite Prose (गद्यः) and poem (पद्यः) with the appropriate accent (उच्चारणस्थानानन तथा बाह्यभ्यरप्रयत्नानन). उच्चारणस्थानानां बाह्यभ्यन्तरप्रयत्नानां च सहाय्येन पाठने तथा लेखने सामर्थ्यम्	PO-5, PO-6, PO-7, PO-8, PO-9
<b>CO 2</b>	Apply various Technical Terms in Ayurveda (पररभाषाशब्दाः), Nouns & Pronouns (नामरूपानण तथा सर्यनामरूपानण), Verbs (धातुरूपानण), suffixes (प्रत्ययाः), Grammatical Terms (सांज्ञा), Syntax (सांधी) and Compounds (समासाः) from Sanskrit Grammar for enhanced interpretation of Ayurveda texts (आयुरेद सांनहताः). पररभाषाशब्देषु नामरूपेषु सर्यनामरूपेषु नियापदेषु प्रत्येषु सांज्ञासु सनन्धेषु समासेषु च ज्ञानां तद्वारा आयुरेदसांनहतासु अथायबोधनम् प्रायोनगकनर्ज्ञानञ्च	PO-5, PO-7, PO-9
<b>CO 3</b>	Discriminate and interpret the Cases & meanings (नर्भाक्त्यथय) used in various verses of Ayurveda texts (आयुरेद सांनहता). कारकनर्भाक्त्यथयानदषु पररज्ञानां तथा आयुरेदसांनहतासु तेषां प्रयोगपररचयञ्च	PO-5, PO-7, PO-9
<b>CO 4</b>	Formulate the Prose order (अत्र्यः) of Slokas/Sutras in Ayurveda Textbooks (सांनहता) to derive the meaning (र्याच्याथय), to determine the Scientific Meaning (शास्त्राथय) and to Translate (Regional or other language). अत्र्यलेखने र्याच्याथायबोधने शास्त्राथायबोधने च सामर्थ्यं अनुरादनपाटञ्च	PO-5, PO-6, PO-7, PO-8, PO-9
<b>CO 5</b>	Interpret the Synonyms (पयाययाः) and Derivations (ननरुनि) of Ayurveda Terms using samskrita dictionaries (सांस्कृ त शब्दकोश). कोशप्रन्थानां सहाय्येन आयुरेदे नर्द्यमानानां पदानां तेषां पयाययानाञ्च ननरुनक्तिपरू कपररज्ञानां तेषां प्रयोगे पररचयञ्च	PO-5, PO-7, PO-9
<b>CO 6</b>	Speak, Write and Summarize and Express in Samskrit (सांस्कृ तम्). सांस्कृ तभाषायां भाषणे लेखने सङ्क निया नलखने अथयप्रकाशने च सामर्थ्यम्	PO-5, PO-6, PO-7, PO-8, PO-9
<b>CO 7</b>	Develop the ethical responsibility towards the profession, society and human being. सामानिक- औद्योनकक-मानुनषक धमयबोधता	PO-6 & PO-8
<b>Ayurved Itihas</b>		
<b>CO 8</b>	Analyse and explain the important milestones in the history of Ayurveda	PO-1
<b>CO 9</b>	Appreciate the status of Ayurveda in different time periods and Contributions made by different Acharyas to Ayurveda.	PO-1

**Table 2 : Contents of Course AyUG SN & AI**

Sr No	A2 List of Topics AyUG-SN & AI  Paper I	B2 Term	C2 Marks	D2 Lecture hours	E2 Non- Lecture hours
<b>Paper I Sanskrit</b>					
1	सांस्कृतोपायनाम् पररचया: - माहेश्वरसूत्रानण, उच्चारणस्थानानन, बाह्यप्रयत्नानन, अभ्यन्तर प्रयत्नानन	I	05	3	10
2	सांज्ञा- 2.1 - सांयोगः, सांनहता, ह्रस्वदीर्यप्लुतः, अनुनासकः, पदम्, धातुः, उपसगायः, गुणः, रृनिः [नस्तरिण पाठनम् - Detailed teaching] 2.2 - इत्, लोपः, प्रत्याहारः, उदाः, अनुदाः, स्वरतः, सर्णयः, ननपातः, प्रगृहाम्, [सङ्क निष्य पाठनम् - Brief teaching]	2.1 – I 2.2 – II	05	05	-
3.	उपसगायः- उपसगायः निययोगे प्र, परा, अप, सम, अनु, अर्, ननस्, ननर्, दुस्, दुर्, नर्, आङ्, नन, अनप, अनध, अनत, सु, उत्, अनभ, प्रनत, परर, उप।	II	05	02	03
4.	अव्ययानन 4.1 - च अनप खलु नह तु नकल ननु र्ा च एर् 4.2- पुनः नर्ना उच्चैः ऋते एर्म् सह साधयम् युगपत् यथा -तथा यार्त्-तार्त् इनत यदा-तदा यनद-तनहय साकम् न कुत्र कनत कुतः नकमथयम्, नकयत् इहअत्र तत्र सर्पत्र अन्यत्र कुत्र एकत्रसदा अन्यथा एकथा [नस्तरिण पाठनम् - detailed teaching] A) Identify अव्ययानन B) Explain the meaning with reference to the context C) Construct the sentences using अव्ययानन	I A II B III C	5	I-01 II-01	I-0 II-0 III-03
5.	कारकप्रकरणम् – कृत्यकारकम्, कमयकारकम्, करणकारकम्, सम्प्रदानकारकम्, अपादान कारकम्, अनधकरणकारकम्, सम्बन्धः, उपपदनर्भर्नाक्तेः सू सनहतपाठनां परां परीायां सू व्याख्यानानद प्रश्नानन न प्रष्टव्यानन। A) Discriminate the नर्भर्ने and their meaning. B) Identify the karakas from Ayurveda texts like <b>करणम् कारणम्</b> C) Construct sentences D) Translate sentences from English to Sanskrit & from Sanskrit to English.	I A II B III C, D	15	I- 05	II-05 III-05
6.	सनन्धः 6.1 - अच् सनन्धः/स्वरसनन्धः - यण् सनन्ध -इको यणनच, गुण सनन्धः=आद्गुणः रृनिसनन्धः-रृनिरेनच, अयर्ायार् सनन्धः - एचोऽयर्ायर्/र्ान्तो नय	II	15	10	10

	<p>प्रत्यये, लोप सनन्धः-लोपः शाकल्यस्य, पररूपसनन्धः-एनङ्क पररूपम्, पूरूपसनन्धः-एङ्कः पदान्तादनत, प्रकृतीभार्-सर्पत्र नर्भाषा गोः, प्लुत प्रगृह्य अनच ननत्यम्  </p> <p><b>सूत्रसहितपाठनं परं परीक्षायां सूत्रव्याख्यानानि प्रश्नानि न प्रष्टव्याहन् ।</b></p> <p><b>6.2 - हलसनन्धः/व्यञ्जिनसनन्धः - श्वसनन्धः- स्तोः श्वना श्वः, ष्टसनन्धः- ष्टुना ष्टुः, षित्त्रसनन्धः-झलां षिशो/न्ते, अनुनानसकसनन्धः-</b></p> <p>यरोऽनुनानसके ऽनुनानसको र्ा/प्रत्यये भाषायां ननत्यम्, परसर्णयसनन्धः-तोनलयः/र्ा पदान्तस्य, चत्र्यसनन्धः</p> <p>खरर च, पूरूपसर्णयसनन्धः-झयोऽहोऽन्यतरस्याम्, छुत्रसनन्धः</p> <p>शशत्छोऽनट/ छत्रमीनत र्ाच्यम्, अनुस्ारसनन्धः- मोऽनुस्ारः, तुगागमसनन्धः- नश तुक् /छे च/पदान्तावा, रुत्रादेशसनन्धः-नशत्छव्यप्रशान् <b>सूत्रसहितपाठनं परं परीक्षायां सूत्रव्याख्यानानि प्रश्नानि न प्रष्टव्याहन् ।</b></p> <p><b>6.3 - नर्सगयसनन्धः - रुत्रसनन्धः-ससिषो रुः, उत्रसनन्धः-अतो रोरप्लुदादप्लुते/हनश च, रो रर, भो भागो अर्ो अपर्ू ष्ययोऽनश, रोऽनुप, एतिदोः सुलोपोऽकोरनञ् समासे हनल, सोऽनच लोपे चेत् पादपरू णम्  </b></p> <p><b>सूत्रसहितपाठनं परं परीक्षायां सूत्रव्याख्यानानि प्रश्नानि न प्रष्टव्याहन् ।</b></p> <p><b>6.4.- रुत्रप्रकरणसनन्धः- [ सङ्कनिष्य पाठनम् – Brief teaching] समः</b></p> <p>सुनट, कानाम्प्रेनिते च, अत्रानुनानसको पूरूपस्यतु र्ा, अनुनानसकात्परोऽनुस्ारः, खरसर्णयोनर्यसियनीयः, नर्सियनीयस्य सः, सम्पुङ्क कानां सो विर्त्तव्यः  </p>				
<p><b>7.</b></p>	<p><b>समास</b></p> <p><b>7.1 - अव्ययीभार्समासः - 7.1.1 - अव्ययम्</b></p> <p>नर्भनिसमीपसमन्वित्यर्थयथायभार्ात्ययसम्प्रतशब्दप्रादुभायभार्पश्चायथानुपक्वू यययौगप दसाहउशतयसम्पनिसाकल्यान्तर्चनेषु   <b>7.1.2. - प्रथमा नननदयष्टम् उपसियनम्/ उपसियनां पूर्यम् /नाव्ययीभार्ादतो/ म् ञ्चम्प्याः/ तृतीयासप्तम्योर् बहुलम्/अव्ययीभार्े चाकाले  </b></p> <p><b>7.2. - तत्पुरुष समासः - नवतीया नितातीतपनतगतात्यस्तप्राप्तापत्रैः, तृतीया तत्कृ ताथेन गुणर्चनेन, कृत्यकरणे कृ ता बहुलम्, चतुथी तदथायथय बनलनहतसुखरनितैः, पञ्चमीभयेन, षष्ठी, सप्तमीशौण्िः, नर्शेषणां नर्शेषेणबहुलम्, उपमानानन सामान्यर्चनैः, नञ्, कमयधारय, नवगुः, उपपद तत्पुरुष</b></p> <p><b>7.3 - बहुव्रीहन समासः - अनेकमन्यपदाथे</b></p> <p><b>7.4 - वन्समासः - चाथे वन्वः</b></p> <p><b>सूत्रसहितपाठनं परं परीक्षायां सूत्रव्याख्यानानि प्रश्नानि न प्रष्टव्याहन् ।</b></p>	<p><b>II</b></p>	<p><b>15</b></p>	<p><b>09</b></p>	<p><b>10</b></p>
<p><b>8.</b></p>	<p><b>शब्दरूपनण</b></p> <p><b>8.1 - पुनल्लङ्गः शब्दरूपनण</b></p> <p>अकारान्तः - र्ात, र्ैद्य, रुण, राम आनद</p> <p>इकारान्तः - अनग्र, मुनन आनद</p> <p>उकारान्तः - ऋतु, भानु गुरु आनद ऋकारान्तः</p> <p>- नृ, धात्, नपत् आनद</p>	<p><b>I</b></p>	<p><b>10</b></p>	<p><b>02</b></p>	<p><b>14</b></p>

	<p>ओकारान्तः - गो आनद  नकारान्त - श्लेशतमन्, रोमगन्, ज्ञानगन् आनद  सकारान्त - चत्रमस् आनद  तकारान्त - मरुत् आनद  दकारान्त - सुहृद् आनद  िकारान्त - नभषि, आनद  शकारान्तः - कीदृश्, एतादृश् आनद</p> <p><b>8.2 - स्तनिलङ्क गःशब्दरूपानण</b>  आकारान्तः - बला, कला, नस्थरा, माला आनद  इकारान्तः - सम्प्रानप्त, प्रकृ नत, मनत आनद  ईकारान्तः - धमनी, नदी आनद  उकारान्तः - रज्ि, धेनु  आनद ऊकारान्तः - षयिभू, धू  आनद ऋकारान्तः - मातृ  आनद चकारान्तः - र्ाच्  आनद  तकारान्तः - योनषत्, सररत् आनद दकारान्ताः  - पररषद् आनद  िकारान्तः - सि आनद  सकारान्तः - िलौकस्, सुमनस् आनद  षकारान्ताः - प्रारृष् आनद</p> <p><b>8.3 - नपुंसकनलङ्क ग शब्दरूपानण</b>  अकारान्तः - नपि, र्न आनद  उकारान्तः - भि, मधु आनद  इकारान्तः - अनि, अनस्थ, रार, दनध आनद  ऋकारान्तः - ज्ञात्, धात् आनद  नकारान्तः - त्मयन्, दनण्ि आनद  सकारान्तः - स्रीतस्, मनस् आनद  षकारान्ताः - सनपयष, आयुष् आनद  तकारान्तः - शकृत्, िगत् आनद</p> <p>अष्टङ्क गहृदयसांनहतायाम् नर्धमानानाम् अन्यानामनप समाननामरूपानाम्  पररचयकरणम् अनभलषणीयम् । प्रश्नपत्रे न प्रष्टव्यम् ।</p> <p><b>8.4 - सर्यनामपदानन - अस्मद्, युष्मद्, तद्, एतद्, यद्, नकम्, इदम् आनद</b></p>				
<p><b>9.</b></p>	<p>धातुरुपानण - [नस्तरेण पाठनम्-detailed teaching]  <b>9.1 - परस्मैपद - लट्/लृट्/लङ्/नर्नधनलङ्क/लोट्</b>  भ्रानद गण - भूसियाम्, नि िये, गमू(गम्) गतौ, पा पाने,  िीर्, पच्, त्यि, दृश् (पशतय)  अदानद गण - अद् भिणे, हन् नहम्सागत्योः, र्ा गनतगन्धनयोः पा रिणे, अस्,  क्षस्, स्रप्, ब्रू  िुहोत्यानद गण- धा धारणपोषणयोः, पृ - पलनपूरणयोः, हा त्यागे, दा (दाञ्)  नदरानद गण- नदरु िीिादौ, त्रसी उवेगे, पुष् पुष्टौ, कु प, नश्, तुष्, नस्रह,  िृ स्रानद गण- नचञ् चयने, शक्, िु  तुदानद गण- तुद् व्यथने, कृष् नर्लेखने, नलख् लेखने, नदश्, कृन्त्, निप्, स्पृश्</p>	<p>I</p>	<p>10</p>	<p>05</p>	<p>05</p>

	<p>रुधानद गण- रुनधर् आरणे, नभनदर् नदररणे, भुि तनानद गण- तनु नस्तारि, कृञ् करणे क्रयानद गण- प्रीञ् -तपयणे कान्ते च, ग्रह उपादाने, ज्ञा चुरानद गण- गण् सांस्थाने, साध, ताि, धृ, कथ् र्वाक्तयप्रबन्धे आत्मनेपनद- भ्रानद गण - रृतु रियेने, रृध(र्ध), लभ्, सेर्, रुच् अदानद गण - शीङ्क स्र्, ब्रू िुहोत्यानद गण- धा धारणपोषणयोः, दा (दाञ्), नदरानद गण- िनी प्रादुभायर, मन्, बुध्, पद, नर्द स्रानद गण- नचञ् चयने, तुदानद गण- तुद् व्यथने, कृष् नर्लेखने, नम्र, नर्द, मुच्, नसञ्च, रुधानद गण- रुनधर् आरणे, नभनदर् नदररणे, भुि तनानद गण- तनु नस्तारि, कृञ् करणे क्रयानद गण- प्रीञ् -तपयणे कान्ते च, ग्रह उपादाने, ज्ञा चुरानद गण- चुर, िाल्, कथ्, र्ोष, भि आयुर्देसांनहतासु नर्दमानानां धतुरूपाणां पररचयीकरणम् अनभकाम्यम् 9.2 - लुिग, आशीनलयिग, नलट, लुिग, लुि [सङ्क निप्य पाठनम्- Brief teaching] भ्रानद गण, अदानद गण, िुहोत्यानद गण, नदरानद गण, स्रानद गण, तुदानद गण, रुधानद गण, तनानद गण, क्रयानद गण, चुरानद गण पूोिधातुप्रैकस्य पञ्चलकारेषु रूपानण दशययेत्   परां परीायाम् न पृष्टव्यान  </p>				
10	<p>प्रत्ययाः 10.1 – क्ति - क्तिर्त्, तव्यत् – अनीयर, शतृ – शानच्, ल्युट् - ण्रुल्, क्त्वा - ल्यप्, नणनः, नक्तिन्, तुमुन् प्रत्ययाणाम् प्रयोगाः एर् पृष्टव्याः   10.2 - भार्े ञ्, करणे ञ्, भार्े ष्यञ्, कमयनण ण्यत्, कियरर अच् अप् आयुर्देसांनहतायां नर्दमानानां भार्े/करणे/कियरर/ताच्छील्ये/ आनद प्रत्ययानां पररचयः करणीयः   परां परीायाम् न पृष्टव्याः   परीायाम् र्ाच्य प्रयोगः स्वरूपे पृष्टव्यः  </p>	II	10	05	6
11	नशषण नशष्य	II	05	02	03

Paper II – Part A Sanskrit				
A2 List of Topics (Maximum Marks – 80 (SAQ & LAQ only))	B2 Term	C2 Marks	D2 Lecture hours	E2 Non- Lecture hours



1	ननरुनक्तं तथा पयायय पदानन- A) आयुः, शरीर, मनः, अनग्रः, िलम्, र्ातः, नपिम्, कफः B) रस, रि, मांस, मेद, अनस्थ, मज्िा, शुि, इनत्रयम्,िोत्रः, चिः, रसना ,, घ्राण C) धी, धृनत, स्मृत,बुिी, मनत, प्रज्ञा, म्, पुरीषः, स्ेद, आत्मा, रोगः,ननदानम्	A- I B – II C- III	15	7 (A-1, B-3, C-3)	13 (A- 4, B-4, C-5)
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	रोनगः, भेषिनचनकत्सा, आनद				
2	पररभाषापदानन – A) आयुरेदः, पञ्चमहाभतू ानन, नत्रगुणम्, दोषाः, मलाः, दषू यम्, सम्सगयः, सनत्रपातः B) रव्य, गुण, क्म, सामान्य, नर्षेष, गुरु, लरु, प्रकृ नतः, नर्कृ नतः, चयः, प्रकोपः, प्रसरः, स्थानसम्पुियः, दोषगनतः, भेदः, रसः, र्ीययम्, नर्पाकः, काययकारणभारः C) स्रोतस्, कोष्ठः, आमम्, नर्रुिाहम्, नर्रुिाहारः, नर्दानह, नर्नम्भ, सात्म्यम्, ओकसात्म्यम्, देशसात्म्यम्, अत्यशनम्, अर्धयशनम्, स्थानी, योगर्ाही, पर्थयम्, अपर्थयम्, कृ तान्नर्गयः, अस्थर्पाकः, रेगः, शोधन, शमन, लार्न, बृहण, अनुपान आनद	A - I B – II C- III	20	10 (A-2, B-4, C- 4)	15 (A- 5, B-5, C-5)

3.	<p>अत्रयलखनम् -</p> <p>A) अष्टाङ्कगृह्यदयम् सूत्रस्थानम् - अध्यायतः सर्वाहण सूत्राहण</p> <p>१. आयुष्कामीयम्</p> <p>२. नदनचयाय</p> <p>३. रोगानुत्पादनीयम्</p> <p>B) अष्टाङ्कगृह्यदयम् सूत्रस्थानम् - अध्यायतः सर्वाहण सूत्राहण</p> <p>दोषानदनर्ज्ञनीयम् दोषभेदीयम्</p> <p>दोषोपिमणीयम्</p> <p>नवनर्धोपिमणीयम्</p> <p>C) रौघकीय सुभानषतसानहत्यम् - shloka numbers - (भास्कर गोवर्द्धन राणैकर नलनखत, चौखम्बा प्रकाशन)</p> <p>प्रथमः 1, 2</p> <p>नवतीयः 1, 7</p> <p>तृतीयः 9</p> <p>चतुर्थः 2, 3</p> <p>पञ्चमः 2, 3</p> <p>षष्ठः 1, 4, 7</p> <p>सप्तमः 2, 5, 17</p> <p>अष्टमः 13, 12</p> <p>नर्मः 12, 13</p> <p>दशमः 1, 19</p> <p>एकादशः 1, 2</p> <p>वादशः 1, 6</p> <p>त्रयोदशः 1, 7, 8, 9</p>	A - I B - II C - III	30	20 (A- 4, B- 8, C- 8)	14 (A- 4, B- 5, C- 5)
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	<p>चतुदशः 2, 3, 4</p> <p>पञ्चदशः 7, 10</p> <p>षोडशः 5, 6</p> <p>सप्तदशः 1, 4</p> <p>अष्टदशः 1, 2, 3</p> <p>एकोनविंशतः 2, 3, 4</p> <p>द्वविंशतः 12, 3, 4</p> <p>श्लोकपरूपां न प्रष्टव्यम् परीक्षायाम्। पदच्छेदां नर्ग्रहर्वाक्तयम् अत्रयः र्वाक्तयाथं भार्थां इत्यादयः एर् प्रष्टव्याः।</p>				
4.	<p>पञ्चतन्त्र-अपरीनितकारकम् ५ अर्धयाय कथा -</p> <p>१ नानपतिपणक कथा</p> <p>कथा-२ नकु लीब्राह्मणी कथा</p> <p>कथा-३ चिधर कथा</p> <p>कथा-४ नसांहरकारक मूख</p> <p>यपनण्ठिकथा कथा-५</p> <p>मूख यपनण्ठिकथा</p> <p>श्लोकपरूपां तथा अत्रयलेखनां न प्रष्टव्ये।</p>	III	15	03	04

Paper II – Part B – Ayurved Itihas –					
	A2 List of Topics AyUG SN & AI (Maximum Marks – 20 (MCQ only))	B2 Term	C2 Marks	D2 Lecture hours	E2 Non- Lecture hours
1	Derivation (Vyutpatti and Niruktti) and definition of Itihasa. Necessity, Significance and Utility of knowledge of Ayurveda itihasa. Means and method of study of Ayurveda itihasa. Different Time periods relevant for the Study of Ayurveda itihasa (viz, Prevedic, Vedic, Samhita kala, Sangraha kala etc.)	I	5	1	2
2	Origin and lineage of Ayurveda (Ayurvedavatarana) and Introduction of references of Ayurveda in Veda, Upanishat and Puarana.	I		1	2
3	Structure, Specialities, Time period of Ayurveda Samhitas and their commentaries (including Special contributions of authors and commentators): Charaka Samhita, Sushruta Samhita, Ashtanga Sangraha, Ashtanga Hridaya, Bhela Samhita, Hareeta Samhita, Kashyapa Samhita.	I	5	2	2

4	Structure, Contributions and importance of Laghutrayee and Commentaries: Madhava Nidana, Sharngadhara Samhita, Bhavaprakasha.	II		1	3
5	Origin and period of different systems of medicine in the world.	II	5	1	2
6	Introduction to Vrukshayurveda, Hastayurveda and Ashwayurveda. (Included in Transitional Curriculum)	II		-	1
7	Status of Ayurveda during the period of Ashoka, Mughal and British rule.	II		1	2
8	Contribution of Scholars of modern era: Acharya Gana Nath Sen, Vaidya Yamini Bhushan Rai, Vaidya Shankar Dajishastri Pade, Acharya Swami Lakshmiram, Acharya Yadavji Tikramji, Dr. PM. Mehta, Vaidya B G Ghanekar, Vaidya Damodar Sharma Gaur, Acharya Priyavrat Sharma, Vaidya C Dwarakanath, Vaidya K R Shrikantamurthy, Vaidya VJ Thakkar, Vaidyaratnam PS Varier, Vaidya B V Gokhale.	III	5	1	2
9	Globalization of Ayurveda	III		1	2
10	1)Developmental activities in Ayurveda in the post-independence period: <ul style="list-style-type: none"> <li>• Introduction to various committees and their recommendations</li> <li>• Introduction of activities of the following Organizations : Department of AYUSH, CCIM/ NCISM, CCRAS,</li> </ul> 2) National institutions Viz- All India Institute of Ayurved (AIIA), National Institute of Ayurveda, Jaipur. ITRA, Jamnagar. Faculty of Ayurveda, BHU, Varanasi. Rashtriya Ayurveda Vidyapeetha, New Delhi.	III		1	2

**Table 3: Learning objectives (Theory) of Course AyUG-SN & AI**

<b>Paper I – Sanskrit</b>									
<b>A3 Course outcome</b>	<b>B3 Learning Objective  (At the end of the session, the Students should be able to)</b>	<b>C3 Domain/sub</b>	<b>D3 Must to know/ desirable to know/Nice to know</b>	<b>E3 Level Does/ Shows how/ Knows how/ Know</b>	<b>F3 T-L method</b>	<b>G3 Assessment</b>	<b>H3 Formative /summative</b>	<b>I3 Term</b>	<b>J3 Integration</b>
<b>Topic 1- सांस्कृत तर्णयिनाम् पररचया:(5 marks) Time: 13 hrs (Lecture:- 3 hours Non lecture10 hrs)</b>									
CO 1, CO 6	Read & write Sanskrit words	Cognitive domain - Knowledge	Must know	Knows how	Practical classes Demonstrations Classroom reading	Oral Written	F&S	I	
CO 1, CO 6	Pronounce Sanskrit as per their appropriate articulations	Cognitive domain – Comprehension	Must know	Knows how/ Shows how	1) Practical classes 2) presentation of videos 3) Graphical Representation of Vocal system Class room reading / speaking	Oral / Written Assignment on Identifying the Places of articulation of the words in Ayurveda texts.	F&S	I	
<b>Topic 2- सांज्ञा (10 marks)- Time: 05 Hrs (Lecture:- 5 hours Non lecture 00 hrs)</b>									
CO 2, CO 4, CO	2.1 Explain the terms related to सांज्ञा in Sanskrit grammar	Cognitive domain- Comprehension	Desirable to know	Knows	Lecture with Power point presentation	Oral, Conduction of quiz	F&S	II	
CO 2, CO 4, CO 5	2.2 Identify the सांज्ञा Explain the meaning of the सांज्ञा	Cognitive domain- Comprehension	Must know	Knows how	Lecture with Power point presentation	Oral / written Very short answer Differentiate, identify, fill in the blanks etc	F&S	I	

						Preparation of MSQ (MCQ) Question-answer sessions			
Topic 3 उपसर्गाः - उपसर्गाः हियायोर् (05 marks) Time: 05 Hrs (Lecture:- 02 hours Non lecture 03 hrs)									
CO 2, CO 4, CO 6	Identify the उपसर्गायः  Explain the meaning of the words with उपसर्गायः  Identify the difference in meaning according to the उपसर्गायः	Cognitive domain - Comprehension problem solving	Must know	Knows how	Lectures with Power point presentation. Problem Based Learning (PBL) Group Discussions	Oral & Written  objective type very short answer compare differentiate etc, Assignments open book test	F&S	II	
Topic 4- अव्ययाहन (05 marks) Time: 05 Hrs (Lecture:- 02 hours Non lecture 03 hrs)									
CO 2, CO 4, CO 6	4.1 Identify अव्ययानन	Cognitive domain - Comprehension	Must know	Knows	Lectures with Power point presentation.  Group Discussions	Oral & Written. objective type very short answer - compare, differentiate Assignments on sentence construction, presentation by the students	F&S	I	
CO 2, CO 4, CO 6	4.2 Explain the meaning with reference to the context	Cognitive domain – Application	Must Know	Knows how	Lectures with Power point presentation.  Group Discussions	Oral & Written  objective type very short	F&S	II	

						answer / compare differentiate Assignments open book test			
CO 2, CO 4, CO 6	Construct the sentences using अव्ययानन	Cognitive domain - Synthesis	Must Know	Shows how	Lectures with Power point presentation.  Group Discussions  Conversation Sessions	Oral & Written  Construct sentences with proper use of Avyayas. Use appropriate Avyayas. Very short answer Assignments on finding out the अव्ययानन used in the texts and explain their meaning with reference to the context. Open book test.	F&S	III	

**Topic 5— कारकप्रकरणम्** (15 marks) Time: 15 Hrs (Lecture:- 5 hours Non lecture 10 hrs)

CO 3, CO 6	A) Discriminate the नभिनि and their meaning. B) Identify the karakas from Ayurveda texts like करणम् कारणम् C) Construct sentences. D) Translate sentences from English to	Cognitive domain - Synthesis problem solving	Must know	Shows how	Lectures with Power point presentation.  Group Discussions	Oral & Written  objective type very short answer / compare differentiate /	F&S	A)– I B) – II C) – III D) - III	
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	Sanskrit & from Sanskrit to English.					meaning with reference to the context etc Assignments on identification of the karakas used in the Ayurveda basic principle terms like <b>करणम्</b> <b>कारणम्.</b>			
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**Topic 6- सनन्धः (15 marks) Time: 20 Hrs (Lecture:- 10 hours Non lecture 10 hrs)**

CO 2, CO 6	6.1 Identify सनन्धः Explain the meaning of the context by splitting.  Formulate the joined words while writing the sentences	Cognitive domain - Application and problem solving	Must know	Knows how	Lectures with Power point presentation.  Group Discussions  Classes by the students Ashtang hrudaya with the <b>सहधिः</b>	Oral & Written Objective type, very short answer – compare, differentiate etc. Assignments to find the <b>सहधिः</b> in Ashtangahrudaya Quiz on सनन्धः	F&S	II	
CO 2, CO 6	6.2 Identify सनन्धः  Explain the meaning of	Cognitive domain - Application and problem solving	Must know	Knows how	Lectures with Power point presentation.  Group Discussions	Oral & Written objective type very short	F&S	II	



	the context by splitting.  Formulate the joined words while writing the sentences				Classes by the students Ashtang hrudaya with the सनन्धः	answer compare and differentiate Assignments  to find the सहधिः in Ashtangahrudaya  Quiz on सनन्धः Preparation of charts, mindmaps etc.			
CO 2, CO 6	6.3 Identify सनन्धः  Explain the meaning of the context by splitting.  Formulate the joined words while writing the sentences	Cognitive domain - Application and problem solving	Must know	Knows how	Lectures with Power point presentation.  Group Discussions  Classes by the students Ashtang hrudaya with the सनन्धः	Oral & Written  objective type very short answer Assignments to find the सहधिः in Ashtang hrudaya  Quiz on सनन्धः Preparation of charts, mindmaps etc.	F&S	II	
CO 2, CO 6	6.4 Identify सनन्धः  Explain the meaning of the context by splitting.	Cognitive domain – Comprehension Application	Desirable to know	Knows	Lectures with Power point presentation.	Oral Preparation of charts, mindmaps etc.	F&S	II	

**Topic 7- समास (15 marks) Time: 19 Hrs. (Lecture:- 09 hours Non lecture 10 hrs)**

CO 2	Identify समास: Discriminate between the सन्धि:and समास:	Cognitive domain - Comprehension	Must know	Knows	Lectures with Power point presentation.  Group Discussions Problem Based Learning(PBL)  Flipped classroom  Peer learning Classes by the students on the sutras in Ashtang hrudaya with the नष्टर्क्तयम्	Oral & Written  objective type very short answer- compare differentiate Assignments to find the समास: in Ashtanga hrudaya  Quiz on समास: Puzzles Word cloud Cross words etc.	F&S	II
CO 2, CO 6	7.1 Identify समास: Explain the meaning of the context by writing the नष्टर्क्तयम् Construct the समस्तपदम्while writing the sentences	Cognitive domain - Application and problem solving	Must know	Shows how	Lectures with Power point presentation.  Group Discussions Problem Based Learning(PBL) Flipped classroom  Peer learning Classes by the students on the sutras in Ashtang hrudaya with the नष्टर्क्तयम्	Oral & Written  objective type very short answer Assignments to find the समास: in Ashtanghrdaya a Quiz on समास: Puzzles Word cloud Cross words	F&S	II

						etc. Preparation of charts, mindmaps etc.			
CO 2, CO 6	7.2 Identify समासः Explaining the meaning of the context by writing the नग्रेहर्क्तयम्  Construct the समस्तपदम् while writing the sentences	Cognitive domain - Application and problem solving	Must know	Shows how	Lectures with Power point presentation.  Group Discussions Problem Based Learning(PBL) Flipped classroom  Peer learning Classes by the students on the sutras in Ashtang hrudaya with the नग्रेहर्क्तयम्	Oral & Written  objective type very short answer Assignments to find the समासः in Ashtangahrdaya  Quiz on समासः Puzzles Word cloud Cross words etc. Preparation of charts, mindmaps etc.	F&S	II	
CO 2, CO 6	7.3 Identify समासः Explaining the meaning of the context by writing the नग्रेहर्क्तयम्  Construct the समस्तपदम् while writing the sentences	Cognitive domain - Application and problem solving	Must know	Shows how	Lectures with Power point presentation.  Group Discussions Problem Based Learning(PBL) Flipped classroom  Peer learning Classes by the students on the sutras in Ashtang hrudaya with the नग्रेहर्क्तयम्	Oral & Written  objective type very short answer meaning with reference to the context etc. Assignments to find the समासः in Ashtangahrdaya	F&S	II	

						a Quiz on समासः Puzzles Word cloud Cross words etc. Preparation of charts, mindmaps etc.			
CO 2, CO 6	7.4 Identify समासः Explaining the meaning of the context by writing the नप्रेहर्क्तयम्  Construct the समस्तपदम् while writing the sentences	Cognitive domain - Application and problem solving	Must know	Shows how	Lectures with Power point presentation.  Group Discussions Flipped classroom  Peer learning Classes by the students on the sutras in Ashtang hrudaya with the नप्रेहर्क्तयम् Problem Based Learning(PBL)	Oral & Written  objective type very short answer Assignments to find the समासः in Ashtangahrday a Quiz on समासः Puzzles Word cloud Cross words etc. Preparation of charts, mindmaps etc.	F&S	II	
<b>Topic 8- शब्दरूपानण (10 marks) Time: 16 Hrs (Lecture:- 2 hours Non lecture 14 hrs)</b>									
CO 2, CO 3, CO 6	Identify & write the अन्तनलङ्क गनभनक्तिरननन of a noun.  Construct sentences	Cognitive domain – Synthesis  problem solving	Must know	Shows how	Lectures with Power point presentation.  Recitation  Peer learning	Oral & Written  objective type very short answer	F&S	I	

					Group Discussions	Assignments to find out the अन्तर्लङ्गनभे नक्तिचर्चानेन of nouns used in various text books and writing all forms of all नभेनक्ति. Quizzes Puzzles Word cloud Cross words etc.			
<b>Topic 9- िातुरुपाहण (10 marks) Time: 10Hrs. (Lecture:- 5 hours Non lecture 05 hrs)</b>									
CO 2, CO 6	9.1 Identify & write लकारपदपुरुषचर्चानेन of the roots.  Interpret the meaning according to the लकारः  Use for constructing sentences.	Cognitive domain - Synthesis and problem solving	Must know	Shows how	Lectures with Power point presentation.  Recitation  Group Discussions  Peer learning	Oral & Written objective type very short answer Assignments to find out the verbs used in various text book in the syllabus and completing all the forms. Quizzes Word cloud etc.	F&S	I	
CO 2, CO 6	9.2 Identify & write लकारपदपुरुषचर्चानेन of the roots.	Cognitive domain- Comprehension problem	Nice to know	Knows	Lectures with Power point presentation.  Group Discussions	Oral Assignments Quizzes Word cloud etc.	F&S	I	

	Interpret the meaning according to the लकारः	solving							
<b>Topic -10 प्रत्ययाः (10 Marks) Time: 11 Hrs (Lecture:- 5 hours Non lecture 06 hrs)</b>									
CO 2, CO 6	10.1 Identify the प्रत्ययाः Interpret the meaning with reference to the context with the support of the प्रत्ययाः	Cognitive domain - Comprehension and problem solving	Must know	Shows how	Lectures with Power point presentation. Group Discussions	Oral & Written objective type very short answer Assignments Quizzes	F&S	II	
CO 2, CO 6	10.2 Identify the प्रत्ययाः Interpret the meaning with reference to the context with the support of the प्रत्ययाः (परीक्षायाम् र्चाच्य प्रयोगः स्वरूपे पृष्टव्यः ।)	Cognitive domain- Application and problem solving	Must to Know	Shows how	Lectures with Power point presentation. Group Discussions	Oral Assignments Quizzes	F&S	II	
<b>Topic 11- नर्षेण नर्षेष््य (05 Marks) Time: 05 Hrs (Lecture:-02 hours Non lecture 03 hrs)</b>									
CO 2, CO 6	Identify and discriminate different types of Visheshanas. Effectively use visheshanas in sentences.	Cognitive domain - Application and problem solving	Must know	Knows how / Shows how	Lectures with Power point presentation. Flipped classroom	Oral & Written Quizzes Word cloud etc.	F&S	II	

**Paper II Part A - Sanskrit Learning Objective**

A3 Course outcome	B3 Learning Objective  (At the end of the session, the Students should be able to)	C3 Domain/sub	D3 Must to know/ desira ble to know/ Nice to know	E3 Level Does/ Shows how/ Knows how/ Know	F3 T-L method	G3 Assessment	H3 Form ative /sum mative	I3 Te rm	J3 Integr ation
<p><b>Topic 1- ननरुनक्ति/ Paryaya padani (15 marks) Time: 18 Hrs. Lecture:- 7 hours (A-2, B-5) Non lecture 13 (A- 4, B-4, C-5 hrs)</b></p>									
<p>CO 2, CO 5</p>	<p>Explain the meaning of the words and their synonyms with the help of their nirukti (ननरुनिः) A) आयुः, शरीर, मनः, अनग्रः, िलम्, र्ातः, नपिम्, कफः B) रस, रि, मांस, मेद, अनस्थ, मज्िा, शुि, इनत्रयम्, िोत्र, चि, ,रसना, घ्राण C) धी, धनत, स्मृत, बुंो, ,मनत प्रज्ञा, म्, पुरीषः, स्ेद, आत्मा, रोगः, ननदानम्, रोनगः, भेषिनचनकत्सा, आनद</p>	<p>Cognitive domain - comprehension</p>	<p>Must know</p>	<p>Knows how</p>	<p>Lectures with Power point presentation. Flipped classroom Peer learning Ayurveda Samhita Group Discussions</p>	<p>Oral &amp; Written objective type very short answer compare differentiate meanings meaning with reference to the context etc Assignments Open book test</p>	<p>F &amp; S</p>	<p>A- I B- II C- III</p>	<p>Samhita, Krिया Shari r, Ra ch an a Shari r.</p>
<p><b>Topic 2- पररभाषापदानन (20 marks) Time 25 Hrs (Lecture:- 10 (A-2, B-4, C- 4 hours) Non lecture 15 (A- 5, B-5, C-5 hrs)</b></p>									

<p>CO 2, CO 5</p>	<p>Explain the meaning of the words and their synonyms with the help of their nirukti (ननरुनिः)</p> <p>Describe the Paribhasapadas (पररभाषापदाः) पररभाषापदानन – A) आयुर्देः, पञ्चमहाभतू ानन, नत्रगुणम्, दोषाः, मलाः, दषू यम्, सम्सगयः, सनत्रपातः B) रव्य, गुण, कमय, सामान्य, नशेष, गुरु, लरु, प्रकृ नतः, नर्कृ नतः, चयः, प्रकोपः, प्रसरः, स्थानसम्प्यिः, दोषगनतः भेदः, रसः, रीययम्, नर्पाकः, काययकारणभार्ः C) स्रोतस्, कोष्ठः, आमम्, नरुंिाहम्, नरुंिाहारः, नर्दानह, नृनम्भ, सात्म्यम्, आकसात्म्यम्, देशसात्म्यम्, अत्यशनम्, अधयशनम्, स्थानी, यागर्ाहां, पथयम्, अपथयम्, कृ तार्नयः, अर्शापाकः, र्गः, शोधन, शामन, लार्न, बृहण, अनुपान आनद</p>	<p>Cognitive domain – Comprehension Application</p>	<p>Must know</p>	<p>Knows how</p>	<p>Lectures with Power point presentation. Flipped classroom Peer learning Group Discussions</p>	<p>Oral &amp; Written objective type very short answer write short notes Assignments from Ayurveda Samhita Open book test</p>	<p>F&amp;S</p>	<p>A- I B – II C- III</p>	<p>Samhita, Kriya Shari r, Rach an a Shari r.</p>
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**Topic 3 - अत्रयलेखनम् (30 marks) Time 34 Hrs (Lecture:- 20 (A- 4, B- 8, C-8 hours) Non lecture 14 (A-4, B-5, C-5 hrs)**



CO 4, CO 6	Identify the subject object Adjective noun verb in a sentence.	Cognitive domain – Comprehension Application	Must know	Shows how	Self-directed learning  Flipped classroom  Classes by the students	Oral & Written  Objective type Very short answer Anvaya writing	F&S	A - <b>I</b> B - <b>II</b> C - <b>III</b>	Sa mh ita
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	<p>Write the पदच्छेदां नग्नहर्क्तायम् अत्रयः र्ाच्याथं and भार्ाथयम् Of shlokas</p> <p>A) अष्टाङ्क गृह्यसूत्रम् - अर्धयायतः सरायनण सूत्रानण । १. आयुष्कामीयम् २. नदनचयाय ३. रोगानुत्पादनीयम्</p> <p>B) अष्टाङ्क गृह्यसूत्रम् - अर्धयायतः सरायनण सूत्रानण । दोषानदनर्ज्ञनीयम् दोषभेदीयम् दोषोपिमणीयम् नवनर्धोपिमणीयम्</p> <p>C) र्ैद्यकीय सुभानषतसानहृत्यम् - shloka numbers - प्रथमः 1, 2 नवतीयः 1, 7 तृतीयः 9 चतुर्थः 2, 3 पञ्चमः 2, 3 षष्ठः 1, 4, 7 सप्तमः 2, 5, 17 अष्टमः 13, 12 नर्मः 12, 13 दशमः 1, 19 एकादशः 1, 2 वादशः 1, 6</p>			<p>Group Discussions</p>	<p>Short answer Assignments on writing पदच्छेदां नग्नहर्क्तायम् अत्रयः र्ाच्याथं भार्ाथयम्</p>			
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<b>Topic 1- Time (Lecture:- 1 hour, Non lecture 2 hours)</b>									
CO 8	Describe Etymological derivation (Vyutpatti), syntactical derivation (Niruktti) and definition of the word Itihasa.	Cognitive/ Knowledge (K)	Must know	Knows	Lecture & Group Discussion,	Written MCQ	F & S	I	
CO 8	Describe of knowledge of history, its significance and utility, means and method of Ayurveda history	Cognitive/ comprehension	Must know	Knows	Lecture & Group Discussion, Tutorial, Video clips	Written MCQ <b>Discussions or debate</b>	F	I	
CO 8 CO 9	Explain Different Time periods relevant for the Study of Ayurveda itihasa (viz, Prevedic, Vedic, Samhita kala, Sangraha kala etc.)	Cognitive/ K	Must know	Knows	Lecture & Group Discussion, Tutorial, Charts, Edutainment.	Written MCQ	F & S	I	
<b>Topic 2- Time (Lecture:- 1 hour, Non lecture 2 hours)</b>									
CO 8 CO 9	Explain different opinions of origin and lineage of Ayurveda available in Samhitas and Samudra manthana and origin of Dhanvantari.	Cognitive/ K	Must know	Knows	Lecture, video & Group Discussion	Written MCQ	F & S	I	
CO 8 CO 9	Outline 2-3 references of Ayurveda in Veda, Upanishat and Puarana	Cognitive/ K	Desirable to know	Knows	Lecture, charts & Group Discussion, SDL	Written MCQ, <b>Online search of Archiological sites for Ayurved. Presentation by Students,</b>	F	I	

CO 8	Describe Ayurveda as Upaveda of Atharvaveda	Cognitive/comprehension	Desirable to know	Knows	Lecture & Group Discussion	Written MCQ	F & S	I	
<b>Topic 3- Time (Lecture:- 2 hour, Non lecture 2 hours)</b>									
CO 8 CO 9	Describe the Structure, Specialities, Time period of Charaka Samhita	Cognitive/K	Must know	Knows	Lecture, charts & Group Discussion Online Visit of Charakaranya, related places.	Written MCQ <b>Chart preparation</b>	F & S	I	
CO 8 CO 9	Briefly explain contribution of Punarvasu Athreya, Agnivesha, Charaka, Drudhabala	Cognitive/K	Must know	Knows	Lecture & Group Discussion	Written MCQ	F & S	I	
CO 8 CO 9	Enumerate the important Commentaries on Charaka Samhita and identify their authors.	Cognitive/K	Must know	Knows	Lecture & Group Discussion, Activity on commentary, Compilation.	Written MCQ <b>Online samhitas, Commentary search</b>	F & S	I	
CO 8 CO 9	Explain the importance of Ayurveda Deepika, Jalpakalpataru.	Cognitive/K	Must know	Knows	Lecture & Group Discussion.	Written MCQ	F & S	I	
CO 8 CO 9	Justify Charakastu Chikitsa in view of Global medical history.	Cognitive/K	Must know	Knows	Lecture & Group Discussion,	Written MCQ <b>Debate Creative writing</b>	F	I	Roganidana, Kayachikitsa
CO 8 CO 9	Describe the Structure, Specialities, Time period of Sushruta Samhita	Cognitive/K	Must know	Knows	Lecture & Group Discussion	Written MCQ Poster making	F & S	I	
CO 8 CO 9	Briefly explain contribution of Dhanvantari, Sushruta,	Cognitive/k	Must know	Knows	Lecture & Group Discussion	Written MCQ	F & S	I	Salya tantra

	Nagarjuna, Chandrata								
CO 8 CO 9	Enumerate the important commentaries on Sushruta Samhita and identify their authors.	Cognitive/K	Must know	Knows	Lecture & Group Discussion	Written MCQ <b>Chart or collage</b>	F & S	I	
CO 8 CO 9	Explain the importance of Nibandha sangraha, Nyaya chandrika,	Cognitive/K	Must know	Knows	Lecture & Group Discussion	Written MCQ	F & S	I	
CO 8 CO 9	Justify Shaareere Sushruta	Cognitive/comprehension	Must know	Knows	Lecture & Group Discussion	Written MCQ Debate/Discussions	F	I	Rachana Sharira, Kriya sharira
CO 8 CO 9	Describe the Contributions of Sushruta Samhita to the field of surgery.	Cognitive/Comprehension	Must know	Knows	Lecture & Group Discussion	Written MCQ	F & S	I	Shalya Tantra
CO 8 CO 9	Identify the acharyas of Atreya and Dhanvantari Sampradaya	Cognitive/K	Must know	Knows	Lecture & Group Discussion Quiz	Written MCQ	F & S	I	
CO 8 CO 9	Describe the Structure, Specialities, Time period of Ahtanga sangraha and Ashtang hridaya.	Cognitive/K	Must know	Knows	Lecture & Group Discussion Video Clips	Written MCQ Chart or collage of events	F & S	I	
CO 8 CO 9	Briefly explain contributions of Vriddha and Laghuvagbhata	Cognitive/K	Must know	Knows	Lecture & Group Discussion	Written MCQ	F & S	I	
CO 8 CO 9	Enumerate commentaries on Ahtanga sangraha and Ashtang hridaya and explain importance of Indu, Hemadri and Arunadatta commentary.	Cognitive/K	Must know	Knows	Lecture & Group Discussion	Written MCQ Quiz	F & S	I	
CO 8	Justify Sutrasthane tu	Cognitive	Must know	Knows	Lecture & Group	Written	F & S	I	

CO 9	vagbhata	e/K			Discussion	MCQ			
CO 8 CO 9	Enumerate the salient features of Bhela Samhita	Cognitiv e/k	Desirable to know	Knows	Lecture & Group Discussion, SDL	Written MCQ	F	I	
CO 8 CO 9	Enumerate the salient features of Hareeta Samhita	Cognitiv e/k	Desirable to know	Knows	Lecture & Group Discussion, SDL	Written MCQ	F & S	I	
CO 8 CO 9	Describe the Structure, Specialties, Time period of Kashyapa Samhita	Cognitiv e/k	Must know	Knows	Lecture & Group Discussion	Written MCQ Chart or collage of Events	F & S	I	
CO 8 CO 9	Briefly explain contribution of Kashyapa, Jeevaka, Vatsya.	Cognitiv e/k	Must know	Knows	Lecture & Group Discussion	Written MCQ	F & S	I	
CO 8 CO 9	Identify contribution of Kashyapa Samhita to the field of Pediatrics.	Cognitiv e/k	Must know	Knows	Lecture & Group Discussion	Written MCQ	F & S	I	
<b>Topic 4- Time (Lecture:- 1 hour, Non lecture 3 hours)</b>									
CO 8 CO 9	Describe Structure, Contributions and importance of Madhava Nidana.	Cognitiv e/k	Must know	Knows	Lecture & Group Discussion, Library Session for handing of books.	Written MCQ Library Searching <b>online availabe Samhitas. Samhita mobile applications</b>	F & S	II	
CO 8 CO 9	Outline the importance of Madhavakara, Vijayarakshita, Shrikanthadatta and Justify nidane madhava shreshtha.	Cognitiv e/k	Must know	Knows	Lecture & Group Discussion	Written MCQ	F & S	II	Roganidana
CO 8	Describe Structure,	Cognitiv	Must know	Knows	Lecture & Group	Written	F & S	II	

CO 9	Contributions and importance of Sharngadhara Samhita.	e/k			Discussion	MCQ			
CO 8 CO 9	Briefly explain contribution of Sharngadhara, Adhamalla, Kashiram.	Cognitiv e/k	Must know	Knows	Lecture & Group Discussion	Written MCQ	F & S	II	
CO 8 CO 9	Explain about Bhavamishra and Enumerate the salient features of Bhavaprakasha.	Cognitiv e/k	Must know	Knows	Lecture & Group Discussion,	Written MCQ	F & S	II	
<b>Topic 5- Time (Lecture:- 1 hour, Non lecture 2 hours)</b>									
CO 8 CO 9	Enlist origin and period of different systems of medicine in the world.	Cognitiv e/k	Must know	Knows	Lecture & Group Discussion	Written MCQ Assignment s	F & S	II	
<b>Topic 6- Time (Lecture:- 0 hour, Non lecture 1 hours)</b>									
CO 8 CO 9	Explain in brief about Ashwayurveda, Gajayurveda, Gavayurveda and Vrukshayurveda.	Cognitiv e/k	Must know	Knows	Lecture (Included in Transitional Curriculum)& Group Discussion	Written MCQ Serach of Use of Ayurved plats in different cattle food.  Poster making	F & S	II	
<b>Topic 7- Time (Lecture:- 1 hour, Non lecture 2 hours)</b>									
CO 8 CO 9	Describe the Status of Ayurveda during the period of Ashoka, Mughal and British rule.	Cognitiv e/K	Desirable to know	Knows	Lecture & Group Discussion, SDL	Written MCQ Collect the photos online and make a documentor	F & S	II	



						y in your voice.			
<b>Topic 8- Time (Lecture:- 1 hour, Non lecture 2 hours)</b>									
CO 8 CO 9	Name the Contributions of Acharya Gana Nath Sen, Vaidya Yamini Bhushan Rai, Vaidya Shankar Dajishastri Pade, Acharya Swami Lakshmiram, Acharya Yadavji Tikramji, Dr. PM. Mehta, Vaidya B G Ghanekar, Vaidya Damodar Sharma Gaur, Acharya Priyavrat Sharma, Vaidya C Dwarakanath, Vaidya K R Shrikantamurthy, Vaidya VJ Thakkar, Vaidyaratnam PS Varier, Vaidya B V Gokhale.	Cognitive/K	Desirable to know	Knows	Lecture & Group Discussion, Tutorial, Self directed learning (SDL)	Written MCQ, Quiz, Match the pair Edutainment Poster making, Video clip making, Compilation,	F & S	III	
<b>Topic 9- Time (Lecture:- 1 hour, Non lecture 2 hours)</b>									
CO 8 CO 9	Discuss Globalization of Ayurveda – Expansion of Ayurveda in Misra (Egypt), Sri Lanka, Nepal other nations.	Cognitive/K	Desirable to know	Knows	Lecture & Tutorial, Video Edutainment	Written MCQ  Collect data and make video clip with your own narration.	F & S	III	
<b>Topic 10- Time (Lecture:- 1 hour, Non lecture 2 hours)</b>									

CO 8 CO 9	Enumerate the various Committees and 2-3 recommendations	Cognitive	Must know	Knows	Lecture	Written MCQ	F & S	III	
CO 8 CO 9	Explain activities of Department of AYUSH, CCIM/ NCISM, CCRAS	Cognitive/K	Must know	Knows	Lecture & Group Discussion, Tutorial	Written MCQ Visit to Website of the Departments and discussion	F & S	III	
CO 8 CO 9	Identify the institutes All India Institute of Ayurved, New Delhi, (AIIA), National Institute of Ayurveda, Jaipur. ITRA, Jamnagar. Faculty of Ayurveda, BHU, Varanasi. Rashtriya Ayurveda Vidyapeetha, New Delhi.	Cognitive/K	Desirable to know	Knows	Lecture & Group Discussion, Video	Written MCQ, Visit to websites of colleges and Discussions	F & S	III	

**List of Practicals**

Hours: 180 Hrs

SN	Name of Practical Sanskrit	Term	Hours
P1	Use of Dictionaries and Shabdakoshas अमरकोशः, नौषनधर्गयः, शब्दकल्परुमः, र्चस्पत्यम्	I	15
P2	Translation from Sanskrit to desirable language.	II	15
P3	Translation from desirable language to Sanskrit.	II	15
P4	सम्भाषण भाषा पठनम् Spoken Sanskrit and Communication Skills	III	15
P5	All activity based practicals from above table are enlisted. (In table 2 and Table 3) They are as follows: 1. Presentation of videos about Maheshwar Sutra, Prayatna, Uccharana Sthanani etc. 2. Graphical Representation of Vocal system 3. Reading / Pronunciation 4. Preparing different Shabdarupani and recitation 5. Preparing different Kriyapadani. 6. Practicals on Karakani. 7. Practicals on Pratyayas 8. Practicals on Sandhis 9. Practicals on Samasa 10. Practicals on Upasargas. 11. Practicals on Avyayas 12. Practicals on Visheshan – Visheshya 13. Practicals on Anvay lekhana 14. Practicals on Nirukti 15. Practicals on Paribhasha 16. Practicals on Panchatantra	I I I I/II I I/II II II II II II II I/II/III II/III I/II/II III	120 hours

**Table 4: Learning objectives (Practical) of AyUG- SN & AI**

Sanskrit Practical									
A4 Course outcome	B4 Learning Objective  (At the end of the session, the Students should be able to)	C4 Domain/sub	D4 Must to know/ desirable to know/Nice to know	E4 Level Does/ Shows how/ Knows how/ Know	F4 T-L method	G4 Assessment	H4 Formative /summative	I4 Term	J4 Integration
Practical 1- अमरकोशः - नैषधर्गयः, शब्दकल्पद्रुमः, वृचस्पत्यम्, Dictionaries Time: 15 Hrs (Practical/ Clinical 15 hours)									
CO 5	Refer the dictionaries. Refer the Books on synonyms	Cognitive domain - comprehension	Must to know	knows	Demonstration for identifying the meaning of the words with the support of the shabdakoshas like Amarkosha, Shabda kalpadruma, vachaspatyam etc. Record writing	Oral	F & S	I	
CO 5, 6	Improve the vocabulary.  Use in reading and writing.	Cognitive domain - comprehension	Desirable know	knows	Group Discussions Record writing	Oral Recitation Competitions Aksharashloka competitions etc.	F & S	II	
Practical 2 - Translation from Sanskrit to desirable language. Time: 15 Hrs. (Practical/ Clinical 15 hrs)									
CO 3, 4, 5, 6	Translate from Sanskrit to	Cognitive domain -	Must to know	Shows how	Demonstration Group Activity	Oral Written	F & S	II	

	desirable language.	comprehension, synthesis.			Record writing				
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**Practical 3 - Translation from desirable language to Sanskrit. Time: 15 Hrs. (Practical/ Clinical 15 hrs)**

CO 3, 4, 5, 6	Translate from desirable language to Sanskrit.	Cognitive domain - comprehension, synthesis.	Must to know	Shows how	Demonstration Group Activity Record writing	Oral Written	F & S	II	
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**Practical 4- सम्भाषण भाषा पठनम् Spoken Sanskrit Time: 15 Hrs (Practical/ Clinical 15 hrs)**

CO 6, 7	Apply Sanskrit grammar.	Cognitive domain - comprehension.	Must to know	Shows how	Staging small skits. Script writing, elocution competitions. Games Conversation Peer learning Creating conversations Conversations in different situations by the students.	Oral	F & S	III	
	Write a small paragraph or Script.								
	Speak atleast 5 to 10 lines in Sanskrit fluently.	Psychomotor domain – articulation							
	Stage a skit.	Psychomotor domain – articulation							

P5 All activity based practicals from above table are enlisted. (In table 2 and Table 3) They are as follows: (NLH 120)

1. Presentation of videos about Maheshwar Sutra, Prayatna, Uccharana Sthanani etc.
2. Graphical Representation of Vocal system
3. Reading / Pronunciation
4. Preparing different Shabdarupani and recitation
5. Preparing different Kriyapadani.
6. Practicals on Karakani.
7. Practicals on Pratyayas

8. Practicals on Sandhis
9. Practicals on Samasa
10. Practicals on Upasargas.
11. Practicals on Avyayas
12. Practicals on Visheshan - Visheshya
13. Practicals on Anvay lekhana
14. Practicals on Nirukti
15. Practicals on Paribhasha
16. Practicals on Panchatantra

**Table 5: Non Lecture Activities Course AyUG- SN & AI**

List non lecture Teaching-Learning methods	No of Activities	Total
Sanskrit		
Presentation of videos	2	120
Graphical Representation of Vocal system	1	
Guided Reading,	5	
Peer learning	4	
PBL	36	
Quizes, puzzles, cross word, word cloud	13	
Group activities	37	
SDL	17	
Recitation	5	
Practical (Refer Table 4	60	
<b>Ayurved Itihas</b>	20	20
		<b>200</b>

**Topic wise details –**

List non lecture Teaching-Learning methods	No of Activities
Presentation of videos about Maheshwar Sutra, Prayatna, Uccharana Sthanani etc.	2
Graphical Representation of Vocal system	1
Reading / Pronunciation (Guided Reading, Peer learning)	7
Preparing different Shabdarupani and recitation (PBL, Peer learning, Quizes, word cloud, crosswords, recitation etc.)	14
Preparing different Kriyapadani. (PBL, Group activities)	5
Practicals on Karakani. (PBL, Group Discussions)	10
Practicals on Pratyayas. (PBL, Group Discussions)	6
Practicals on Sandhis (PBL, Quizes, puzzles, Group activities)	10
Practicals on Samasa (PBL, Quizes, puzzles,)	10
Practicals on Upasargas. (PBL, group activities)	3
Practicals on Avyayas (PBL, group activities)	3
Practicals on Visheshan – Visheshya (PBL)	3
Practicals on Anvay lekhana (PBL, SDL, Group Discussions)	14
Practicals on Nirukti (PBL, SDL, Group Discussions)	13
Practicals on Panchatantra - Vachya of sentences, Writing sentences using appropriate Shabdarupani and Kriyapadani etc. (SDL, PBL, group activities)	4
Practicals on Paribhasha (PBL, SDL, Group Discussions)	15
	120

**Ayurved Itihas-**

List non lecture Teaching-Learning methods	No of Activities
Group Discussion,	10
Video clips	5
Online Search, Prroject	
Tutorial	
Quiz, Collage, Puzzle	5
	20

**Table 6: Assessment Summary**

**6 A-Number of Papers and Marks Distribution**

S.No.	Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand Total
				Practical/Clinical	Viva	Electives	IA	Sub Total	
1.	AyUG-SN & AI	2	200	-	75*	10 (Set-FA)	15	100	300
*Viva voce examination shall be for Sanskrit and not for Ayurved Ithihasa									

**6 B - Scheme of Assessment (formative and Summative)**

SR.NO.		PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
			First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
1	AyUG- SN & AI	First	3 PA & First TT	3 PA & Second TT	3 PA & UE
PA: Periodical Assessment; TT: Term Test; UE: University Examinations					

**6 C - Calculation Method for Internal assessment Marks (15 Marks)**

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 15 Marks (D/15*15)	Term Test (Marks converted to 15) (15 Marks)	Sub Total _/30 Marks	Term Assessment (.../15)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert total marks to 15 marks.							



## 6 D- Evaluation Methods for Periodical Assessment

S. No.	Evaluation Methods
1.	Activities Indicated in Table 3 - Column G3 as per Indicated I, II or III term in column I3.
2.	Practical / Clinical Performance
3.	Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
4.	Open Book Test (Problem Based)
5.	Summary Writing (Research Papers/ Samhitas)
6.	Class Presentations; Work Book Maintenance
7.	Problem Based Assignment
8.	Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)
9.	Extra-curricular Activities, (Social Work, Public Awareness, Surveillance Activities, Sports or Other Activities which may be decided by the department).
10.	Small Project
11.	Specific Periodic Assessment <b>AyUG- SN &amp; AI</b> <b>Sanskrit (3 PA / term)</b> Quiz, Puzzles, Word cloud, Cross words, Preparation of charts, mindmaps, Assignments, Open book test, Recitation. Sanskrit Topics 8 and 9 शब्दरूपाणि and धा ्रूपाणि from paper 1 can be asked for recitation, word cloud, crossword etc. in all Terms Test and viva or any from above table. <b>Ayurved Itihas ( 3 PA/term)</b> Quiz, Puzzles, Word cloud, Cross words, Preparation of charts, mindmaps, Assignments, Open book test, Video Clips making. Any of Evaluation Methods for Periodical Assessment

## 6 E- Paper Layout

### I PROFESSIONAL BAMS EXAMINATIONS

#### AyUG SN & AI

#### PAPER-I

Time: 3 Hours Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

TOTAL MARKS 100 Sanskrit

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ) All Sanskrit	20	1	20
Q 2	Short answer questions (SAQ) All Sanskrit	8	5	40
Q 3	Long answer questions (LAQ) All Sanskrit	4	10	40
				100

### I PROFESSIONAL BAMS EXAMINATIONS

#### AyUG SN & AI

#### PAPER-II

Time: 3 Hours

INSTRUCTIONS: All questions compulsory

TOTAL MARKS 100 = [ Sanskrit, (LAQ and SAQ) 80 marks + Ayurved Itihas, (MCQ) 20 marks]

		Number of Questions	Marks per question	Total Marks
Q 1	Multiple Choice Questions (MCQ) Ayurved Itihas, (all 20)	20	1	20
Q 2	Short answer questions (SAQ) All Sanskrit	8	5	40
Q 3	Long answer questions (LAQ) All SaAnskrit	4	10	40
				100

## 6 F- Disribution of Theory Exam

Paper I: Sanskrit				D Type of Questions "Yes" can be asked. "No" should not be asked.		
A List of Topics	B Term	C Marks	MCQ (1 Mark)	SAQ (5 Marks)	LAQ (10 Marks)	
1	संस्कृतं तर्णायनाम् पररचयाः - माहेश्वरसूत्रानण, उच्चरणस्थानानन, बाह्यप्रयत्नानन, अभ्यन्तर प्रयत्नानन	I	05	5	No	No
2	सांज्ञा- 2.1 - सांयोगः, सांनहता, हस्रदीर्यप्लुतः, अनुनानसकः, पदम्, धातुः, उपसगयः, गुणः, रृनि 2.2 - इत्, लोपः, प्रत्याहारः, उदािः, अनुदािः, स्ररतः, सर्णयः, ननपातः, प्रगृह्यम्,	2.1 - I 2.2 - II	05	5	No	No
3.	उपसगायः- उपसगायः निययोगे प्र, परा, अप, सम्, अनु, अर्, ननस्, ननर्, दुस्, दुर्, नर्, आङ्, नन, अनप, अनध, अनत, सु, उत्, अनभ, प्रनत, परर, उप	II	05	No	Yes (1 que of 5 marks)	No
4.	अव्ययानन 4.1 - च अनप खलु नह तु नकल ननु र्ा च एर् 4.2- पुनः नर्ना उच्चैः ऋते एर्म् सह साधयम् युगपत् यथा -तथा यार्त्-तार्त् इनत यदा-तदा यनद-तनहय साकम्न कुत्र कनत कुतः नकमथयम्, नकयत् इह अत्र तत्र सर्पत्र अन्यत्र कुत्र एकत्र सदा अन्यथा एकथा A) Identify अव्ययानन B) Explain the meaning with reference to the context C) Construct the sentences using अव्ययानन	I A II B III C	5	No	Yes (1 que of 5 marks)	No
5.	कारकप्रकरणम् तथा र्ाच्य प्रयोगः - कृत्यकारकम्, कमयकारकम्, करणकारकम्, सम्प्रदानकारकम्, अपादान कारकम्, अनधकरणकारकम्, सम्बन्धः, उपपदनर्भनक्तिः A) Discriminate the नर्भनि and their meaning. B) Identify the karakas from Ayurveda texts like करणम् कारणम् C) Construct sentences D) Translate sentences from English to Sanskrit & from Sanskrit to English.	I A II B III C, D	15	5	Yes (1 que of 5 marks)	Yes (1 que of 5 marks)

<p>6.</p>	<p>सनन्धः  <b>6.1</b> - अच् सनन्धः/स्वरसनन्धः - यण् सनन्ध- इको यणनच, गुण सनन्धः=आद्गुणः रृन्सिनन्धः-रृन्निरेनच, अयर्ायार् सनन्धः - एचोऽयर्ायार्/ःरान्तो नय प्रत्यये, लोप सनन्धः-लोप :शाकल्यस्य, पररूपसनन्धः-एनङ्क पररूपम्, पूर्यरूपसनन्धः- एङ्कः पदान्तादनत, प्रकृ तीभार्- सर्यत्र नर्भाषा गोः , प्लुत प्रगृह्य अनच ननत्यम् ।  <b>6.2</b> - हल्सनन्धः/व्यञ्जिनसनन्धः - श्वस्सनन्धः-स्तो : श्वना श्वः, ष्टुस्सनन्धः-ष्टुना ष्टुः, िशत्र् सनन्धः-झलां िशो/न्ते, अनुनानसकसनन्धः-यरोऽनुनानसके ऽनुनानसको र्ा/प्रत्यये भाषायां ननत्यम्, परसरण्यसनन्धः-तोनलय/ःर्ा पदान्तस्य, चत्र्यसनन्धः खरर च, पूर्यसरण्यसनन्धः-झयोऽहोऽन्यतरस्याम्, छुस्सनन्धः शशतछोऽनत /छत्रमीनत र्ाच्यम्, अनुस्ारसनन्धः - मोऽनुस्ारः, तुगागमसनन्धः- नश तुक् /छे च/पदान्तावा, रुत्रादेशसनन्धः- नशतछव्यप्रशान्  <b>6.3</b> - नर्सगयसनन्धः - रुस्सनन्धः-ससिषो रुः, उस्सनन्धः- अतो रोरप्लुदादप्लुते/हनश च, रो रर, भो भागो अर्ो अपूर्यस्य योऽनश , रोऽसुनप , एतिदोः सुलोपोऽकोरनच् समासे हनल, सोऽनच लोपे चेत् पादपूरणम् ।  <b>6.4</b>- रुत्रकरणसनन्धः- [ सङ्क निप्य पाठनम् – Brief teaching] सम :सुनट, कानाप्प्रेनिते च, अत्रानुनानसको पूर्यस्य तु र्ा,अनुनानसकात्परोऽनुस्ारः, खरर्सानयोर्नर्यसियनीयः, नर्सियनीयस्य सः,सम्पुङ्क कानां सो क्तिच्यः ।</p>	<p>II</p>	<p>15 (6.1-5marks 6.2/6.4-5marks 6.3 – 5marks )</p>	<p>No</p>	<p>Yes (1 que of 5 marks)</p>	<p>Yes 10 (1 Que. of 10 marks)</p>
<p>7.</p>	<p><b>समास</b>  <b>7.1</b> - अव्ययीभार्समासः - <b>7.1.1</b> - अव्ययम् नर्भिसमीपसम्निव्यर्थयथायभार्ात्ययसम्प्रनतशब्दप्रादुभायभार्प श्रायथानुपूव्यययोगपद्यसादृशतयसम्पनिसाकल्यान्तर्चनेषु ।  <b>7.1.2</b> - प्रथमा नननदयष्टम् उपसियनम्/ उपसियनां पूर्यम् /नाव्ययीभार्ादतो/ म् अञ्जम्प्याः/ तृतीयासप्तम्योर् बहुलम्/अव्ययीभार्े चाकाले ।  <b>7.2</b> - तत्पुरुष समासः - नवतीया नितातीतपनततगतात्यस्तप्राप्तापत्रैः, तृतीया तत्कृ ताथेन गुणर्चनेन, कर्तृकरणे कृ ता बहुलम्, चतुर्थी तदथायथय बनलनहतसुखरनितैः, पञ्चमीभयेन, षष्ठी, सप्तमीशौर्ण्िैः, नर्शेषणां नर्शेष्येणबहुलम् ,उपमानानन सामान्यर्चनैः, नञ् ,कमयधारय ,नवगुः उपपद तत्पुरुष</p>	<p>II</p>	<p>15 (7.1.1 &amp;7.1.2 -- 5marks 7.1.3 – 5marks 7.14 &amp; 7.15 – 5marks )</p>	<p>No</p>	<p>Yes (1 que of 5 marks)</p>	<p>Yes 10 (1 Que. of 10 marks)</p>

	7.3 - बहुव्रीह समास - :अनेकमन्यपदाथे 7.4 - वन्त्रसमास - :चाथे वन्वः					
8.	<p>शब्दरूपनण</p> <p><b>8.1 - पुनल्लङ्ग शब्दरूपनण</b>  अकारान्तः - र्ात, र्ैद्य, रुग्ण, राम आनद  इकारान्तः - अनग्र, मुनन आनद  उकारान्तः - ऋतु, भानु गुरु आनद  ऋकारान्त :- नृ, धातृ, नपतृ आनद  ओकारान्तः - गो आनद  नकारान्त - श्लेशतमन्, रोमगन्, ज्ञाननन् आनद सकारान्त  - चत्रमस् आनद  तकारान्त - मरुत् आनद दकारान्त  - सुहृद् आनद  िकारान्त - नभषि, आनद  शकारान्तः - कीदृश, एतादृश आनद</p> <p><b>8.2 - स्तमल्लङ्ग ग शब्दरूपनण</b>  ओकारान्त :- बला, कला, नस्थरा, माला आनद  इकारान्तः - सम्प्राणत्, प्रकृ नत्, मनत् आनद ईकारान्तः  - धमनी, नदी आनद  उकारान्तः - रज्ि, धेनु आनद  ऊकारान्तः - ष्यभूर्धू आनद  ऋकारान्त :- मातृ आनद  चकारान्तः - र्ाच् आनद  तकारान्तः - योनषत्, सररत् आनद  दकारान्तः - पररषद् आनद  िकारान्तः - सि आनद  सकारान्तः - िलोकस्, सुमनस् आनद  षकारान्तः - प्रारृष् आनद</p> <p><b>8.3 - नपांुसकनल्लङ्ग ग शब्दरूपनण</b>  अकारान्तः - नपि, र्न आनद  उकारान्तः - अि, मधु आनद  इकारान्तः - अने, अनस्थ, र्ारर, दनध आनद  ऋकारान्तः - ज्ञातृ, धातृ आनद  नकारान्तः - त्मयन्, दनर्णिन् आनद  सकारान्तः - स्रोतस्, मनस् आनद  षकारान्तः - सनपयष्, आयुष् आनद  तकारान्तः - शकृत्, िगत्  आनद  <b>8.4 - सर्यनामपदानन - अस्मद्, युष्मद्, तद्, एतद्,  यद्, नकम्, इदम् आनद</b></p>	I	10	No	Yes (1 que of 5 marks)	Yes (1 que of 5 marks)
9.	<p>धातुरुपानण-</p> <p><b>9.1 - परस्मैपद - लट्/लट्/लङ्/नर्नधनलङ्/लोट्  भ्रानद गण - भू सियायाम्, नि िये, गम्,गम् (गतौ), पा</b></p>	I	10	No	Yes (1 que of 5 marks)	Yes (1 que of 5 marks)

<p> पाणे, िीर्, पच्, त्पि, दृश्(पशतय)  अदानद गण - अद् भिणे, हन् नहम्सागत्योः, र्ा  गनतगन्धनयोः पा रिणे, अस, श्वस्सप, र् ब्रू,  िुहोत्यानद गण- धा धारणपोषणयोः, पृ - पलनपूरणयोः, हा  ल्यागे, दा (दाञ्)  नदर्ानद गण- नदर्ु िीिादौ, त्रसी उवेगे, पुष् पुष्टौ, कु प,  नश्, तुष्, नस्रह, िु  स्रानद गण- नचञ् चयने, शक् िु,  तुदानद गण- तुद् व्यथने, कृ ष् नर्लेखने, नलख् लेखने, नदश्, कृ  न्त्, निप, स्पृश्  रुधानद गण- रुनधर् आरणे, नभनदर् नर्दारणे, भुिर्  तनानद गण- तनु नस्तरि, कृ ज् करणे  क्रयानद गण- प्रीञ्- तपयणे कान्ते च, ग्रह उपादाने ज्ञा चुरानद  गण- गण् सांस्थाने, साध्, ताि, धृ, कथ् र्ाक्तयप्रबन्धे  आत्मनेपनद -  भ्रानद गण - र्तु रियने, र्धृ(र्ध्), लभ्,  सेर्, रुच् अदानद गण - शीङ्क स्रप्रेब्रू,  िुहोत्यानद गण- धा धारणपोषणयोः, दा  (दाञ्), नदर्ानद गण- िनी प्रादुभायर्, मन्, बुध्,  पद्, नर्द् स्रानद गण- नचञ् चयने,  तुदानद गण- तुद् व्यथने, कृ ष् नर्लेखने, नम्र, नर्द्, मुच्, नस्रञ्, रुधानद  गण- रुनधर् आरणे, नभनदर् नर्दारणेभुि, र्  तनानद गण- तनु नस्तरि, कृ ज् करणे  क्रयानद गण- प्रीञ्- तपयणे कान्ते च, ग्रह उपादानेज्ञ, र्ा  चुरानद गण- चुर, िाल्, कथ्, र्ोष्, भि  आयुरेदसांनहतासु नर्दमानानां धतुरूपाणां पररचयीकरणम्  अनभकाम्यम्  <b>9.2 - लुिग, आशीनलयिग, नलट, लुिग, लुि [सङ्क  निष्य पाठनम्-Brief teaching] भ्रानद गण, अदानद  गण,</b>  िुहोत्यानद गण, नदर्ानद गण, स्रानद गण, तुदानद गण  , रुधानद गण, तनानद गण, क्रयानद गण, चुरानद गण  पूरोिधातुप्रेकस्य पञ्चलकारेषु रूपानण दशययेत् । परां  परीायाम् न पृष्टव्यानन । </p>					
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10	<p>प्रत्ययाः  10.1 - क्ति - क्तिर्त्, तव्यत् - अनीयर्, शतृ - शानच्, ल्युट् - ष्रुल्, क्त्त्रा - ल्यप्, नणनन .: नक्तिन्, तुमुन् प्रत्ययाणाम् प्रयोगाः एर् पृष्टव्याः।  10.2 - भार्जे, करणे र्ज, भार्ज्यञ्, कमयनण प्यत्, कियरर अच् अप् आयुर्देसानहतायां नर्धमानानां भार्जे/करणे/कियरर/ताच्छील्ये/ आनद प्रत्ययानां पररचयः करणीयः। परां परीायाम् न</p>	I	10	3	Yes (2 Que of 1 mark)	Yes (1 que of 5 marks)
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	पृष्टव्याः। परीायाम् र्वाच्य प्रयोगः स्वरूपे पृष्टव्यः।					
11	नर्शेषण नर्शेष्य	II	05	2	Yes (3 Que of 1 mark)	No

Paper II Sanskrit and Ayurved Itihās		D Type of Questions “Yes” can be asked. “No” should not be asked.				
Part A Sanskrit List of Topics	B Term	C Mar ks	MCQ (1 Mar k)	SAQ (5 Marks)	LAQ (10 Marks)	
1 ननरुनक्ति तथा पयायय पदानन- A) आयुः, शरीर, मनः, अनग्रः, िलम्, र्ातः, नपिम्, कफः B) रस, रि, मांस, मेद, अनस्थ, मज्िा, शुि, इनत्रयम्, िोत्रः, चिः, रसना, घ्राण C) धी, धनत, स्मृत, बुिी, मनत, प्रज्ञा, मूत्र, पुरीषः, स्ेद, आत्मा, रोगः, ननदानम्, रोनगः, भेषिनचनकत्सा, आनद	A - I B - II C - III	15	No	Yes (2 que of 5 marks)	Yes (1 que of 5 marks)	
2 पररभाषापदानन – A) आयुर्ेदः, पञ्चमहाभतू ानन, नत्रगुणम्, दोषाः, मलाः, दषू यम्, सम्पसगयः, सनत्रपातः B) रव्यगुण, कमय, सामान्य, नर्शेष, गुरु, लरु, प्रकृ नतः, नर्कृ नतः, चयः, प्रकोपः, प्रसरः, स्थानसम्प्यिः, दोषगनतः, भेदः, रसः, र्ीययम्, नर्पाकः, काययकारणभार्ः C) स्रोतस्, कोष्ठः, आमम्, नर्रिाह्मम्, नर्रिाहारः, नर्दानह, नर्नम्भ, सात्त्यम्, ओकसात्त्यम्, देशसात्त्यम्, अत्यशनम्, अर्धयशनम्, स्थानी, योगर्ाही, पर्थयम्, अपर्थयम्, कृ तात्रर्गयः, अस्थापाकः, र्ेगः, शोधन, शमन, लार्न, बृहण, अनुपान आनद	A - I B - II C - III	20	No	Yes (2 que of 5 marks)	Yes (1 Que. of 10 marks)	
3. अत्रयलेखनम् - A) अष्टङ्क गहदयम् सूत्रस्थानम् -अधयायतः सर्ायनण सूत्रानण १. आयुष्कामौयम् २. नदनचयाय	A - I B - II C - III	30				

<p>३. रोगानुत्पादनीयम्  B) अष्टाङ्क गृह्यसूत्रस्थानम् -अध्यायतः सर्वायनसूत्रानां  दोषानुदनीयम्  दोषभेदीयम्  दोषोपिमीयम्  नवनर्थापिमीयम्  C) रौद्रकीय सुभानुत्पादनसहितम् - shloka numbers -  प्रथमः 1, 2  नवतीयः 1, 7  तृतीयः 9</p>	(A B C 10 mark s each)	<b>No</b>	Yes (3 que of 5 marks)	Yes (1 Que. of 10 marks and 1 Que of 5 marks as part A of Que. 3 )
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<p>चतुर्थः 2, 3  पञ्चमः 2, 3  षष्ठः 1, 4, 7  सप्तमः 2, 5, 17  अष्टमः 13, 12  नवमः 12, 13  दशमः 1, 19  एकादशः 1, 2  द्वादशः 1, 6  त्रयोदशः 1, 7, 8, 9  चतुर्दशः 2, 3, 4  पञ्चदशः 7, 10  षोडशः 5, 6  सप्तदशः 1, 4  अष्टादशः 1, 2, 3  एकोनविंशतः 2, 3, 4  द्विंशतः 12, 3, 4</p>						
4.	पञ्चतन्त्र-अपरीणितकारकम् ५ अध्याय	III	15	<b>No</b>	Yes (1 que of 5 marks)	Yes (1 que of 10 marks)
	<b>Part B</b> <b>Ayurved Itihas</b>					
	<b>All Topics</b>			<b>Yes</b>	<b>No</b>	<b>No</b>

### 6 G- Question paper blue print Paper

#### I – Sanskrit

A Question Sr. No	B Type of Question	C Question Paper Format
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Q1	<p><b>Multiple choice Questions (MCQ)</b></p> <p>20 Questions</p> <p>1 mark each</p> <p>All compulsory</p> <p>Must know part 15 MCQ, Desirable to know 3 MCQ. Nice to Know 2 MCQ</p>	<ol style="list-style-type: none"> <li>1. Topic number 1</li> <li>2. Topic number 1</li> <li>3. Topic number 1</li> <li>4. Topic number 1</li> <li>5. Topic number 1</li> <li>6. Topic number 2</li> <li>7. Topic number 2</li> <li>8. Topic number 2</li> <li>9. Topic number 2</li> <li>10. Topic number 2</li> <li>11. Topic number 5</li> <li>12. Topic number 5</li> <li>13. Topic number 5</li> <li>14. Topic number 5</li> <li>15. Topic number 5</li> </ol>
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		<ol style="list-style-type: none"> <li>16. Topic number 10</li> <li>17. Topic number 10</li> <li>18. Topic number 10</li> <li>19. Topic number 11</li> <li>20. Topic number 11</li> </ol>
Q2	<p><b>Short answer Questions (SAQ)</b></p> <p>8 questions</p> <p>5 marks for each que.</p> <p>All compulsory</p> <p>Must know part 7 questions, 1 question on Desirable to know. No Questions on Nice to know.</p>	<p>Q1 Topic 6 अधोदिनां पदानां सन्धां नछत्रां र्ा योिनयत्रां नलखत (5 Que x 1 marks each)</p> <p>Q2 Topic 7 अधोदिनां पदानां नर्ग्रहर्ाक्तयां समस्तपदां र्ा नलखत 5 Que x 1 mark each</p> <p>Q3 Topic 4 - अधोदैः अव्ययपदैः ररक्तिस्थानम् पूरयत  5 Que x 1 mark each</p> <p>Q4 Topic 8 - शब्दरूपानण नलखत (5 Que x 1 mark each)</p> <p>Q5 Topic 3 - उपसगायाः (स्)र्ाक्तयेषु योियत 5 Que x 1 mark each</p> <p>Q6 Topic 10 and 11- (स्)र्ाक्तयेषु योियत – 5 Que x 1 mark each</p> <p>Q7 Topic 9 - धातुरुपानण नलखत 5 Que x 1 mark each</p> <p>Q8 Topic 5, 6 - अधोदि श्लोके रेखाङ्क नगतानां पदानां कारकसांबांधां नर्शदीकृत्रा / ननश्चयीकृत्रा तदनुसृत्य पदानां अथं नलखतु   (shlokas should be taken from the syllabus.) 5 Que x 1 mark each</p>

<p>Q3</p>	<p><b>Long answer Questions (LAQ)</b> All compulsory 4 questions 10 marks for each que.</p> <p>All questions on must know. No Questions on Nice to know and Desirable to know.</p>	<p>Q1 Topic 8, 5 – उनचर्ता शब्दरूपां ननेलख्य र्ाक्तये योियता 5 Que. X 2 mark Q2 Topic 7 - अधोदिषु श्लोके षु रेखाङ्क नगतानां समस्तपदानां नर्ग्रहर्ाक्तयां समस्तपदम् र्ा समासनाम्ना सह नलखत   (Underline 5 Samast padas or give 5 Vighrah vakyas from a 5 to 7 line passage <b>or</b> 2 to 3 shlokas from the syllabus.) 5 Que. X 2 marks Q3 Topic 6 - अधोदि पररच्छेदे रेखाङ्क नगतानां सनन्धां नछत्रा र्ा योिनयत्रा सनन्ध सूत्रम् च नलखत  (Underline 5 Sandhi padas or Sandhi Vighrahas from a 5 to 7 line passage <b>or</b> 2 to 3 shlokas from the syllabus.) 5 Que. X 2 marks Q4 Topic 5, 9, 10 - अ) अधोदिस्य धातोः तव्यत् तुमुन् ल्यप् िर्त् शत्/शानच् प्रत्ययरूपानण नलखत   5 Que. X 1 marks आ) र्ाच्य प्रयोगाः   5 Que. X 1 marks (Sentences should be taken from syllabus Panchatantra.)</p>
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AyUG SN & AI :

**Paper II – Sanskrit and Avurved Itibas**

A Question Sr. No	B Type of Question	C Question Paper Format
Q1	<p><b>Multiple choice Questions (MCQ)</b> <b>Ayurved Itihas</b> 20 Questions</p> <p>1 mark each</p> <p>All compulsory</p> <p>Must know part 15 MCQ, Desirable to know 3 MCQ. Nice to Know 2 MCQ</p>	<p>All Questions From <b>Ayurved Itihas</b>.Paper II Part B</p> <ol style="list-style-type: none"> <li>1. Topic number 1/2</li> <li>2. Topic number 3/4</li> <li>3. Topic number 5/6 /7 /8</li> <li>4. Topic number 9/ 10</li> <li>5. Topic number 1/2</li> <li>6. Topic number 3/4</li> <li>7. Topic number 5/6 /7 /8</li> <li>8. Topic number 9/ 10</li> <li>9. Topic number 1/2</li> <li>10. Topic number 3/4</li> <li>11. Topic number 5/6 /7 /8</li> <li>12. Topic number 9/ 10</li> <li>13. Topic number 1/2</li> <li>14. Topic number 3/4</li> <li>15. Topic number 5/6 /7 /8</li> <li>16. Topic number 9/ 10</li> <li>17. Topic number 1/2</li> <li>18. Topic number 3/4</li> <li>19. Topic number 5/6 /7 /8</li> <li>20. Topic number 9/ 10</li> </ol>
Q2	<p><b>Short answer Questions (SAQ)</b> <b>Sanskrit</b> All compulsory 8 questions 5 marks for each que.</p> <p>Must know part 7 questions, 1question on Desirable to know. No Questions on Nice to know.</p>	<ol style="list-style-type: none"> <li>1. Topic number 3 अधोदिस्य श्लोकस्य पदच्छेदां नलनखत्र्ा रेखाङ्क नगतानां पदानां शब्दरूपानण धातुरुपानण र्ा नलखत  </li> <li>2. Topic number 3 अधोदिस्य श्लोकस्य अत्र्यम् अथयम् च नलखत</li> <li>3. Topic number 2/3 अधोदिस्य श्लोकस्य अत्र्यम् अथयम् च नलखत</li> <li>4. Topic number 3/ 4 प्रयोगां नर्पररणमयत   5 Que x 1 markeach</li> <li>5. Topic number 2 अधोदिनाम् नटप्पनणनलयखत  </li> <li>6. Topic number 1 शब्दस्य ननरुनक्तिं तथा पयाययर्चनानन च नलखत  </li> <li>7. Topic number 3/4 सांस्कृत भाषायां अनुर्दत  </li> <li>8. Topic number 3/4 मातृभाषायां अनुर्दत  </li> </ol>
Q3	<p><b>Long answer Questions (LAQ)</b> <b>Sanskrit</b> All compulsory 4 questions 10 marks for each que.</p>	<ol style="list-style-type: none"> <li>1. Topic 4 अधोदिकथायाः साराम्शां सम्स्कृत भाषायाम् नलखत   or Comprehension.</li> <li>2. Topic 2 अधोदिनाम् नटप्पनणनलयखत   2x5 (5 marks for each)</li> <li>3. Topic 1, 3       <ol style="list-style-type: none"> <li>A) प्रश्नानाम् पूणयर्ाक्तयेन उिरानण नलखत   5 Que.X 1 Mark for each</li> <li>B) ननरुनक्तिं तथा पयाययर्चनानन च नलखत    5 Que. X 1 mark for each</li> </ol> </li> </ol>

All questions on must know. No Questions on Nice to know and Desirable to know.	4. Topic 3 अधोदिस्य श्लोकस्य पदच्छेदां नग्नहर्क्तायम् अत्रयः र्क्तायार्थं शास्त्रार्थं च नलखत । 5 Que. X 2 marks
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## 6 H - Distribution of Practical Exam

Practical 100 Marks – (Viva 75 + Elective 10 + IA 15) Marks

SN		Heads	Marks
<b>A</b>	<b>VIVA (75)</b>		
	<b>1</b>	Reading (structured approach)	<b>10</b>
	<b>2</b>	Shabdarupani and Karakani	<b>10</b>
	<b>3</b>	Sandhi and Padachcheda, Dhaturupani	<b>10</b>
	<b>4</b>	Samas	<b>5</b>
	<b>5</b>	Paribhasha, Nirukti	<b>5</b>
	<b>6</b>	Anvay	<b>10</b>
	<b>7</b>	Constructing sentences and conversation	<b>10</b>
	<b>8</b>	Compilation/ Record writing [Compilation/ Record writing book should contain 1. Anvay 2. Padachcheda 3. Samas 4. Shabdarupani 5. Dhaturupani 6. Bhavarth  Of the 40 shlokas from Sanskrit Paper 2 topic numbers 3 A and B Ashtanga Hridayam and ten verses from Charak Samhita Sutrasthan 5 and 6 from Samhita Adhyayan - 1 subject.]	<b>10</b>
	<b>9</b>	Communication Skill	<b>5</b>
<b>B</b>	<b>Internal Assessment (15)</b>		<b>15</b>
<b>C</b>	<b>Electives (10)</b>		<b>10</b>
		Total Marks	<b>100</b>

## 7. References/ Resources

### Sanskrit

#### Books

1. सांस्कृतपाठ्यपुस्तकम् प्रथमः तथा नवतीयभागः- Sanskrit for Ayurveda part- I and Part –II Published by CCIM New Delhi
2. आयुर्वेदस्य भाषा-पञ्चभागाः- Ayurvedasya bhaSha part I to part –V samskrita samvardhana prathisthan mumbai
3. लघुसिद्धान्तकौमुदः - रंदि - Laghusiddhantakaumudi of bhattojidikshita
4. नसिन्तकौमुद - भट्टोनिदीनितः siddhantakaumudi
5. रैद्यकीयसुभानषतसानहत्यम् - Vaidyakiyasubhashitasahityam, भास्कर गोनर्द र्णेकर, चौखम्बा प्रकाशन
6. पन्तन्त्रम् अपरीनितकारकम् - Pancatantra aparikshitakarakam 1 to 5 stories
7. शब्दकल्पद्रुमः - Sabdakalpadruma:
8. र्चस्पत्यम्- Vachaspatyam
9. अमरकोशः- Amarakosha
10. नसिरूपम् - Siddharupam
11. धातुपाठः- Dhatupatha
12. Sanskrit to English and English to Sanskrit Dictionary – Monier Williams
13. Sanskrit to Hindi and Hindi to Sanskrit Dictionary – Va. Shi. Apte
14. Sanskrit to Regional/ Desirable language dictionaries.
15. Ayurvediya Shabdakosha
16. Encyclopedic dictionary of Ayurveda – Dr. Kanjiv Lochan, Dr. P.S. Byadgi (Chaukhambha Publications)

#### Online Recourses:-

- Crossword Online  
<https://crosswordlabs.com/>
- Readymade Sanskrit Puzzles  
<http://webapps.samskrutam.com/tools/CrosswordPuzzle.aspx>
- Learning Sanskrit - Pronunciation 1  
<https://www.sanskrit-trikashaivism.com/en/learning-sanskrit-pronunciation-1-1/456>
- Pronunciation of all Sanskrit letters.....  
[sanskritdocuments.org](http://sanskritdocuments.org)  
[http://sanskritdocuments.org/learning\\_tools/sarvanisutrani/allutrani.htm](http://sanskritdocuments.org/learning_tools/sarvanisutrani/allutrani.htm)  
[sanskrit.jnu.ac.in](http://www.taralabalu.org/panini/greetings.htm)  
<http://www.taralabalu.org/panini/greetings.htm>
- Vyakarana –  
<https://sites.google.com/site/samskritavyakaranam/>
- कोशाः / Dictionaries -
- Cologne Digital Sanskrit Lexicon:  
<https://www.sanskritlibrary.org/cologne.html>

<https://www.sanskritdictionary.com/>

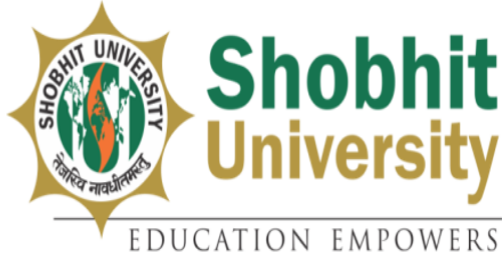
[www.monierwilliams.com](http://www.monierwilliams.com)

- Sanskrit Computational tools Samsadhani-  
<https://sanskrit.uohyd.ac.in/scl/>
- Learning  
<https://www.learnsanskrit.cc/>
- The Sanskrit Heritage Site  
<https://sanskrit.inria.fr/>
- Sanskrit Dictionary for Spoken Sanskrit  
[www.learnsanskrit.cc](http://www.learnsanskrit.cc)  
[https://spokensanskrit.org/index.php?mode=3&direct=es&script=hk&tran\\_input=name](https://spokensanskrit.org/index.php?mode=3&direct=es&script=hk&tran_input=name)

## Ayurved Itihas

### Reference book

1. Upodghata of Kashyapasamhita (Paragraph of acceptance of Indian medicine) Rajguru Hem Raj Sharma
2. Upodghata of Rasa Yogasagar Vaidya Hariprapanna Sharma
3. Ayurveda Ka Itihas KaviraSuram Chand
4. Ayurveda Sutra Rajvaidya Ram Prasad Sharma
5. History of Indian Medicine (1-3 part) Dr. GirindrNath Mukhopadhyaya
6. A Short history of Aryan Medical Science Bhagwat Singh
7. History of Indian Medicine J. Jolly
8. Hindu Medicine Zimer
9. Classical Doctrine of Indian Medicine Filyosa
10. Indian Medicine in the classical age AcharyaPriyavrata Sharma
11. Indian Medicine (Osteology) Dr. Harnley
12. Ancient Indian Medicine Dr. P. Kutumbia
13. Madhava Nidana and its Chief Commentaries (Chapters highlighting history) Dr. G.J. Mulenbelt
14. Ayurveda Ka BrihatItihasa Vaidya Atridev Vidyalankara
15. Ayurveda Ka VaigyanikaItihasa Acharya Priyavrata Sharma
16. Ayurveda Ka PramanikaItihasa Prof. Bhagwat Ram Gupta
17. History of Medicine in India Acharya Priyavrata Sharma
18. Vedome Ayurveda Vaidya Ram GopalS hasstri
19. Vedomein Ayurveda Dr. Kapil Dev Dwivedi
20. Science and Philosophy of Indian Medicine Dr. K.N. Udupa
21. History of Indian Medicine from Pre-Mauryan to Kushana Period Dr. Jyotirmitra
22. An Appraisal of Ayurvedic Material in Buddhist literature Dr. Jyotirmitra
23. Mahayana Granthon mein nihita Ayurvediya Samagri Dr. RavindraNathTripathi
24. Jain Ayurveda Sahitya Ka Itihasa Dr. Rajendra Prakash Bhatnagar
25. Ayurveda- Prabhashaka Jainacharya Acharya Raj Kumar Jain
26. CharakaChintana Acharya Priyavrata Sharma
27. Vagbhata Vivechana Acharya Priyavrata Sharma
28. Atharvaveda and Ayurveda Dr. Karambelkara
29. Ayurvedic Medicine Past and Present Pt. Shiv Sharma
30. Ancient Scientist Dr. O.P. Jaggi
31. Luminaries of Indian Medicine Dr. K.R. Shrikanta Murthy
32. Ayurveda Ke Itihasa Ka Parichaya Dr. RaviduttaTripathi
33. Ayurveda Ke Pranacharya Ratnakara Shastri
34. Ayurveda Itihasa Parichaya Prof. Banwari Lal Gaur



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For

**BAMS FIVE AND HALF YEARS PROGRAMME**

(W.e.f.session2021-2022)

Course curriculum for Second Professional

शास्त्रं ज्योतिः प्रकाशार्थं दर्शनं बुद्धिरात्मनः।  
BAMS(PRESCRIBED BY NCISM)

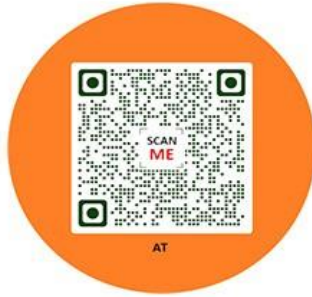
**Agad Tantra evam Vidhi Vaidyaka**

**(SUBJECT CODE : AyUG-AT)**

(Applicable from 2021-22 batch, from the academic year 2023-24 onwards for 5 years or until further notification by NCISM, whichever is earlier)



॥ आयुषे सर्वलोकानाम् ॥





**BOARD OF AYURVEDA**  
**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE**  
**NEW DELHI-110058**

NCISM

## II Professional Ayurvedacharya (BAMS)

**Subject Code : AyUG-AT**

### Summary

Total number of Teaching hours: 300		
Lecture hours(LH)-Theory		
Paper I	100	100(LH)
Non Lecture hours(NLH)-Theory		
Paper I	60	200(NLH)
Non Lecture hours(NLH)-Practical		
Paper I	140	

Examination (Papers & Mark Distribution)					
Item	Theory Component Marks	Practical Component Marks			
		Practical	Viva	Set SA	IA
Paper I	100	100	60	10	30
Sub-Total	100	200			
Total marks	300				

**Important Note:-**The User Manual II BAMS is a valuable resource that provides comprehensive details about the curriculum file. It will help you understand and implement the curriculum. Please read the User Manual II before reading this curriculum file. The curriculum file has been thoroughly reviewed and verified for accuracy. However, if you find any discrepancies, please note that the contents related to the MSE should be considered authentic.

In case of difficulty and questions regarding curriculum write to [cur.imp@ncismindia.org](mailto:cur.imp@ncismindia.org)

## **PREFACE**

Agada Tantra, is one of the eight clinical branches (Ashtanga) of Ayurveda. This branch of clinical toxicity was considered as the stalwart of Ayurveda which popularized this science across several civilizations around the world. Many great explorers glorified the snake bite management existed in India and this paved way for the popularization of Ayurveda in several countries with Ayurvedic scriptures being translated to several languages and many scholars came to India to study this science. The subject encompasses the detailed study for several toxicological conditions ranging from animate, inanimate and other disease entities with an inherent toxic pathology that enables to apply the principles of Agada Tantra in several diseases of contemporary significance.

Poisons disrupts the homeostasis created by the three doshas. Agada Tantra details measures to re-establish the proper functioning of the dosha, dhatu, mala, srotas and to reinstate the vital force (Oja). To attain this, a judicious use of Agada formulations is necessary coupled with specific treatment procedures enshrined in the 24-fold treatments (Chaturvimsati Upakrama). A proper assessment of the patient with respect to the level of spread of poison in the body ascertained through the concept of Vega is utmost important as far as any successful management of poisoning is concerned. A thorough knowledge of all these is essential to adopt treatment of any poison or to extend it to any contemporary toxicological conditions like contact dermatitis, food poisoning etc. Current curriculum has been designed to unearth the scope of this subject as a clinical branch which aims at empowering an undergraduate student to understand the current clinical toxicological manifestations under the theoretical and practical/clinical framework of Agada Tantra.

The present curriculum of Agada Tantra equips an undergraduate student to grasp the clinical utility of these concepts through an effective teaching-learning process involving cognitive, psychomotor and affective domains. Students will be guided through effective teaching-learning methods to understand the concepts through state-of-the-art techniques like activity based learning, problem based learning and group activities. Effective evaluation techniques are also been incorporated to make the student community learn this subject in its entirety and utilizes the spectrum of its theoretical, practical and clinical aspects.

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**Course Code and Name of Course**

<b>Course code</b>	<b>Name of Course</b>
AyUG-AT	Agad Tantra evam Vidhi Vaidyaka

**Table 1- Course learning outcomes and matched PO**

<b>SR1 CO No</b>	<b>A1 Course learning Outcomes (CO) AyUG-AT At the end of the course AyUG-AT, the students should be able to-</b>	<b>B1 Course learning Outcomes matched with program learning outcomes.</b>
CO1	Demonstrate application of fundamental concepts of Agada Tantra, Vyavahara Ayurveda and Vidhi vaidyaka in real life situations.	PO1,PO2
CO2	Diagnose and manage acute and chronic poisoning due to Sthavara, Jangama and Kritrima visha along with their contemporary relevance.	PO1,PO2,PO3,PO4, PO5
CO3	Demonstrate application of concepts of Dushivisha, Garavisha and Viruddha ahara in prevention, diagnosis and management of diseases.	PO1,PO2,PO3,PO4, PO5
CO4	Demonstrate application of principles of Agada Tantra and therapeutic administration of common Agada yoga and Visha dravya in Clinical practice.	PO2,PO3,PO4,PO5, PO9
CO5	Appreciate research updates in relevance to Agada Tantra and apply for healthcare promotion and social awareness.	PO6,PO7,PO8,PO9
CO6	Demonstrate application of professional skills of Forensic Medicine in handling medico legal issues.	PO2,PO3,PO6
CO7	Demonstrate professional and ethical behavior in discharging the medico-legal duties and responsibilities in abidance to the law.	PO5,PO6,PO8,PO9

**Table 2 : Contents of Course**

<b>Paper 1</b>					
<b>Sr. No</b>	<b>A2 List of Topics</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
1	<b>Concepts of Agada Tantra (Clinical Toxicology)</b> 1.1 Agada Tantra and Clinical Toxicology. 1.2 Scope of Agada Tantra. 1.3 Definition of visha and poison, synonyms, visha guna, difference between visha, madya and oja guna, visha gati, classification of visha and poison, sthavara and jangama visha adhishtana. 1.4 Difference between poison, venom and toxin. 1.5 Routes of administration of poison. 1.6 Mode of action of visha (visha gunanusara karma) and poison (Introduction to toxicokinetics) 1.7 Factors modifying the action of poison. 1.8 Visha vardhaka bhava and visha sankata 1.9 Vishavega, vegantara and sthavara visha veganusara lakshana and chikitsa. 1.10 Visha peeta and vishamukta lakshana.	1	13	8	1
2	<b>Visha Chikitsa (Management of Poisoning)</b> 2.1. Diagnosis of poisoning in living & dead 2.2. Chaturvimshati upakrama. 2.3. General principles of management of poisoning. 2.4. Duties of medical officer in case of suspected poisoning.	1		5	4
3	<b>Vishakta aahara pariksha and Viruddha ahara</b> 3.1. Sources of exposure of visha with contemporary relevance. 3.2. Vishakta aahara pariksha. 3.3. Adulteration and tests for its detection. 3.4. Techniques used in the detection of poisons. 3.5. Viruddha-ahara with contemporary relevance. 3.6. Food poisoning and amavisha.	1		3	2
4	<b>Garavisha and Dooshivisha</b> 4.1. Garavisha 4.2. Dooshivisha 4.3. Contemporary aspects of garavisha and dooshivisha. 4.4. Role of garavisha and dooshivisha in the manifestation of diseases 4.5. Research updates in garavisha and dooshivisha	1	12	7	2
5	<b>Visha Upadrava and diseases caused due to exposure to Visha/poisons</b>	1		4	2

	<ul style="list-style-type: none"> <li>◆ 5.1 Visha upadrava</li> <li>◆ 5.2 Drug-induced toxicity</li> <li>◆ 5.3 Occupational hazards.</li> <li>◆ 5.4 Allergic manifestations</li> <li>◆ 5.5 Endocrine disrupters</li> </ul>				
6	<b>Environmental Toxicology</b> <ul style="list-style-type: none"> <li>◆ 6.1 Vishakta vayu, jala and bhumi (air, water and land pollution)</li> <li>◆ 6.2 Effect of biological, chemical and nuclear warfare.</li> <li>◆ 6.3 Ecotoxicology &amp; biomagnification.</li> <li>◆ 6.4 Toxicovigilance.</li> </ul>	2	11	2	5
7	<b>Dermatological manifestations of visha/poisons.</b> 7.1. Contact dermatitis and its management. 7.2. Signs and symptoms and management of abhyanga visha, lepa visha, vastra visha, paduka visha, abharana visha etc. with contemporary relevance. 7.3. Signs and symptoms and management of dermatological manifestations due to cosmetics, chemicals, occupational and other allergens. 7.4. Dermatological manifestation due to dooshivisha and garavisha. 7.5. Dermatological manifestation due to bites and stings.	2		6	2
8	<b>Therapeutic utility of Agada yoga</b> <ul style="list-style-type: none"> <li>◆ 8.1 Dooshivishari agada</li> <li>◆ 8.2 Bilwadi agada</li> <li>◆ 8.3 Dashanga agada</li> <li>◆ 8.4 Murvadi agada</li> <li>◆ 8.5 Panchashirisha agada</li> <li>◆ 8.6 Vishaghna mahakashaya (Charaka Samhita)</li> <li>◆ 8.7 Ekasara gana (Sushruta Samhita)</li> </ul>	2		1	0
9	<b>Sthavara visha – Poisons of Plant origin</b> 9.1. Cardiac Poisons - Vatsanabha, Karaveera, Digitalis, Tobacco and Cerbera odollam.	2	17	4	2

	9.2. Neurotoxic Poisons- Kupeelu, Ahiphena, Dhattura, Bhanga. 9.3. Irritant Poisons - Jayapala, Gunja, Bhallataka, Arka, Snuhi, Langali.				
10	<b>Sthavara Visha – Poisons of Metallic origin</b> 10.1. Arsenic. 10.2. Mercury. 10.3. Lead. 10.4. Copper	2		4	2
11	<b>Jangama Visha</b>  ♦ 11.1. Sarpa visha 11.2. Loota visha 11.3. Vrischika visha 11.4. Mushika visha and its contemporary relevance. ♦ 11.5. Alarka visha and its contemporary relevance. 11.6. Keeta visha 11.7. Vector borne diseases.	2		10	6
12	<b>Kritrima visha</b>  ♦ 12.1. Inorganic Acids – Sulphuric acid, Hydrochloric acid, Nitric acid. ♦ 12.2. Organic Acids - Oxalic acid, Carbolic acid, Formic acid. 12.3. Alkalies - Potassium hydroxide and Sodium hydroxide. 12.4. Asphyxiants – Carbon monoxide, Carbon dioxide. 12.5. Non-metallic poisons – Phosphorous, cyanide 12.6. Hydrocarbons – Kerosene. 12.7. Agrochemical Poisoning – Organo-phosphorus compounds, Carbamates, Organo-chlorine compounds, Aluminium phosphide. 12.8. Household poisons.	3	12	2	0
13	<b>Substances of abuse</b> 13.1. Madya and madatyaya, Alcoholism. 13.2. Addiction - Alcohol, Bhang, Opioids, Tobacco and Digital addiction. 13.3. Drugs of abuse- Lysergic acid diethylamide (LSD) and 3,4-Methylenedioxy methamphetamine (MDMA).	3		4	3



	13.4. Narcotic Drugs and Psychotropic Substances (NDPS) Act.				
14	<b>Agada Tantra perspectives on cancer</b> 14.1. Toxic carcinogens. 14.2. Toxicities due to chemo and radiotherapy and its Ayurvedic approach. 14.3. Agada and visha dravya prayoga in the prevention and management of cancer along with its research updates.	3		2	4
15	<b>Forensic medicine (Vyavahara Ayurveda) and Medical jurisprudence (Vidhi vaidyaka):</b>  ♦ 15.1 Forensic Medicine and Medical Jurisprudence. 15.2 Introduction to Indian Penal Code, Indian Evidence Act and Criminal Procedure Code.	1	10	1	0
16	<b>Vaidya sadvritta : Duties and Responsibilities of medical practitioner</b>  ♦ 16.1 Vaidya sadvritta, medical ethics and code of conduct, Charaka oath and Hippocratic oath. ♦ 16.2 NCISM - constitution, objectives and functions. ♦ 16.3 Duties, rights and privileges of a registered medical practitioner. ♦ 16.4 Consent, professional secrecy and privileged communication. ♦ 16.5 Professional negligence, professional misconduct and unethical practices. ♦ 16.6 Defenses in medical negligence suits. ♦ 16.7 Medical records. ♦ 16.8 Consumer Protection Act.	1		6	4
17	<b>Legal Procedures</b> 17.1. Courts and their powers 17.2. Inquest, evidence and witnesses 17.3. Court procedures: summons, oath, recording of evidence and conduct money. 17.4. Conduct of a medical professional in the court of law.	1		4	4
18	<b>Personal identity</b>	1		2	2

	18.1. Identification data 18.2. Age 18.3. Race, religion, sex. 18.4. Moles, tattoos, scars, occupational marks & hairs. 18.5. Hand writing, dactylography, DNA typing and superimposition				
19	<b>Thanatology</b> 19.1. Death 19.2. Signs of death. 19.3. Medicolegal autopsy and exhumation. 19.4. The Transplantation of Human Organs and Tissues Act (THOTA).	2	12	6	2
20	<b>Asphyxial deaths</b> 20.1. Hanging. 20.2. Strangulation and suffocation 20.3. Drowning.	2		4	2
21	<b>Injury</b> 21.1. Basics of injury 21.2. Mechanical injury 21.3. Firearm injury 21.4. Thermal injury 21.5. Dowry death	2		5	3
22	<b>Pregnancy, delivery and abortion</b>  <ul style="list-style-type: none"> <li>◆ 22.1 Medico-legal aspects of pregnancy, delivery, infanticide and battered baby syndrome.</li> <li>◆ 22.2 Abortion, Medical Termination of Pregnancy (MTP) Act and Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act.</li> <li>◆ 22.3 Medico-legal aspects of artificial insemination and surrogacy.</li> </ul>	3	6	2	3
23	<b>Sexual offences</b> 23.1. Rape 23.2. Medico-legal aspects of sexual offences 23.3. Protection of Children from Sexual Offences (POCSO) Act	3		2	1
24	<b>Forensic psychiatry.</b> 24.1. Common symptoms associated with psychiatric disorders 24.2. Lucid interval	3	7	2	2

	24.3. Civil and criminal responsibilities of a mentally ill person 24.4. Mental Health Act (MHA)			
25	<b>Forensic science laboratory</b> 25.1. Hierarchy and major divisions of forensic lab services. 25.2. Newer techniques and recent advances - polygraphy, narcoanalysis, DNA profiling.	3	1	0
26	<b>Laws, Acts, Rules and Regulations</b> 26.1 Clinical Establishments Act 26.2 State AYUSH registration board rules and regulations. 26.3 Medicare Service Persons and Medicare Service Institutions (Prevention of violence and damage or loss to property) Act, 2008. 26.4 Drugs and Cosmetics Act and Rules – Schedules related to poison. 26.5 The Occupational Safety, Health and Working Conditions Code, 2020 26.6 Employees State Insurance Act, 1948. 26.7 Rights of Person with Disability Act, 2016.	3	3	2
<b>Total Marks</b>		<b>100</b>	<b>100 hr</b>	<b>60 hr</b>

**Table 3: Learning objectives (Theory) of Course**

<b>Paper 1</b>									
<b>A3</b> Course outcome	<b>B3</b> Learning Objective (At the end of the session, the students should be able to)	<b>C3</b> Doma in/sub	<b>D3</b> Must to know / desirable to know / Nice to know	<b>E3</b> Level Does/ Show s how/ Know s how/ Know	<b>F3</b> T-L meth od	<b>G3</b> Assessment  (Refer abbreviations)	<b>H3</b> Form ative/ summ ative	<b>I3</b> Term	<b>J3</b> Integr ation
<b>Topic 1 Concepts of Agada Tantra (Clinical Toxicology) (Lecture :8 hours, Non lecture: 1 hours)</b>									
CO1	Define Agada Tantra and Toxicology. Describe the scope of Agada Tantra in the present era.	CK	MK	K	L&PP T	T-EMI,T- EW	F&S	I	
CO1	Define visha and poison. Enlist its synonyms.	CK	MK	K	L&PP T	T-EMI	F&S	I	
CO1	Differentiate between poison,venom and toxin.	CK	MK	K	L,L& PPT	P-VIVA	F&S	I	
CO1	Describe classification of visha & poison	CK	MK	K	L&PP T	T-EMI,P- VIVA	F&S	I	
CO1	Describe sthavara and jangama visha adhisthana.	CK	MK	K	L&PP T	T- EW	F&S	I	
CO1	Describe the routes of administration of poison.	CC	MK	K	L&PP T	T- EW,P- VIVA	F&S	I	
CO1	Enlist visha guna and differentiate between visha, madya and oja	CK	MK	K	L&PP	T-EMI	F&S	I	

	guna.				T				
CO1	Describe the mode of action of visha (visha gunanusr karma) & poison (Introduction to toxicokinetics).	CC	MK	KH	L,L&PPT,L &GD	T-EMI,T- EW	F&S	I	
CO1	Describe the factors modifying the action of poison.	CC	MK	KH	L&PPT	T- EW	F&S	I	
CO1	Describe vishavardhaka bhava and visha sankata.	CC	MK	KH	L&PPT	T-EMI,T- EW,P-VIVA	F&S	I	
CO1	Describe visha vega & vegantara	CK	DK	K	L&PPT	T-EMI,P-VIVA	F&S	I	
CO1	Describe sthavara visha veganusara lakshana and chikitsa	CK	MK	K	L,L&PPT	T-EMI	F&S	I	
CO1	Describe vishapeeta and vishamukta lakshana.	CK	MK	K	L&GD	T-EMI,P-VIVA	F&S	I	
<b>Topic 2 Visha Chikitsa (Management of Poisoning)</b> (Lecture :5 hours, Non lecture: 4 hours)									
CO2	Describe the diagnosis of poisoning in living and dead.	CAP	MK	KH	L&PPT	T-EMI,T- EW,P-VIVA	F&S	I	
CO2	Enumerate and discuss chaturvimshati upakrama	CC	MK	KH	L&PPT	T- EW,P-VIVA	F&S	I	
CO2	Describe the general principles of management of poisoning.	CAP	MK	KH	L&PPT	T-EMI,P-VIVA	F&S	I	V-KC
CO2	Describe the duties of medical officer in case of suspected poisoning.	CK	MK	K	L&PPT	T-EMI,P-VIVA	F&S	I	
<b>Topic 3 Vishakta aahara pariksha and Viruddha ahara</b> (Lecture :3 hours, Non lecture: 2 hours)									

CO1,CO2,CO3	Explain the various sources of exposure of visha like anna, paana, vastra, abhyanga, lepa, paduka, abharana, etc.	CK	DK	K	L&PP T,L& GD	T- EW,CL- PR,M-CHT	F&S	I	
CO1,CO2,CO3	Describe the Ayurvedic methods of detection of food and beverages contaminated with visha.	CC	MK	KH	L&PP T,L_ VC,S DL,D	T- EW,P-VIV A,P-EXAM	F&S	I	
CO1,CO2,CO3	Define adulteration, describe the methods of detection of adulterants and its relevance in Agada Tantra.	CAP	DK	KH	L_VC ,SDL, PT	T- EW,P-VIV A,P- EXAM,OSPE ,RK	F&S	I	
CO1,CO2,CO3	Describe the modern analytical techniques for the detection of poison (in contaminated articles) like chromatography, spectroscopy, etc.	CC	NK	KH	L&PP T,L& GD,L _VC	T- EW,P- VIVA,CL-PR	F&S	I	
CO1,CO2,CO3	Define viruddha ahara and explain its types.	CC	MK	KH	L&PP T,L& GD,B S	T- EW,P- VIVA,INT	F&S	I	
CO1,CO2,CO3	Discuss and illustrate the contemporary importance of viruddha ahara with examples	CAN	MK	KH	L&G D,BS, SDL	T- EW,QZ ,CL-PR	F&S	I	
CO1,CO2,CO3	Discuss the application of concepts of viruddha ahara in the prevention and management of diseases.	CAP	MK	KH	L&G D,BS, SDL	T- EW,P-VIV A,CR-RED	F&S	I	
CO1,CO2,CO3	Describe food poisoning, its types and management.	CC	MK	KH	L&PP T,L&	T- EW,P-VIV A,CR-RED	F&S	I	

					GD,L _VC, CD				
CO1,CO2,CO3	Discuss the clinical application of principles of Agada Tantra in the management of food poisoning.	CAP	MK	KH	L&G D,BS, CBL, SDL	T- EW,P- VIVA,CL-PR	F&S	I	
CO1,CO2,CO3	Describe the concept of amavisha.	CC	MK	KH	L&PP T,L& GD,L _VC	T- EW,P- VIVA	F&S	I	
<b>Topic 4 Garavisha and Dooshivisha</b> (Lecture :7 hours, Non lecture: 2 hours)									
CO1,CO3	Describe the various definitions of garavisha.	CK	MK	K	L&PP T	T- EW	F&S	I	
CO1,CO3	Describe the clinical presentations of garavisha.	CC	MK	KH	L&PP T	T- EW	F&S	I	
CO1,CO3	Understand and explain the management principles of garavisha.	CC	MK	KH	L&PP T	T- EW	F&S	I	
CO1,CO3	Describe the various definitions of dooshivisha.	CC	MK	KH	L&PP T	T- EW	F&S	I	
CO3	Describe the clinical presentations of dooshivisha.	CC	MK	KH	L&PP T	T- EW	F&S	I	
CO3,CO4	Describe the principles of management of dooshivisha.	CC	MK	KH	L&PP T,DIS	T- EW,P-REC	F&S	I	
CO3,CO4	Discuss the application of the concept of dooshivisha and	CAP	MK	KH	L&G	P-VIVA	F&S	I	

	garavisha and its management in day to day clinical practice.				D				
CO3,CO5	Discuss the recent research updates in the concept of garavisha and dooshivisha.	CAN	MK	KH	L&G D,PE R	P-VIVA,CL- PR	F&S	I	
CO1,CO3,CO 4	Describe garavisha and dooshivisha as an etiology for the diseases of present era.	CAP	MK	KH	DIS,B S,FC	P-VIVA,CL- PR	F&S	I	
<b>Topic 5 Visha Upadrava and diseases caused due to exposure to Visha/poisons</b> (Lecture :4 hours, Non lecture: 2 hours)									
CO1,CO3	Describe visha upadrava.	CK	MK	K	L&PP T	T- EW,P- VIVA	F&S	I	
CO2,CO3,CO 4	Define drug induced toxicity and discuss its Agada Tantra perspective.	CC	MK	KH	L&G D,L_ VC,B S	T- EW,T- OBT,P-VIVA	F&S	I	
CO2,CO3,CO 4	Discuss the application of principles of Agada Tantra in drug induced hepatotoxicity, nephrotoxicity and neurotoxicity.	CAP	MK	KH	L&PP T,CB L	T- EW,P- VIVA,CL-PR	F&S	I	
CO2,CO3,CO 4	Discuss various occupational poisons and their health hazards.	CC	MK	KH	L&PP T,PB L,SD L	T-OBT,P-VIV A,M-CHT,M- POS	F&S	I	H-SW
CO2,CO3,CO 4	Discuss the application of principles of Agada Tantra in occupational diseases caused due to pollution, paints, pesticides, fertilizer and other chemicals.	CC	DK	KH	L&PP T,ML	QZ ,CL-PR,M- CHT,M-POS	F&S	I	
CO2,CO3,CO 4	Define and discuss allergy, types of allergens and its understanding as per Ayurveda.	CC	MK	KH	L&PP T,DIS ,BS,C	INT,CR-RED	F&S	I	



					BL				
CO2,CO3,CO4	Discuss the application of the treatment principles of Agada Tantra in various allergic manifestations.	CAP	MK	KH	L&G D,BS, CBL	T-EMI,P-VIV A,PRN,CL-PR	F&S	I	
CO2,CO3,CO4	Define and enlist endocrine disruptors and discuss its Agada Tantra perspectives.	CAP	DK	KH	L&PP T,DIS ,BS,C BL	CL-PR,M- CHT,COM	F&S	I	
<b>Topic 6 Environmental Toxicology</b> (Lecture :2 hours, Non lecture: 5 hours)									
CO4,CO5	Define environmental toxicology.	CK	DK	K	L&PP T,DIS	PRN,M-POS	F&S	II	
CO3,CO4,CO5	Describe the lakshanas and chikitsa of vishakta bhoomi, vishakta jala, and vishakta vayu.	CK	DK	K	L&PP T	P-VIVA,P- MOD	F&S	II	
CO4,CO5	Define pollution. Describe various pollutants and explain water pollution, soil pollution, air pollution,along with their health hazards.	CK	DK	KH	L&PP T,BS	T- EW,T-CS,P RN,P-MOD	F&S	II	
CO4,CO5	Describe the health effects of biological, chemical and nuclear warfare.	CK	NK	K	L&G D,SD L	PRN,QZ	F&S	II	
CO4,CO5	Define ecotoxicology & biomagnification.	CK	NK	KH	L&G D,SD L	PRN,CL-PR	F&S	II	
CO4,CO5	Explain the concept of toxicovigilance	CC	DK	K	FC,S DL	P-POS,CL- PR,CR-RED	F	II	
<b>Topic 7 Dermatological manifestations of visha/poisons.</b> (Lecture :6 hours, Non lecture: 2 hours)									

CO3,CO4	Describe the clinical presentations and diagnosis of paduka visha, abharana visha, vastra visha, lepa visha, abhyanga visha, etc.	CAP	MK	KH	L&PP T,DIS ,CBL, CD	T- EW,P- CASE,CL-PR	F&S	II	
CO3,CO4	Discuss the management of paduka visha, abharana visha, vastra visha, lepa visha, abhyanga visha, etc.	CAN	MK	KH	L&PP T,DIS ,CBL, PER	T- EW,P-EXA M,P- CASE,CL-PR	F&S	II	
CO3,CO4	Describe contact dermatitis and its types.	CK	MK	K	L&PP T	T- EW,P- VIVA	F&S	II	
CO3,CO4	Discuss the application of treatment principles of Agada Tantra in the contact dermatitis.	CAP	MK	KH	L&PP T,CB L	P-VIVA,P- CASE,CL-PR	F&S	II	
CO3,CO4	Discuss the dermatological conditions caused due to garavisha and dooshivisha.	CAP	MK	KH	L&PP T,DIS ,CBL, CD	T- EW,P-VIV A,P-CASE	F&S	II	
CO3,CO4	Discuss the application of principles of treatment of garavisha and dooshivisha in the management of dermatological manifestations.	CAP	MK	KH	L&PP T,DIS ,CBL	P-VIVA,P- CASE,CL-PR	F&S	II	
CO3,CO4	Discuss the daignosis and application of the treatment principles of Keeta visha in dermatological manifestations due to bites & stings.	CAP	MK	KH	L&PP T,DIS ,CBL, SDL	T- EW,P-VIV A,P-CASE,CL- PR	F&S	II	
<b>Topic 8 Therapeutic utility of Agada yoga</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2,CO	Enlist ingredients and discuss the therapeutic utility of	CAP	MK	KH	L&PP	T- EW,P-	F&S	II	

3,CO4	Doohivishari Agada, Bilwadi Agada, Dashanga Agada, Murvadi agada and Panchashririsha Agada.				T,DIS ,CBL	CASE			
CO1,CO2,CO 3,CO4	Enlist and discuss the ingredients of vishaghna mahakashaya (Charaka Samhita) and ekasara gana (Sushruta Samhita).	CAP	MK	KH	L&PP T,BS, CBL, FC	T- EW,P- VIVA	F&S	II	
<b>Topic 9 Sthavara visha – Poisons of Plant origin</b> (Lecture :4 hours, Non lecture: 2 hours)									
CO2,CO4,CO 6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of vatsanabha.	CAP	MK	KH	L&PP T	T- EW,P- VIVA,P-ID	F&S	II	
CO2,CO4	Mention therapeutic dose and enlist two important formulations of vatsanabha.	CK	NK	K	L	T-EMI,P-VIV A,P-EXAM	F&S	II	
CO2,CO4,CO 6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of karaveera.	CAP	MK	K	L&PP T	T- EW,P- VIVA,P-ID	F&S	II	
CO2,CO4	Mention therapeutic dose and enlist two important formulations of karaveera.	CK	NK	K	L	T- EW,T- ME Qs,P-VIVA,P- EXAM	F&S	II	
CO2,CO6	Describe mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of digitalis.	CAP	NK	K	L&PP T	T- EW,P- VIVA	F&S	II	
CO2,CO6	Describe mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of tobacco.	CK	MK	K	L&PP T	T- EW,P-ID	F&S	II	
CO2,CO6	Describe mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and	CK	DK	K	L&PP T	T- EW	F&S	II	

	medicolegal aspects of Cerbera odollam.								
CO2,CO4,CO6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of Kupeelu.	CK	MK	KH	L&PP T	T- EW,P- VIVA,P-ID	F&S	II	
CO2,CO6	Mention therapeutic dose and enlist two important formulations of kupeelu.	CK	NK	K	L	T-EMI	F&S	II	
CO2,CO4,CO6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of ahiphena.	CK	MK	KH	L&PP T	T- EW,P- VIVA,P-ID	F&S	II	
CO2,CO6	Mention therapeutic dose and enlist two important formulations of ahiphena.	CK	NK	K	L	T-EMI	F&S	II	
CO2,CO4,CO6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of dhatura.	CK	MK	KH	L&PP T	T- EW,P- VIVA,P-ID	F&S	II	
CO2,CO6	Mention therapeutic dose and enlist two important formulations of dhatura.	CK	NK	K	L	T-EMI	F&S	II	
CO2,CO4,CO6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of Bhanga.	CK	MK	K	L&PP T	T- EW,P-VIV A,P-EXAM,P- ID	F&S	II	
CO2,CO6	Mention therapeutic dose and enlist two important formulations of bhanga.	CK	NK	K	L	T-EMI	F&S	II	
CO2,CO4,CO6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of jayapala.	CK	MK	K	L&PP T	T- EW,P- VIVA,P-ID	F&S	II	
CO4	Mention therapeutic dose and enlist two important formulations	CK	NK	K	L	T-EMI,P-	F&S	II	

	of jayapala.					EXAM			
CO2,CO4,CO 6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of gunja.	CAP	DK	KH	L&PP T	T- EW,P- VIVA,P-ID	F&S	II	
CO4	Mention therapeutic dose and enlist two important formulations of gunja.	CK	NK	KH	L	T- EW,P-VIV A,P-EXAM	F&S	II	
CO2,CO4,CO 6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of bhallataka.	CAP	MK	KH	L&PP T	T- EW,P- VIVA,P-ID	F&S	II	
CO4	Mention therapeutic dose and enlist two important formulations of bhallataka.	CK	NK	K	L	T-EMI,P-VIV A,P-EXAM	F&S	II	
CO2	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of arka and snuhi.	CK	DK	K	L&PP T	T- EW,P- VIVA	F&S	II	
CO2,CO4,CO 6	Describe the active principles, mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance and medicolegal aspects of langali.	CK	NK	K	L&PP T	T- EW,P- VIVA,P-ID	F&S	II	
<b>Topic 10 Sthavara Visha – Poisons of Metallic origin</b> (Lecture :4 hours, Non lecture: 2 hours)									
CO2	Describe the mode of action, fatal dose, fatal period, signs and symptoms, management, post-mortem appearance, medicolegal aspects of acute poisoning of  1. Arsenic 2. Mercury 3. Lead 4. Copper	CK	MK	K	L&PP T,PB L	T-EMI,T- MEQs,P- VIVA	F&S	II	

	Write its therapeutic dose and enlist any four important formulations.								
CO1,CO2	Discuss the Ayurvedic concepts for the diagnosis and management of chronic heavy metal toxicity.	CC	DK	K	L&PP T,L& GD	T-EMI,T- MEQs,P- VIVA	F&S	II	
CO2,CO3,CO 4	Discuss the toxicological implications of improperly prepared medicines with special reference to those containing metals, minerals and poisonous substances.	CAP	NK	KH	L&PP T,CB L,FC	P-VIVA	F&S	II	
<b>Topic 11 Jangama Visha</b> (Lecture :10 hours, Non lecture: 6 hours)									
CO2,CO5	Describe sarpa bheda and enumerate the identification features of darvikara, mandali and rajimantha sarpa.	CAP	MK	KH	L&PP T,BS, CBL	T- EW,P-VIV A,P-EXAM	F&S	II	
CO2,CO5	Classify snakes and describe the features of venomous and non venomous snakes and identify their bites.	CAN	MK	K	L&PP T	T- EW,P-VIV A,P-EXAM	F&S	II	
CO2,CO5	Describe the fatal dose, fatal period, signs and symptoms of common cobra, king cobra, russel's viper, saw scaled viper, pit vipers and common krait.	CAN	MK	KH	L&PP T,DIS ,BS,C BL	T- EW,T-CS,P -VIVA,P- EXAM	F&S	II	
	Describe the samanya lakshana and samanya chikitsa of darvikara, mandali and rajimanth sarpa damsha.	CK	MK	K	L	T-EMI	F&S	II	
CO2,CO5	Describe the management of snake bites according to recent WHO snake bite management guidelines.	CAN	MK	KH	L&PP T,CB L,PE R,CD	T- EW,P-VIV A,P-EXAM	F&S	II	
CO2,CO5	Describe the classification, diagnosis, samanya lakshana and chikitsa of lootavisha with its contemporary aspects.	CAN	MK	KH	L&PP T,CB	T- EW,P- VIVA	F&S	II	

					L				
CO2,CO5	Describe the classification, diagnosis, samanya lakshana and chikitsa of vrischika damsha (Scorpion Sting) along with its contemporary aspects.	CK	MK	K	L&PP T,CB L,CD	T- EW,P-VIV A,P-EXAM	F&S	II	
CO2,CO4	Describe leptospirosis and rat bite fever with special reference to mushika visha.	CK	NK	K	L,CB L	T- EW	F&S	II	
CO2,CO5	Describe rabies and its management with special reference to alarka visha.	CK	DK	KH	L&G D,CB L	T- EW,P- VIVA	F&S	II	
CO2,CO5	Describe the classification of keeta, samanya sakshana and chikitsa of keeta damsha with special importance to regional prevalence.	CAN	DK	KH	L&PP T,CB L	T- EW	F&S	II	
CO2,CO5	Discuss the application of visha chikitsa in vector borne diseases like chikungunya, dengue and malaria.	CAP	DK	KH	L&PP T,DIS	P-VIVA	F&S	II	
<b>Topic 12 Kritrima visha</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO2	Describe the action of poison, fatal dose, fatal period, signs and symptoms, management, post mortem appearance and medico legal aspects of  Inorganic acids - Sulphuric acid, Hydrochloric acid and Nitric Acid  Organic acids - Oxalic acids, Carbolic acids and Formic acid  Alkalies	CK	MK	KH	L&PP T,PE R	T- EW,P-VIV A,P-EXAM	F&S	III	
CO2	Describe the action of poison, fatal dose, fatal period, signs and	CK	DK	KH	L&PP T,PE	T- EW,P- VIVA	F&S	III	

	<p>symptoms, management, post mortem appearance and medico legal aspects of</p> <p>Asphyxiants - CO and CO2</p> <p>Non Metal - Phosphorous</p> <p>Hydrocarbon - Kerosene</p>				R				
CO2	Describe the action of poison, fatal dose, fatal period, signs and symptoms, management, post mortem appearance and medico legal aspects of agrochemical poisons- organophosphorous compounds, carbamates, organochlorine compounds and aluminium phosphide and enlist the household poisons.	CAP	MK	SH	L&PP T,PB L	T- EW,P-VIV A,P-EXAM	F&S	III	
<b>Topic 13 Substances of abuse</b> (Lecture :4 hours, Non lecture: 3 hours)									
CO1,CO2	Define Mada and describe its stages.	CK	MK	K	L&PP T	T-EMI,T- MEQs,P- VIVA	F&S	III	
CO1,CO2	Describe the types of madatyaya along with its management.	CK	MK	K	L&PP T	T-EMI,T- MEQs,P- VIVA	F&S	III	
CO1,CO2,CO 6	Describe mode of action, fatal dose, fatal period, signs and symptoms, management, post mortem appearance and medicolegal importance of acute ethanol poisoning.	CC	MK	KH	L&PP T	T-EMI,T-CS, T-OBT,P- VIVA	F&S	III	
CO1,CO2,CO 6	Describe mode of action, fatal dose, fatal period, signs and symptoms, management, post mortem appearance and medicolegal importance of acute methanol poisoning.	CC	MK	K	L&PP T	T-EMI,T- MEQs,P- VIVA	F&S	III	
CO2,CO4	Discuss the application of principles of Ayurveda in the	CC	MK	KH	L&G	T- EW,P-	F&S	III	



	management of chronic alcoholism.				D,BS	VIVA			
CO2,CO4	Discuss the signs & symptoms of alcohol withdrawal with its Ayurvedic approach.	CC	MK	KH	L&G D,BS, IBL	T- EW,P- VIVA	F&S	III	
CO2,CO4	Discuss the signs & symptoms of withdrawal of bhang (cannabis), ahiphena/opium and its derivatives, tobacco, LSD and MDMA with its Ayurvedic approach.	CC	MK	KH	L&G D,BS, TUT	T- EW,P- VIVA	F&S	III	
CO2,CO4	Discuss the reseach updates in Ayurveda in the management of conditions due to substances of abuse.	CC	MK	KH	L&G D	T-EMI,T- ME Qs,T-CRQs,P- VIVA	F&S	III	
CO7	Describe the NDPS Act.	CK	DK	K	L&PP T	T- EW	F&S	III	
<b>Topic 14 Agada Tantra perspectives on cancer</b> (Lecture :2 hours, Non lecture: 4 hours)									
CO2,CO4	Discuss the concepts of Agada Tantra in oncology.	CC	MK	KH	L&G D,BS, PBL	T-EMI,T- MEQs,P- VIVA	F&S	III	
CO1,CO2	Enlist the cancer causing toxic chemicals / substances (toxic carcinogens) and describe the process of mutation in genes and carcinogenesis.	CC	MK	K	L&G D	T-EMI,T- ME Qs,T-CRQs,P- VIVA,SA	F&S	III	
CO2,CO4	Describe the chemotherapy induced common toxicities and Ayurvedic approach for its management.	CC	MK	KH	L&PP T,PB L	T-EMI,T- ME Qs,T-CRQs,P- VIVA,SA	F&S	III	
CO2,CO4	Describe the radiotherapy induced common toxicity and Ayurvedic approach for its management.	CC	MK	KH	L&G D,PB L,SD L	T-EMI,T- ME Qs,T-CRQs,P- VIVA	F&S	III	

CO2,CO4	Discuss the role of visha and vishaghna dravya in the management of cancer along with its research updates.	CC	DK	KH	L&G D,BS	T-EMI,T- ME Qs,T-CRQs,P- VIVA	F&S	III	
<b>Topic 15 Forensic medicine (Vyavahara Ayurveda) and Medical jurisprudence (Vidhi vaidyaka):</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO6,CO 7	Define Forensic Medicine & Medical Jurisprudence. Give an introduction to Indian Penal Code (IPC), Criminal Procedure Code (CrPC) and Indian Evidence Act (IEA).	CC	MK	KH	L&G D	T- EW,P- VIVA,QZ	F&S	I	
<b>Topic 16 Vaidya sadvritta : Duties and Responsibilities of medical practitioner</b> (Lecture :6 hours, Non lecture: 4 hours)									
CO1,CO6,CO 7	Describe vaidya sadvritta, medical ethics, code of conduct, Charaka oath and Hippocratic oath.	CK	MK	K	L&PP T,L& GD,B S,PER	T- EW,P- VIVA	F&S	I	
CO1,CO6,CO 7	Describe the constitution, objectives and functions of NCISM.	CK	MK	K	L&PP T,DIS	T- EW,P- VIVA	F&S	I	
CO6,CO7	Describe the duties and rights and privileges of a registered medical practitioner.	CK	MK	K	L&PP T,DIS	T- EW,P- VIVA	F&S	I	
CO1,CO6,CO 7	Describe consent, professional secrecy and privileged communication.	CC	MK	K	L&PP T,BS	T- EW	F&S	I	
CO1,CO6,CO 7	Describe professional negligence, professional misconduct and unethical practices.	CC	MK	K	L&G D,CB L,PE R	T- EW,P- VIVA	F&S	I	
CO6,CO7	Explain the defenses in medical negligence suits with appropriate case laws.	CAP	MK	K	L&PP T,L& GD,B	T- EW,P- VIVA	F&S	I	

					S,CB L				
CO6,CO7	Describe the maintainance of medical records and explain its significance.	CC	MK	K	L,FV	T- EW,P-VIVA	F&S	I	
CO7	Describe the Consumer Protection Act.	CK	MK	K	L&PP T	T- EW,P-VIVA	F&S	I	
<b>Topic 17 Legal Procedures</b> (Lecture :4 hours, Non lecture: 4 hours)									
CO1,CO6,CO7	Describe the types of courts along with their powers. Describe - Inquest, Evidence, Witness, Summons, Conduct money and procedure of recording of evidence in a court of law. Describe the conduct of a medical professional in the court of law.	CC	MK	KH	L&PP T,DIS ,SDL	T- EW,P-VIVA,CL-PR	F&S	I	
<b>Topic 18 Personal identity</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1,CO6	Define identification and enlist the identification data. Describe the method of estimation of age based on Teeth, ossification of bones, secondary sexual characteristics and general development.	CC	DK	KH	L&PP T,L_ VC,D IS	T- EW,P-VIVA	F&S	I	
CO1,CO6	Describe the medico-legal importance of age, tattoo marks and occupational marks.	CK	DK	K	L&PP T	T- EW	F&S	I	
CO1,CO6	Describe the medico-legal importance of race, religion, sex, moles and hair.	CC	DK	KH	L_VC ,DIS, EDU	P-VIVA	F	I	
CO1,CO6	Describe the medico-legal importance of handwriting, dactylography, DNA typing and superimposition as an identification data.	CK	NK	K	L,ED U	T- EW	F	I	
<b>Topic 19 Thanatology</b> (Lecture :6 hours, Non lecture: 2 hours)									

CO6	Define death and describe the stages and modes of death. Explain the immediate changes following death.	CC	MK	KH	L&PP T,L& GD,L _VC	T- EW,P- VIVA	F&S	II	
CO6	Enlist and explain the early changes following death. Describe Algor mortis, rigor mortis and livor mortis with regards to their definition, mechanism, modifying factors and medico legal importance. Enable Ginger <i>Cannot connect to Ginger</i> Check your internet connection or reload the browser Disable in this text field Rephrase Rephrase current sentence Edit in Ginger	CC	MK	KH	L&PP T,L_ VC,D IS,SI M	T- EW,P- VIVA	F&S	II	
CO6	Enlist the late changes following death and describe the definition, modifying factors and medico legal importance of putrefaction, mummification and adipocere formation. Enable Ginger <i>Cannot connect to Ginger</i> Check your internet connection or reload the browser Disable in this text field Rephrase Rephrase current sentence Edit in Ginger	CC	MK	KH	L&PP T,L_ VC,D IS	T- EW,P- VIVA	F&S	II	
CO6	Define Autopsy and describe its types, its objectives, rules and procedure along with exhumation.	CC	MK	KH	L&PP T,L_ VC	T- EW,P- VIVA	F&S	II	
CO6	Describe the Transplantation of Human Organs and Tissues Act.	CC	NK	KH	BS,S DL,P ER	T- EW,P- VIVA	F	II	
<b>Topic 20 Asphyxial deaths</b> (Lecture :4 hours, Non lecture: 2 hours)									
CO6	Define hanging. Describe its classification, causes of death, post-mortem appearances and medico-legal aspects.	CK	MK	KH	L&PP T,DIS	T- EW,T- ME Qs,T-CS,P-	F&S	II	

						VIVA,P-MOD			
CO6	Define strangulation and suffocation. Enlist their classification, post-mortem appearances and medico-legal aspects.	CK	MK	K	L&PP T,D- M	T- EW,T- ME Qs,PRN,M- MOD	F&S	II	
CO6	Define Drowning, explain its classification, post-mortem appearances and medico-legal aspects.	CK	MK	K	L&PP T,L_ VC	T- EW,P-VIV A,PRN,P- CASE	F&S	II	
<b>Topic 21 Injury</b> (Lecture :5 hours, Non lecture: 3 hours)									
CO6	Define and classify Injuries. Describe the medico-legal aspects of injuries.	CK	MK	K	L&G D	T- EW	F&S	II	
CO6	Describe the characteristics, age and medico-legal aspects of mechanical injuries.	CK	MK	K	L&PP T	T- EW	F&S	II	
CO6	Describe firearm injuries, its characteristics and medico-legal aspects. Differentiate between entry and exit wound	CK	DK	K	L&PP T	T- EW	F&S	II	
CO6	Define and classify thermal injury. Describe charecterstics and degrees of burns, rule of nine, post-mortem appearances, and medico-legal aspects.	CK	DK	K	L&G D	T- EW	F&S	II	
CO6	Explain medico-legal aspects of dowry death.	CK	NK	K	L&G D	T- EW	F&S	II	
<b>Topic 22 Pregnancy, delivery and abortion</b> (Lecture :2 hours, Non lecture: 3 hours)									
CO6,CO7	Define pregnancy, delivery, infanticide and battered baby syndrome along with their medico legal aspects.	CK	MK	K	L,L& PPT,L &GD	T- EW,T-CS,P -VIVA,P- EXAM	F&S	III	
CO6,CO7	Define and classify abortion, MTP Act and PCPNDT Act.	CK	MK	K	L&PP T,D-	T- EW,T- ME Qs,T-CS,P-	F&S	III	

					M,D	VIVA,PRN			
CO6,CO7	Describe Surrogacy (Regulation) Act 2021 and the Assisted Reproductive Technology (Regulation) Act 2021.	CK	NK	KH	L,L&PPT	P-VIVA,O-QZ	F&S	III	
<b>Topic 23 Sexual offences</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO6	Describe classification of sexual offences.	CK	NK	KH	L&PP T	P-VIVA,PRN, QZ	F&S	III	
CO6	Define rape. Describe the examination of rape victim and accused and its medico legal aspects.	CK	MK	KH	L&PP T,CB L	T- EW,P-VIV A,P- EXAM,PRN	F&S	III	
CO6	Define the un-natural sexual offences and sexual perversion with their medico-legal aspects and give introduction to POCSO Act.	CK	NK	K	L&PP T,CB L	P-VIVA,QZ	F&S	III	
<b>Topic 24 Forensic psychiatry.</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO6	Describe the symptoms commonly associated with psychiatric disorders & the significance of lucid interval.	CK	DK	K	L&PP T,TU T	T-EMI,T- EW,P-VIVA	F&S	III	
CO6,CO7	Describe the civil and criminal responsibilities of a mentally ill person.	CK	DK	K	L&PP T	T- EW,P- VIVA	F&S	III	
CO6	Describe Mental Health Act	CK	NK	K	SDL, PER	T- EW,P- VIVA	F&S	III	
<b>Topic 25 Forensic science laboratory</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO6	25.1. Hierarchy and major divisions of forensic lab services.  25.2. Newer techniques and recent advances - polygraphy,	CK	DK	K	L&PP T,ML	T-OBT,P- VIVA	F&S	III	

narcoanalysis, DNA profiling.

**Topic 26 Laws, Acts, Rules and Regulations** (Lecture :3 hours, Non lecture: 2 hours)

CO6,CO7	Describe the  1. NCISM Rules and Regulations in force. 2. Clinical Establishments Act. 3. Medicare Service Persons and Medicare Service Institutions (Prevention of violence and damage or loss to property) Act, 2008. 4. The Drug and Cosmetic Act - schedules related to poison. 5. Rules and Regulations related to AYUSH State Registration Boards of concern state.	CK	DK	K	L&PP T,DIS ,SDL	T- EW,P- VIVA,CL-PR	F&S	III	
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**List of Practicals** [Term and Hours]

<b>PRACTICALS (Marks-100)</b>			
<b>S.No</b>	<b>List of Topics</b>	<b>Term</b>	<b>Hours</b>
1	Visha Chikitsa	1	6
2	Vishakta Ahara Pariksha	1	6
3	Dooshivisha, Garavisha, Visha Upadrava	1	20
4	Dermatological manifestation of visha	2	20
5	Environmental toxicology	2	2
6	Jangama Visha	2	10
7	Sthavara visha	2	6
8	Substance abuse	3	8
9	Legal Procedures	1	2
10	Vaidya Sadvritta	1	2
11	Personal Identity	1	4
12	Thanatology	2	6
13	Injury	2	6
14	Sexual offences	3	2
15	Field Visits (Field visits should be integrated along with the educational tour conducted by Dravyagunavijnan, Rasasatra and Swasthavruttha Departments)	2	30
16	Topics related to regional preference	3	10



**Table 4: Learning objectives (Practical)**

<b>A4</b> Course outcome	<b>B4</b> Learning Objective (At the end of the session, the students should be able to)	<b>C4</b> Domain/sub	<b>D4</b> Must to know / desirable to know / Nice to know	<b>E4</b> Level Does/ Shows how/ Knows how/ Knows	<b>F4</b> T-L method	<b>G4</b> Assessment  (Refer abbreviations)	<b>H4</b> Formative/ summative	<b>I4</b> Term	<b>K4</b> Integration
<b>Topic 1 Visha Chikitsa</b>									
CO2	Demonstrate the procedure of gastric lavage on mannequin.	CAP	MK	SH	D-M,D	P-EXAM,P-PRF,OSPE	F&S	I	
CO2	Demonstrate the procedure of CPR on mannequin.	PSY-MEC	MK	D	D-M,D	P-EXAM,P-PRF,OSPE	F&S	I	
CO2	Observe the different procedures for removal of absorbed poison.	CC	MK	KH	L_VC,D	P-VIVA	F&S	I	
<b>Topic 2 Vishakta Ahara Pariksha</b>									
CO2	Demonstrate adulteration detection test for urea in milk, boric acid in milk, artificial colour in turmeric, pulses and vegetables as per recent Food Safety and Standards Authority of India (FSSAI) guidelines.	PSY-SET	MK	D	D_L	P-PRF,RK	F&S	I	
CO2	Demonstrate adulteration detection test for argemone oil in mustard oil and adulterants in Honey as per recent FSSAI guidelines.	PSY-SET	MK	D	D_L	P-PRF,RK	F&S	I	
<b>Topic 3 Dooshivisha, Garavisha, Visha Upadrava</b>									

CO3,CO4	Diagnosis and management of diseases due to garavisha, dooshivisha and visha upadrava - drug induced toxicities.	CAP	MK	SH	L_VC ,CBL, SIM, CD	SP,OSCE ,RK	F&S	I	
CO3,CO4	Diagnosis and management of diseases due to garavisha, dooshivisha and visha upadrava - occupational hazards.	CAP	MK	KH	L_VC ,PBL, CBL, SIM, CD	OSCE ,RK	F&S	II	
CO3,CO4	Diagnosis and management of diseases due to garavisha, dooshivisha and visha upadrava - allergic manifestations.	CAP	MK	KH	L_VC ,PBL, CBL, SIM, CD	OSCE ,RK	F&S	I	
CO3,CO4	Diagnosis and management of diseases due to garavisha, dooshivisha and visha upadrava - autoimmune diseases	CAP	MK	KH	L_VC ,CBL, CD	OSCE ,RK	F&S	I	
CO3,CO4	Diagnosis and management of diseases due to garavisha, dooshivisha and visha upadrava - endocrine disruptors induced diseases.	CAP	MK	KH	L_VC ,CBL, CD	OSCE ,RK	F&S	I	
<b>Topic 4 Dermatological manifestation of visha</b>									
CO3,CO4	Diagnosis and Management of Dermatological manifestations due to visha ex: contact poisoning (paduka visha, abharana visha etc.)	CAN	MK	SH	L_VC ,CBL, CD	OSCE ,RK	F&S	II	
CO3,CO4	Diagnosis and management of dermatological manifestations due to visha - bites and stings.	CAP	MK	KH	L_VC ,CBL, CD	OSCE ,RK	F&S	II	

CO3,CO4	Diagnosis and Management of contact dermatitis based on the principles of Agada Tantra.	CAP	MK	KH	L_VC ,CBL, CD	OSCE ,RK	F&S	II	
<b>Topic 5 Environmental toxicology</b>									
CO5	Social Awareness program related to environmental toxicology – Rally, street play, skit etc	AFT- VAL	DK	SH	RP	P-VIVA,M- CHT	F	II	
<b>Topic 6 Jangama Visha</b>									
CO2,CO4	Demonstrate identification of poisonous and non poisonous snakes.	CAN	MK	KH	L&G D,L_ VC,D- M,FV	P-VIVA,P- EXAM,OSCE	F&S	II	
CO2,CO4	Demonstration of the diagnosis of poisonous snake bite cases based on local and systemic clinical presentations.	CAP	MK	KH	L&G D,L_ VC,C BL,C D	P-VIVA,P- EXAM,RK	F&S	II	
CO2,CO4	Demonstration of identification of vrishchika, loota and keeta based on regional prevalence and their diagnosis based on clinical presentations.	CAP	MK	KH	L&G D,L_ VC,C BL,C D	P-VIVA,P- EXAM,RK	F&S	II	
<b>Topic 7 Sthavara visha</b>									
CO2	Demonstration of Identification of vatsanabha, karaveera and tobacco with their respective toxic parts.	CAN	MK	KH	D- M,D	P-VIVA,P- EXAM,OSPE ,RK	F&S	II	
CO2	Demonstration of Identification of kupeelu, dhattura and bhanga	CAN	MK	KH	D	P-VIVA,P-	F&S	II	

	and their respective toxic part.					EXAM,OSPE ,RK			
CO2	Demonstration of Identification of jayapala, gunja, bhallataka, langali with their respective toxic parts.	CAN	MK	KH	D	P-VIVA,P-EXAM,OSPE ,RK	F&S	II	
CO2	Demonstration of identification of arsenic, copper, mercury and lead.	CAN	MK	K	D-M	P-VIVA,P-EXAM	F&S	III	
CO2	Demonstration of Identification of non metal and mineral compounds, acids, alkalis, agrochemicals, hydrocarbons and household poisons.	CK	MK	K	D	P-VIVA,P-EXAM,RK	F&S	III	
<b>Topic 8 Substance abuse</b>									
CO2,CO4	Create public awareness on substance abuse and its ill effects.	AFT-VAL	MK	SH	RP,D	P-POS,QZ ,M-CHT	F	III	
<b>Topic 9 Legal Procedures</b>									
CO6,CO7	Demonstartion on issuing of fitness certificate, sickness certificate, birth and death certificate, and other relevant medical and medico legal certificates.	CAN	MK	D	PBL, W,PT	P-EXAM,OSPE ,RK	F&S	I	
CO6,CO7	Demonstartion of reporting of Leave against medical advice (LAMA), discharge against medical advice (DAMA) and doscharge on patient request (DOPR)	CAP	MK	D	SDL	P-VIVA,RK	F	I	
<b>Topic 10 Vaidya Sadvritta</b>									
CO6,CO7	Exposure to medical records department for understanding storage, maintanance and disposal of Medical records.	CK	DK	K	D,FV	P-VIVA	F&S	I	
<b>Topic 11 Personal Identity</b>									

CO6	Demonstrate the method of sex determination based on pelvis.	CAP	MK	SH	EDU, SIM, D	P-PRF,OSPE	F&S	I	
<b>Topic 12 Thanatology</b>									
CO6	Observe the procedure of medico-legal autopsy and preparation autopsy report.	CAP	MK	SH	L_VC ,D,FV	RK	S	II	
<b>Topic 13 Injury</b>									
CO6,CO7	Demonstrate the difference between homicidal, suicidal and accidental injuries.	CAP	MK	SH	L&PP T,L_ VC,SI M,D- M	P-VIVA,P- EXAM	F&S	II	
CO6,CO7	Demonstration of drafting of an injury report.	CAP	MK	D	D- M,D	P-EXAM,P- PRF	F&S	II	
<b>Topic 14 Sexual offences</b>									
CO5,CO6,CO7	Discuss the essentials of Protection of Women from Domestic Violence Act (PWDV Act) 2005 and The Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal) Act and Rules (PoSH Act) 2013.	AFT- VAL	DK	D	L&G D,BS, RP	C-INT,INT	F&S	III	
<b>Topic 15 Field Visits (Field visits should be integrated along with the educational tour conducted by Dravyagunavijnan, Rasasatra and Swasthavrutha Departments)</b>									
CO6,CO7	(Visit to Forensic Science Laboratory) - (Mandatory) Appraise the functioning of a forensic science laboratory	CC	MK	KH	FV	P-VIVA,RK	F	III	
CO4,CO5	(Visit to Food testing laboratory) Observe the instrumentation and procedure of food testing	CC	DK	KH	FV	RK,COM	F	I	

CO4,CO5	(Visit to Pollution Control Board) - (Mandatory) Perceive the functioning of Pollution Control Board	CC	DK	KH	FV	P-VIVA,RK	F	II	
CO4,CO5	(Visit to De-addiction centre)Observe the management of de-addiction cases	PSY-GUD	DK	KH	FV	RK	F	III	
CO7	(Visit to the Court) - (Mandatory) Observe the procedure of court procedure and conduct of a medical practitioner as an expert witness	PSY-GUD	MK	KH	FV	RK	F	I	
CO6	(Visit to mortuary for observation of autopsy)Observe the procedure of medico-legal autopsy	PSY-GUD	MK	KH	FV	P-VIVA,RK	F	II	
CO2	(Visit to snake park) - (Mandatory)Observe live specimens of snake	CC	DK	KH	FV	P-VIVA,RK	F	II	
CO2,CO7	(Visit to casualty) -( Mandatory) Watch the procedure of resuscitation and emergency management	CK	MK	KH	FV	RK	F	I	
CO4,CO5	(Visit to occupational hazards centre)Observe the types and management of cases of occupational hazard	CK	DK	KH	FV	RK	F	II	
CO2	(Visit to ASV manufacturing centre)Observe the steps and procedures involved in ASV manufacturing	CK	DK	K	FV	RK	F	II	
CO4,CO5	Visit Cancer treatment centre.	CK	NK	K	FV	RK	F	III	
CO2,CO4	Visit to department of entomology.	CC	NK	K	FV	RK	F	II	
CO2,CO5	Visit to folklore vaidya using Agada tantra concepts in visha chikitsa.	CAP	DK	SH	FV	RK	F&S	II	
<b>Topic 16 Topics related to regional preference</b>									
CO2,CO3	Discuss the topics related to regional preference like bites and stings, substance abuse, texts of regional importance, regional	CAP	NK	K	L&G D	P-VIVA,M- POS	F	III	

visha chikitsa practices, regional medico-legal issues etc.									
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**Table 4a: List of Practical**

S.No	Name of practical	Term	Activity	Practical hrs
1	Visha Chikitsa	1	1.1 Gastric lavage 1.2 Cardiopulmonary resuscitation (CPR) 1.3 Video demonstration or visit to the emergency care unit for procedures used for removal of absorbed poison.	6
2	Vishakta Ahara Pariksha	1	2.1 Adulteration detection Tests 2.1.1 Urea in milk 2.1.2 Boric acid in milk 2.1.3 Artificial color in turmeric. 2.1.4 Artificial color in pulses and Vegetables. 2.1.5 Argemone Oil in Mustard oil 2.1.6 Adulteration in Honey	6
3	Dooshivisha, Garavisha, Visha Upadrava	1	3.1 Case based teaching on diseases due to dooshivisha and garavisha - drug induced toxicity, occupational hazards, allergic manifestations, autoimmune diseases and endocrine disruptors. 3.2 Recording 10 cases based on case based teaching or OPD and IPD exposure.	20
4	Dermatological manifestation of visha	2	4.1 Dermatological manifestations due to visha ex: contact poisoning (paduka visha, abharana visha etc.) and bites and stings. 4.2 Contact Dermatitis 4.3 Recording 10 cases based on case based teaching or OPD and IPD Exposure.	20
5	Environmental toxicology	2	5.1 Social Awareness program – Rally, street play, skit etc.	2
6	JangamaVisha	2	6.1 Identification of Poisonous and non poisonous snakes 6.2 Diagnosis based on bite marks of snakes 6.3 Diagnosis and Management of snake bite cases through audio/video case presentations or OPD/IPD exposure 6.4 Diagnosis and management of vrishchika, loota and keeta damsha cases through audio/video case presentations or	10



			OPD/IPD exposure.	
<b>7</b>	Sthavara visha	2	7.1 Identification of various plant poisons, metal and mineral compounds, acids, alkalis, agrochemicals, hydrocarbons and household poisons.	6
<b>8</b>	Substance abuse	3	8.1 Community Awareness programmes by students like rallies, street play etc. 8.1.1. Observation of international day against drug abuse and illicit trafficking. 8.1.2. World No tobacco day.	8
<b>9</b>	Legal Procedures	1	9.1 Hands on training on Preparation of Medical & Medico legal reports. 9.1.1 Fitness & Sickness certificate. 9.1.2 Birth & Death Certificate and other relevant medical and medico legal certificates. 9.1.3 Leaving against medical advice (LAMA), Discharge against medical advice (DAMA), Discharge on patient request (DOPR)	2
<b>10</b>	Vaidya Sadvritta	1	10.1 Exposure to the medical records department for understanding the storage, maintenance and disposal of medical records.	2
<b>11</b>	Personal Identity	1	11.1. Sex determination based on pelvis.	4
<b>12</b>	Thanatology	2	12.1 Procedure of autopsy: visit to mortuary or audio-visual demonstrations.	6
<b>13</b>	Injury	2	13.1. Hands on training on assessment of accidental, suicidal, and homicidal injuries. 13.2. Preparation of injury report.	6
<b>14</b>	Sexual offences	3	14.1 Introduction to Protection of Women from Domestic Violence Act (PWDV Act) 2005 and The Sexual Harassment of	2

			Women at Workplace (Prevention, Prohibition & Redressal) Act and Rules (PoSH Act) 2013.	
15	Field Visits (Field visits should be integrated along with the educational tour conducted by Dravyagunavijnan, Rasasatra and Swasthavrutha Departments)	2	(It is mandatory to have 5 field visits)	30
16	Topics related to regional preference	3	Exposure to topics related to regional preference like bites and stings, substance abuse, texts of regional importance, regional visha chikitsa practices, regional medico-legal issues etc.	10
<b>Total Hr</b>				<b>140</b>

### Activity

CO	Topic name	Activity Details	Hours <sup>#</sup>
CO3,CO4	Survey of personal care products.	Students shall be divided into small groups and are asked to collect the information about common personal care products like soaps, shampoos, deodorants, cosmetics etc. Then they should be asked to enlist the chemicals used in them and discuss about the health hazards associated with their use. Then students can be asked to present their findings in the form of class seminar or Charts or Posters or small videos.	4
CO5	Community teaching by students - awareness among adolescent about Protection of Women from Domestic Violence Act (PWDV Act) 2005 and The Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal) Act and Rules	After undergoing orientation/sensitization regarding Protection of Women from Domestic Violence Act (PWDV Act) 2005 and The Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal) Act and Rules (PoSH Act) 2013, the students will have to visit nearby schools/colleges in small teams/groups and create awareness amongst them. This can be done as part of NSS activity or exclusive visits to schools/colleges.	2

	(PoSH Act) 2013.		
CO2,CO4	Observation of international day against drug abuse and illicit trafficking	Community awareness programmes by students like rallies, street play etc.	3
CO2,CO4	No Tobacco Day	Community Awareness programmes by students like rallies, street play, skit, flash mob etc.	3
CO5	Environmental toxicology	Poster presentation competition related to environment, rallies, skit, flash mob on World Environment Day.	2
CO6,CO7	Vaidya sadvritta	Exposure to Medical records department for maintainance, storage and disposal of medical record, finding out errors in medical case records.	2
CO6	Forensic psychiatry	Seminar/ guest lecture on how to deal with adolescent psychiatric issue	2
CO2,CO4	Chronic toxicity of heavy metals.	Group discussion and case based learning by taking example of published case reports.	1
CO2,CO4	World Cancer Day to raise awareness of cancer risk and cancer prevention	Poster Competition / Quiz Competition / Group Discussion	4
CO6,CO7	Legal procedure- Recording of evidence and duties of a physician in the court of Law.	Mock court / role play	4
CO2	Sarpa Visha	<p>1. Identification of poisonous and non poisonous snakes -</p> <p>Group Discussion/ Brainstorming - Specimens (Photos) of poisonous and non poisonous snakes with their features shall be given to small group of students and asked to identify the snakes.</p> <p>2. Clinical diagnosis of snake bites</p>	2

		<p>Group Discussion - Specimens (Photos) showcasing local and systemic signs and symptoms of poisonous (Hemotoxic and Nuerotoxic) snake bite shall be given to small group of students and asked to diagnose the case.</p> <p>CBL - Presentation of recorded cases or the Case reports or studies published in reputed journals.</p> <p>Brainstorming/Quiz - The same pictures may be shown with MCQ's and Quiz session can be conducted among the groups of students</p>	
CO2	Vrischika visha, luta visha and keeta visha.	<p>Group Discussion - Specimens (Photos) showcasing local and systemic signs and symptoms of Vrischika Visha (Scorpion Sting), Loota Visha (Spider Bite) and Keetavisha (Insect bite) and differentiating with snake bites shall be given to small group of students and asked to diagnose the case.</p> <p>CBL - Presentation of recorded cases or the Case reports or studies published in reputed journals.</p> <p>Brainstorming/Quiz - The same pictures may be shown with MCQ's and Quiz session can be conducted among the groups of students.</p>	2
CO3,CO4	Dooshivisha, garavisha and visha upadrava	<p>Group Discussion - Photographs/case reports/ simulated cases showcasing various drug induced toxicities, occupational hazards, allergic manifestations, autoimmune diseases and diseases due to endocrine disruptors shall be given to small group of students and asked to assess the dosha, diagnose and discuss the plan of treatment.</p>	4

		<p>CBL - Presentation of recorded cases or the Case reports or studies published in reputed journals.</p> <p>Brainstorming/Quiz - The same pictures may be shown with MCQ's and Quiz session can be conducted among the groups of students.</p>	
CO3,CO4	Dermatological manifestation of visha.	<p>Group Discussion - Photographs/case reports/simulated cases showcasing various dermatological presentations of poison, bites and stings and contact dermatitis shall be given to small group of students and asked to assess the dosha, diagnose and discuss the plan of treatment.</p> <p>CBL - Presentation of recorded cases or the Case reports or studies published in reputed journals.</p> <p>Brainstorming/Quiz - The same pictures may be shown with MCQ's and Quiz session can be conducted among the groups of students.</p>	4

# Hours indicated are included in calculations of Table 3 and 4 !

**Table 5- Teaching learning method**

Sr No	Teaching learning methods in the course	No of Activities
1	Lecture	18
2	Lecture with Power point presentation	106
3	Lecture & Group Discussion	32
4	Lecture with Video clips	13
5	Discussions	22
6	Brainstorming	22
7	Inquiry-Based Learning	1

8	PBL	6
9	CBL	26
10	Flipped classroom	4
11	Edutainment	2
12	Mobile learning	2
13	Simulation	1
14	Self-directed learning	15
15	Demo on Model	2
16	Tutorial	2
17	Presentations	9
18	Practical	1
19	Case diagnosis	5
20	Demonstration	2
21	Field visit	1

These are overall teaching learning methods listed in Table 3 and 4. Teachers can select the best possible method amongst the given methods as per objective, available time etc.

**Table 6: Assessment Summary: Assessment is subdivided in A to H points**

#### 6 A-Number of Papers and Marks Distribution

Subject Code	Papers	Theory	Practical/Clinical Assessment				Sub Total	Grand Total
			Practical	Viva	Set SA	IA		
AyUG-AT	1	100	100	60	10	30	200	300

#### 6 B - Scheme of Assessment (formative and Summative)

PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
	First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
Second	3 PA & First TT	3 PA & Second TT	3 PA & UE

PA: Periodical Assessment; TT: Term Test; UE: University Examinations.

\*\* University Examination shall be on entire syllabus

## 6 C - Calculation Method for Internal assessment Marks

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A 4	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 30 Marks (D/15*30)	Term Test (Marks converted to 30)	Sub Total _/60 Marks	Term Assessment (.../30)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert to 30 marks.							

## 6 D - Evaluation Methods for Periodical Assessment

S. No	Evaluation Methods
1	Activities Indicated in Table 3 - Column G3 as per Indicated I, II or III term in column I3

### Evaluation Methods in MSE

1. Practical / Clinical Performance
2. Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
3. Open Book Test (Problem Based)
4. Summary Writing (Research Papers/ Samhitas)
5. Class Presentations; Work Book Maintenance
6. Problem Based Assignment
7. Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)
8. Extra-curricular Activities, (Social Work, Public Awareness, Surveillance Activities, Sports or Other Activities which may be decided by the department).
9. Small Project etc.

## 6 E Question Paper Pattern

### II PROFESSIONAL BAMS EXAMINATIONS AyUG-AT

#### PAPER-1

Time: 3 Hours Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

		<b>Number of Questions</b>	<b>Marks per question</b>	<b>Total Marks</b>
Q 1	MULTIPLE CHOICE QUESTIONS (MCQ)	20	1	20
Q 2	SHORT ANSWER QUESTIONS (SAQ)	8	5	40
Q 3	LONG ANSWER QUESTIONS (LAQ)	4	10	40
				100

Similar for P



## 6 F Distribution of theory examination

<b>Paper 1</b>						
<b>Sr. No</b>	<b>A List of Topics</b>	<b>B Term</b>	<b>C Marks</b>	<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
1	<b>Concepts of Agada Tantra (Clinical Toxicology)</b>	1	13	Yes	Yes	Yes
2	<b>Visha Chikitsa (Management of Poisoning)</b>	1		Yes	Yes	Yes
3	<b>Vishakta aahara pariksha and Viruddha ahara</b>	1		Yes	Yes	No
4	<b>Garavisha and Dooshivisha</b>	1	12	Yes	Yes	Yes
5	<b>Visha Upadrava and diseases caused due to exposure to Visha/poisons</b>	1		Yes	Yes	No
6	<b>Environmental Toxicology</b>	2	11	Yes	Yes	No
7	<b>Dermatological manifestations of visha/poisons.</b>	2		Yes	Yes	No
8	<b>Therapeutic utility of Agada yoga</b>	2		Yes	Yes	No
9	<b>Sthavara visha – Poisons of Plant origin</b>	2	17	Yes	Yes	Yes
10	<b>Sthavara Visha – Poisons of Metallic origin</b>	2		Yes	Yes	Yes
11	<b>Jangama Visha</b>	2		Yes	Yes	Yes
12	<b>Kritrima visha</b>	3	12	Yes	Yes	Yes
13	<b>Substances of abuse</b>	3		Yes	Yes	Yes
14	<b>Agada Tantra perspectives on cancer</b>	3		Yes	Yes	No
15	<b>Forensic medicine (Vyavahara Ayurveda) and Medical jurisprudence (Vidhi vaidyaka):</b>	1	10	Yes	No	No

16	<b>Vaidya sadvritta : Duties and Responsibilities of medical practitioner</b>	1		Yes	Yes	No
17	<b>Legal Procedures</b>	1		Yes	Yes	No
18	<b>Personal identity</b>	1		Yes	Yes	Yes
19	<b>Thanatology</b>	2	12	Yes	Yes	Yes
20	<b>Asphyxial deaths</b>	2		Yes	Yes	Yes
21	<b>Injury</b>	2		Yes	Yes	Yes
22	<b>Pregnancy, delivery and abortion</b>	3	6	Yes	Yes	No
23	<b>Sexual offences</b>	3		Yes	Yes	No
24	<b>Forensic psychiatry.</b>	3	7	Yes	Yes	No
25	<b>Forensic science laboratory</b>	3		Yes	Yes	No
26	<b>Laws, Acts, Rules and Regulations</b>	3		Yes	Yes	No
<b>Total Marks</b>			<b>100</b>			

Paper No:1		
Question No	Type of Question	Question Paper Format
Q1	<p><b>Multiple choice Questions</b>  <b>20 Questions</b>  <b>1 mark each</b>  <b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b>  <b>Desirable to know - 3 MCQ</b>  <b>Nice to know part - 2 MCQ</b></p>	<ol style="list-style-type: none"> <li>1. Concepts of Agada Tantra (Clinical Toxicology)</li> <li>2. Visha Chikitsa (Management of Poisoning)</li> <li>3. Vishakta aahara pariksha and Viruddha ahara</li> <li>4. Garavisha and Dooshivisha</li> <li>5. Visha Upadrava and diseases caused due to exposure to Visha/poisons</li> <li>6. Asphyxial deaths</li> <li>7. Dermatological manifestations of visha/poisons.</li> <li>8. Therapeutic utility of Agada yoga</li> <li>9. Kritrima visha / Sthavara Visha – Poisons of Metallic origin</li> <li>10. Jangama Visha</li> <li>11. Substances of abuse</li> <li>12. Agada Tantra perspectives on cancer</li> <li>13. Vaidya sadvritta : Duties and Responsibilities of medical practitioner / Forensic medicine (Vyavahara Ayurveda) and Medical jurisprudence (Vidhi vaidyaka):</li> <li>14. Legal Procedures / Injury</li> <li>15. Pregnancy, delivery and abortion / Thanatology</li> <li>16. Environmental Toxicology / Personal identity</li> <li>17. Forensic psychiatry. / Forensic science laboratory</li> <li>18. Laws, Acts, Rules and Regulations</li> <li>19. Sthavara visha – Poisons of Plant origin</li> <li>20. Sexual offences</li> </ol>
Q2	<p><b>Short answer Questions</b>  <b>Eight Questions</b>  <b>5 Marks Each</b>  <b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b>  <b>Desirable to know - 1 SAQ</b>  <b>No questions on Nice to know</b></p>	<ol style="list-style-type: none"> <li>1. Vishakta aahara pariksha and Viruddha ahara / Visha Upadrava and diseases caused due to exposure to Visha/poisons / Garavisha and Dooshivisha</li> <li>2. Visha Chikitsa (Management of Poisoning) / Therapeutic utility of Agada yoga / Dermatological manifestations of visha/poisons.</li> <li>3. Kritrima visha / Sthavara visha – Poisons of Plant origin / Environmental Toxicology / Sthavara Visha – Poisons of Metallic origin</li> <li>4. Jangama Visha / Concepts of Agada Tantra (Clinical Toxicology) / Vaidya sadvritta : Duties and Responsibilities of medical</li> </ol>

		<p>practitioner</p> <p>5. Environmental Toxicology / Agada Tantra perspectives on cancer / Substances of abuse</p> <p>6. Asphyxial deaths / Personal identity / Injury</p> <p>7. Pregnancy, delivery and abortion / Sexual offences / Personal identity</p> <p>8. Forensic psychiatry. / Forensic science laboratory / Laws, Acts, Rules and Regulations</p>
<p><b>Q3</b></p>	<p><b>Long answer Questions</b>  <b>Four Questions</b>  <b>10 marks each</b>  <b>All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable to know</b></p>	<p>1. Visha Chikitsa (Management of Poisoning) / Concepts of Agada Tantra (Clinical Toxicology)</p> <p>2. Jangama Visha / Garavisha and Dooshivisha</p> <p>3. Kritrima visha / Sthavara visha – Poisons of Plant origin / Sthavara Visha – Poisons of Metallic origin / Substances of abuse</p> <p>4. Thanatology / Asphyxial deaths / Personal identity / Injury</p>

## 6 H Distribution of Practical Exam

S.No	Heads	Marks
1	<p>Spotting (15 specimens of 4 marks each) 1.1. Snake – 2 specimens</p> <p>1.1.1 Identification - 1 mark</p> <p>1.1.2 Differentiating features of poisonous/ non-poisonous snake – 1 mark</p> <p>1.1.3 Important clinical signs - 1 mark</p> <p>1.1.4 Ayurvedic management - 1 mark</p> <p>1.2. Mineral poisons/ Kritrima visha (1 specimen each)-2 specimens</p> <p>1.2.1. Identification - 1 mark</p> <p>1.2.2 Identification of symptom clusters mimicking other diseases and their differential diagnosis - 2 marks</p> <p>1.2.3 Method of detoxification and Antidotes - 1 mark</p> <p>1.3. Toxic plants– 2 specimens</p> <p>1.3.1 Identification with scientific, family and sanskrit names 1 mark</p> <p>1.3.2 Mode of use in Visha cases – 1 mark</p> <p>1.3.3 detoxification method, Class of poison and Active principles present in the plant - 1 mark</p> <p>1.3.4 Antidotes used against the specimen - 1 mark</p> <p>1.4. Antitoxic plants – 3 specimens</p> <p>1.4.1 Identification with scientific, family and sankrit names - 1 mark</p> <p>1.4.2 Mode of use in visha - 1 mark</p> <p>1.4.3 Active principles - 1 mark</p> <p>1.4.4 Important formulations - 1 mark</p> <p>1.5. Injuries – 2 specimens</p> <p>1.5.1. Identify the injury - 1 mark</p> <p>1.5.2. Identify the weapon/criminal act causing such injury - 2 mark</p> <p>1.5.3. Medico-legal importance - 1 marks</p> <p>1.6. News item – paper cuttings or other medico-legal case scenarios – 2 specimens</p> <p>1.6.1. Identify the crime – 1 mark</p>	60

	<p>1.6.2. Relevant IPC/CrPC sections associated with the crime – 1 mark</p> <p>1.6.3. Relevant Act related to the crime – with sub-questions related to its sub-sections, punishment etc. - 2 marks</p> <p>7. Jangama visha – other poisonous creatures – 2 specimens</p> <p>1.7.1. Identification – 1 mark</p> <p>1.7.2. Adhishtana/samanya lakshana/ chikitsa – 2 marks</p> <p>1.7.3. specific formulations/doses – 1 mark (Sub-questions mentioned against each item is for a purpose of example only. Different questions may be framed on the various aspects of the guidelines provided)</p>	
2	Practical Records	10
3	Medical and Medico-legal Certificate Writing Students will be provided with a case-scenario based on which they are asked to write a medical certificate for a specific purpose. Evaluation guidelines should be based on the essential criteria in the format of a valid medical certificate.	10
4	Short Case Case scenarios with pictures to diagnose a specific case of poisoning and specific questions asked regarding its clinical examination, investigations, treatment, prognosis etc.	10
5	<p>Clinical Applications of Agada</p> <ul style="list-style-type: none"> <li>◆ Identification of Agada for a case scenario detailed – 2 marks</li> <li>◆ Select the ingredients of the formulation from a group of drugs and identify using scientific names and answer sub-questions based on its preparation, anupana, dose etc. – 8 marks</li> </ul>	10
6	<p>Viva Questions will be asked on the following topics</p> <ul style="list-style-type: none"> <li>◆ Agada Tantra (2 questions 5 marks each) - 10 marks</li> <li>◆ Forensic Science (Vyavaharayurveda) (2 questions 5 marks) - 10 marks</li> <li>◆ Jurisprudence (Vidhivaidyaka) (2 questions 5 marks) - 10 marks</li> <li>◆ Toxicology (2 questions 5 marks each) - 10 marks</li> <li>◆ Concepts of Agada Tantra in cancer and substance abuse (one question from each) (2 questions 5 marks each) - 10 marks</li> <li>◆ Viva on Compilation and Communication skills (2 questions 5 marks each) - 10 marks</li> </ul>	60

7	Electives (Set SA)	10
8	IA	30
<b>Total Marks</b>		<b>200</b>

## References Books/ Resources

S.No	Book	Author(s)/Resources
1	Concise Forensic Medicine & Toxicology	KS Narayana Reddy, Jaypee Medical Publisher
2	Essentials of Forensic Medicine & Toxicology	K S Narayana Reddy, Jaypee Medical Publisher
3	Principles of Forensic Medicine & Toxicology	Rajesh Bardale, Jaypee Medical Publisher
4	Modern Medical Toxicology	VV Pillay, Jaypee Medical Publisher
5	Recent Advances in Forensic Medicine and Toxicology (Volume 1 & 2)	Gautam Biswas, Jaypee Medical Publisher
6	Textbook on Medicolegal Issues: Related to Various Medical Specialties by Satish Tiwari Mahesh Baldwa Mukul Tiwari Alka Kuthe	Jaypee Medical Publisher
7	Manual on Doctor and Law	RN Goel Narendra, Malhotra Shashi Goel, Jaypee Medical Publisher
8	Jaypee's Video Atlas of Medicolegal Autopsy	Sujith Sreenivas C Prasannan K Thomas Mathew, Jaypee Medical Publisher
9	Jaypee Gold Standard Mini Atlas Series Forensic Medicine by Ashesh Gunwantrao Wankhede	Jaypee Medical Publisher
10	MODI's Textbook of Medical Jurisprudence and Toxicology	K Kannan, Jaypee Medical Publisher
11	A Text book of Agada Tantra	Dr Shobha Bhat, Chaukamba Orientalia
12	Agada Tantra	Dr Ramesh Chandra Tiwari, Chaukamba Orientalia
13	Text Book of Agad Tantra Evam Vyavaharayurveda	Dr Sandeep Charak Dr.Piyush Gupta Dr Divya Tiwari, Ayurveda Sanskrit Hindi Pustak Bhandar.
14	Ayodhyaprasad Achal's Agada Tantra	Dr Jina Patnaik, Chaukamba Surbharati Prakashan
15	Illustrated Agada Tantra	Dr PVNR Prasad, Chaukamba Sanskrit Series Varanasi
16	Textbook on Agada Tantra	<u>DR V P JOGLEKAR, RASHTRIYA SHIKSHAN MANDAL, PUNE</u>
17	Review of Forensic Medicine and Toxicology by Dr Gautam Biswas	Jaypee Medical Publisher
18	Toxicology - An Ayurvedic Perspective	Department of Agadtantra, Vaidyaratnam PS Varier Ayurveda College, Kottakkal



## Abbreviations

### Assessment

S.No	Short form	Discription
1	T-EMI	Theory extended matching item
2	T- EW	Theory Essay writing
3	T- MEQs	Theory MEQs
4	T-CRQs	Theory CRQs
5	T-CS	Theory case study
6	T-OBT	Theory open book test
7	P-VIVA	Practical Viva
8	P-REC	Practical Recitation
9	P-EXAM	Practical exam
10	PRN	Presentation
11	P-PRF	Practical Performance
12	P-SUR	Practical Survey
13	P-EN	Practical enact
14	P-RP	Practical Role play
15	P-MOD	Practical Model
16	P-POS	Practical Poster
17	P-CASE	Practical Case taking
18	P-ID	Practical identification
19	P-PS	Practical Problem solving
20	QZ	Quiz
21	PUZ	Puzzles
22	CL-PR	Class Presentation,
23	DEB	Debate
24	WP	Word puzzle
25	O-QZ	Online quiz

26	O-GAME	Online game-based assessment
27	M-MOD	Making of Model
28	M-CHT	Making of Charts
29	M-POS	Making of Posters
30	C-INT	Conducting interview
31	INT	Interactions
32	CR-RED	Critical reading papers
33	CR-W	Creativity Writing
34	C-VC	Clinical video cases,
35	SP	Simulated patients
36	PM	Patient management problems
37	CHK	Checklists
38	OSCE	OSCE
39	OSPE	OSPE,
40	Mini-CEX	Mini-CEX
41	DOPS	DOPS
42	CWS	CWS
43	RS	Rating scales
44	RK	Record keeping
45	COM	Compilations
46	Portfolios	Portfolios
47	Log book	Log book
48	TR	Trainers report
49	SA	Self-assessment
50	PA	Peer assessment
51	360D	360-degree evaluation
52	TT-Theory	Theory
53	PP-Practical	Practical
54	VV-Viva	Viva

## Domain

S.No	Short form	Discription
1	CK	Cognitive/Knowledge
2	CC	Cognitive/Comprehension
3	CAP	Cognitive/Application
4	CAN	Cognitive/Analysis
5	CS	Cognitive/Synthesis
6	CE	Cognitive/Evaluation
7	PSY-SET	Psychomotor/Set
8	PSY-GUD	Psychomotor/Guided response
9	PSY-MEC	Psychomotor/Mechanism
10	PSY-ADT	Psychomotor Adaptation
11	PSY-ORG	Psychomotor/Origination
12	AFT-REC	Affective/ Receiving
13	AFT-RES	Affective/Responding
14	AFT-VAL	Affective/Valuing
15	AFT-SET	Affective/Organization
16	AFT-CHR	Affective/ characterization

## T L method

S.No	Short form	Discription
1	L	Lecture
2	L&PPT	Lecture with Power point presentation
3	L&GD	Lecture & Group Discussion
4	L_VC	Lecture with Video clips
5	DIS	Discussions
6	BS	Brainstorming
7	IBL	Inquiry-Based Learning
8	PBL	PBL
9	CBL	CBL
10	PrBL	Project-Based Learning
11	TBL	TBL
12	TPW	Team project work
13	FC	Flipped classroom
14	BL	Blended Learning
15	EDU	Edutainment
16	ML	Mobile learning
17	ECE	ECE
18	SIM	Simulation
19	RP	Role plays
20	SDL	Self-directed learning
21	PSM	Problem solving method
22	KL	Kinesthetic Learning
23	W	Workshops
24	GBL	Game-Based Learning
25	D-M	Demo on Model

26	LS	Library Session
27	PL	Peer learning
28	RLE	Real life experience
29	REC	Recitation
30	SY	Symposium
31	TUT	Tutorial
32	PER	Presentations
33	PT	Practical
34	XRy	X ray identification
35	CD	Case diagnosis
36	LRI	Lab report interpretation
37	DA	Drug analysis
38	D	Demonstration
39	D_BED	Demonstration bedside
40	D_L	Demonstration Lab
41	DG	Demonstration Garden
42	FV	Field visit
43	PRA	Practical
44	VIVA	Viva
45	TH	Theory

॥ आयुषे सर्वलोकानाम् ॥



**Course curriculum for Second Professional BAMS (PRESCRIBED BY**

**NCISM)**

# **Dravyaguna Vigyan**

**(SUBJECT CODE : AyUG-DG)**

**(Applicable from 2021-22 batch, from the academic year 2023-24 onwards for 5 years or until further notification by NCISM, whichever is earlier)**

**BOARD OF AYURVEDA**

**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE NEW DELHI-  
110058**

**II Professional Ayurvedacharya (BAMS)****Subject Code : AyUG-DG****Summary**

Total number of Teaching hours: 400			
Lecture hours(LH)-Theory		150	150(LH)
Paper I	75		
Paper II	75		
Non Lecture hours(NLH)-Theory		250	250(NLH)
Paper I & II	75		
Non Lecture hours(NLH)-Practical			
Paper I & II	175		

Examination (Papers & Mark Distribution)					
Item	Theory Component Marks	Practical Component Marks			
		Practical	Viva	Elective	IA
Paper I	100	100	70	-	30
Paper II	100				
Sub-Total	200	200			
Total marks	400				

**Important Note:-**The User Manual II BAMS is a valuable resource that provides comprehensive details about the curriculum file. It will help you understand and implement the curriculum. Please read the User Manual II before reading this curriculum file. The curriculum file has been thoroughly reviewed and verified for accuracy. However, if you find any discrepancies, please note that the contents related to the MSE should be considered authentic.

In case of difficulty and questions regarding curriculum write to [cur.imp@ncismindia.org](mailto:cur.imp@ncismindia.org)

## **PREFACE**

The Bachelor of Ayurveda education shall produce graduates having profound knowledge of Ashtanga Ayurveda. One of the chatushpada has been mentioned is Dravya. The revised syllabus of Dravyaguna along with the contemporary advances supplemented with knowledge of scientific and technological advances in Dravyaguna along with extensive practical training

Fundamentals of Dravyaguna involves a thorough knowledge of various principles and concepts of Rasapanchaka (fivefold analysis of medicinal substances) and Karma (pharmacological action). It refers to classical Ayurvedic texts, provides suitable examples, and includes contemporary interpretations to facilitate better understanding. Most commonly used dravyas by clinicians are included in curriculum.

The current syllabus focuses greater emphasis on understanding the fundamentals with a scientific interpretation and clinical application. The repetitive topics such as Ahara varga, Nighantu, and Jangama dravyas is avoided since they are covered in Samhita adhyayana (study of classical texts), Itihasa (history), and ethical considerations related to the clinical use of animal-origin drugs.

Additionally, newer areas in Ayurveda related to medicinal plants, such as cultivation techniques, collection methods, and various regulatory guidelines from organizations like NMPB (National Medicinal Plants Board), CCRAS (Central Council for Research in Ayurvedic Sciences), API (Ayurvedic Pharmacopoeia of India), GCTM (Global Centre for Traditional Medicine), PCIMH (Pharmacopoeia Commission for Indian Medicine & Homoeopathy), pharmacovigilance, Vrikshayurveda (science of plant life), Ethno medicine, Network pharmacology, and Bioinformatics, have been incorporated. This information is crucial for the sustainable use of medicinal plants and a better understanding of their properties.

Practical sessions in Dravyaguna focus on understanding fundamental concepts such as Mahabhuta (five elements), Guna (properties), Rasa (taste), and Virya (potency) with Parameters commonly used in physicochemical analysis. The curriculum also addresses challenges faced by the herbal drug industry, including the issue of adulteration, by incorporating quality check parameters. Furthermore, the students gain practical experience in plant identification through visits to various natural and cultivated plant habitats.

The revised curriculum for Dravyaguna reflects commitment to equipping students with the knowledge and skills necessary to excel in the field of Ayurvedic pharmacology. Hope that this curriculum will inspire and empower students to become proficient Ayurvedic practitioners who can contribute to the holistic well-being of individuals and society as a whole.



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**Course Code and Name of Course**

<b>Course code</b>	<b>Name of Course</b>
AyUG-DG	Dravyaguna Vigyan

**Table 1- Course learning outcomes and matched PO**

<b>SR1 CO No</b>	<b>A1 Course learning Outcomes (CO) AyUG-DG At the end of the course AyUG-DG, the students should be able to-</b>	<b>B1 Course learning Outcomes matched with program learning outcomes.</b>
CO1	Demonstrate the application of principles of <i>Dravyaguna</i> in clinical practice.	PO1,PO2,PO8
CO2	Analyze and justify the fundamental principles of <i>Dravyaguna</i> in relevance to contemporary sciences.	PO1
CO3	Analyze and interpret <i>Rasa Panchaka</i> of <i>Dravya</i> with their application in clinical practice.	PO5,PO9
CO4	Interrelate the knowledge on Karma (pharmacological actions) with <i>Rasa panchaka</i> and basic contemporary clinical pharmacology.	PO2
CO5	Demonstrate and Justify the ability to select the specific <i>Dravyas</i> , Prashata Bheshaja with different dosage forms in different clinical conditions.	PO3,PO7,PO9
CO6	Demonstrate knowledge of quality control methods of drug.	PO3
CO7	Demonstrate knowledge and skills about <i>Apamishrana</i> (adulterants), <i>Abhava pratinidhidravaya</i> (substitutes), <i>Prashastabheshaja</i> (ideal drug) and plant extracts.	PO5,PO6
CO8	Identify the medicinal plants and orient about conservation, cultivation, sustainable utilization & Pharmacovigilance	PO4,PO6
CO9	Demonstrate fundamental principles of applied Pharmacology.	PO2

**Table 2 : Contents of Course**

<b>Paper 1 Fundamental Dravyaguna</b>					
<b>Sr. No</b>	<b>A2 List of Topics</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
1	<b>1.Dravyaguna Vigyana</b>	1	1	1	1
2	<b>2.Dravya</b>  <ul style="list-style-type: none"> <li>♦ 2.1 Panchabhoutikatwa of Dravya</li> <li>♦ 2.2 Classification of Dravya based on Utpattibheda, Yonibheda, Prayogabheda, Prabhavbheda, Doshagnabheda, Rasabheda and Karmbheda</li> </ul>	1	6	5	4
3	<b>3. Guna</b>  <ul style="list-style-type: none"> <li>♦ 3.1 Panchabhoutikatva, characteristics and classification</li> <li>♦ 3.2 Gurvadiguna and its karma on Dosha, Dhatu and Mala, clinical application and research updates</li> <li>♦ 3.3 Paradiguna with examples, clinical applications and research updates</li> </ul>	1	11	4	2
4	<b>4. Rasa</b>  <ul style="list-style-type: none"> <li>♦ 4.1 Meaning of “Rasa” in various contexts</li> <li>♦ 4.2 Shadrassa in relative correlation with taste of chemical constituents</li> <li>♦ 4.3 Rasotpatti and Panchabhoutika constitution of Shadrassa</li> <li>♦ 4.4 Rasopalabdhi and pathway of taste perception &amp; sites of taste receptors in the body</li> <li>♦ 4.5 Rasa -Lakshana, Guna &amp; Karmas of each Rasa on Dosha, Dhatu and Mala</li> <li>♦ 4.6 Atiyogalakshana,</li> <li>♦ 4.7 Clinical application and Research updates of Shadrassa</li> <li>♦ 4.8 Anurasa</li> <li>♦ 4.9 Rasa Sevanakrama of Aushadha</li> </ul>	1	11	7	4

5	<b>5. Vipaka</b> <ul style="list-style-type: none"> <li>♦ 5.1 Trividha Vipaka</li> <li>♦ 5.2 Vipak karma on Dosha, Dhatu and Mala</li> <li>♦ 5.3 Clinical application and Research updates</li> <li>♦ 5.4 Vipakopalabdhi (Determination of Vipaka) &amp; Taratamya (Degree of variation)</li> </ul>	1	6	3	1
6	<b>6. Virya</b> <ul style="list-style-type: none"> <li>♦ 6.1 Difference between Guna and Virya</li> <li>♦ 6.2 Karmas of Virya on Dosha, Dhatu and Mala</li> <li>♦ 6.3 Clinical application and Research updates</li> <li>♦ 6.4 Viryaopalabdhi (Determination of Virya) and understanding of Virya with respect to actions of active constituents</li> </ul>	1	6	2	2
7	<b>7. Prabhava</b> <ul style="list-style-type: none"> <li>♦ 7.1 Samanapratyayarabdha and Vichitrapratyayarabdha</li> <li>♦ 7.2 Clinical application of Prabhava and Research updates</li> </ul>	1	5	2	1
8	<b>8. Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava</b> <ul style="list-style-type: none"> <li>♦ Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava with respect to their strength- Pharmacodynamics</li> </ul>	1	1	1	2
9	<b>9. Karma</b> <ul style="list-style-type: none"> <li>♦ <b>9. Individual Karma, correlation with contemporary pharmacological action, examples, clinical application and research updates</b></li> <li>♦ 9.1 Deepana</li> <li>♦ 9.2 Pachana</li> </ul>	1	11	9	5

	<ul style="list-style-type: none"> <li>♦ 9.3 Samshodhana</li> <li>♦ 9.4 Samshamana</li> <li>♦ 9.5 Anulomana</li> <li>♦ 9.6 Sransana</li> <li>♦ 9.7 Bhedana</li> <li>♦ 9.8 Rechana</li> <li>♦ 9.9 Chhedana</li> <li>♦ 9.10 Lekhana</li> <li>♦ 9.11 Grahi</li> <li>♦ 9.12 Sthambhana</li> <li>♦ 9.13 Madakari</li> <li>♦ 9.14 Pramathi</li> <li>♦ 9.15 Abhishyandi</li> <li>♦ 9.16 Vyavayi</li> <li>♦ 9.17 Vikashi</li> <li>♦ 9.18 Rasayana</li> <li>♦ 9.19 Vajeekarana</li> <li>♦ 9.20 Medhya</li> </ul>				
10	<b>10. Karmas of Dashemani Gana</b>	1	5	12	3
11	<b>11. Principles of General Pharmacology</b> <ul style="list-style-type: none"> <li>♦ <b>11 Drug definition, drug dosage forms, route of drug administration, pharmacokinetics (ADME), pharmacodynamics, Drug dose, principles of drug action, mechanism of drug action &amp; bio-availability</b></li> <li>♦ <b>11.1 Drugs Acting on Central Nervous System:</b> Anaesthetics, Sedative Hypnotics, Antiepileptics, Antiparkinsonian, Antidepressants, Antianxiety Drugs, Opioid - Analgesics Drugs</li> <li>♦ <b>11.2 Drugs Acting on Peripheral (somatic) Nervous System: Skeletal Muscle Relaxants, Local Anaesthetics</b></li> <li>♦ <b>11.3 Autacoids and Related Drugs:</b> Nonsteroidal, Anti-inflammatory (NSAIDs)/Antipyretic and Analgesics Drugs</li> <li>♦ <b>11.4 Drugs for Respiratory Disorders:</b> Bronchodilators, Aerosols/ Inhalants Expectorants, Antitussive Drugs</li> <li>♦ <b>11.5 Cardiovascular Drugs:</b> Antihypertensive, Antianginal Drugs</li> <li>♦ <b>11.6 Drugs Acting on Kidney:</b> Diuretics</li> <li>♦ <b>11.7 Drugs Affecting Blood:</b> Haematinics, Coagulants, Anticoagulants, Hypolipidaemic Drugs</li> </ul>	3	20	15	1

	<ul style="list-style-type: none"> <li>♦ <b>11.8 Gastrointestinal Drugs:</b> Antacid, Carminatives, Digestants, Antiemetics, Laxatives, Antidiarrhoeal, Hepatoprotective Drugs</li> <li>♦ <b>11.9 Antibacterial Drugs:</b> Antibiotics, Antitubercular Drugs</li> <li>♦ <b>11.10 Antifungal, Antiviral, Antimalarial and Anthelmintic Drugs</b></li> <li>♦ <b>11.11 Hormones and Related Drugs:</b> Thyroid Hormone, Thyroid Inhibitors, Insulin, Oral Anti-diabetic, Hormonal Contraceptives, Uterine Stimulants, Uterine Relaxants Drugs</li> <li>♦ <b>11.12 Miscellaneous Drugs:</b> Antiseptics and Disinfectants, Vaccines, Vitamins, Water imbalance and IV fluids</li> </ul>				
12	<p><b>12. Mishraka Gana</b></p> <ul style="list-style-type: none"> <li>♦ <b>12. Mishrakagana: its composition, guna karma and therapeutic uses.</b></li> <li>♦ <b>12.1 Brihatpanchamoola.</b></li> <li>♦ <b>12.2 Laghupanchamoola.</b></li> <li>♦ <b>12.3 Vallipanchamoola.</b></li> <li>♦ <b>12.4 Kantakapanchamoola.</b></li> <li>♦ <b>12.5 Trinapanchamoola.</b></li> <li>♦ <b>12.6 Panchavalkala.</b></li> <li>♦ <b>12.7 Triphala.</b></li> <li>♦ <b>12.8 Trikatu.</b></li> <li>♦ <b>12.9 Trimada.</b></li> <li>♦ <b>12.10 Chaturusana.</b></li> <li>♦ <b>12.11 Panchakola.</b></li> <li>♦ <b>12.12 Shadusana</b></li> <li>♦ <b>12.13 Chaturbeeja.</b></li> <li>♦ <b>12.14 Trijataka.</b></li> <li>♦ <b>12.15 Chaturajataka.</b></li> <li>♦ <b>12.16 Panchatikta.</b></li> <li>♦ <b>12.17 Chaturbhadra.</b></li> <li>♦ <b>12.18 Trikarshika.</b></li> </ul>	3	6	6	2
13	<b>13. Nomenclature of dravya as per Nighantu, Vedic taxonomy and Botany</b>	3	1	0	2
14	<b>14. Prashasta Bshesaja, Bshesaja Pariksha and drug evaluation method with correlation as per Pharmacognosy</b>	3	1	1	2

15	15. Dravyasangrahana and Drug collection methods as per GFCP (Good Field collection practices)	3	1	1	0
16	16. GCP (Good cultivation practices), seed bank, conservation of medicinal plants, knowledge about RET (Rear, Endangered & Threatened ) medicinal plants.	3	1	1	0
17	17. Abhava Pratinidhi Dravya (substitutes)	3	1	1	1
18	18. Classifications and techniques of aqueous and alcoholic extracts	3	1	0	2
19	19. Adverse drug reaction and Pharmacovigilance with recent updates	3	1	1	2
20	20. NMPB (National Medicinal Plant Board), CCRAS (Central Council of Research in Ayurveda Sciences), API ( Ayurvedic Pharmacopeia of India), GCTM ( Global Centre for Traditional Medicine), PCIMH ( Pharmacopeia Commission of Indian Medicine and Homeopathy)	3	1	1	0
21	21. Vrikshayurveda and Ethno-medicine	3	1	1	1
22	22. Network pharmacology and Bioinformatics	3	2	1	1
<b>Total Marks</b>			<b>100</b>	<b>75 hr</b>	<b>39 hr</b>

<b>Paper 2 Applied Dravyaguna</b>					
<b>Sr. No</b>	<b>A2 List of Topics</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
23	1. Bshajavacharaniya (Criteria's to be considered for selection of drugs in vyadhis)	2	5	1	6
24	2.1 Dravya (Drug) Nama-Guna-Karma Jnana	2	55	45	10

- ♦ Amalaki
- ♦ Aragwadha
- ♦ Arjuna
- ♦ Ashoka
- ♦ Ashwagandha
- ♦ Ativisha
- ♦ Bala
- ♦ Beejaka
- ♦ Bhallataka
- ♦ Bharangi
- ♦ Bhrungaraja
- ♦ Bhumyamalaki
- ♦ Bilva
- ♦ Brahmi
- ♦ Chandana
- ♦ Chitraka
- ♦ Dadima
- ♦ Dhataki
- ♦ Dhamasa
- ♦ Eranda
- ♦ Gokshura
- ♦ Guduchi
- ♦ Guggulu
- ♦ Haridra
- ♦ Haritaki
- ♦ Hingu
- ♦ Jambu
- ♦ Jatamansi
- ♦ Jyotishmati
- ♦ Kanchanara
- ♦ Kantakari
- ♦ Kapikachhu
- ♦ Karkatshruni
- ♦ Katuki
- ♦ Khadira
- ♦ Kumari
- ♦ Kutaja
- ♦ Latakaranja
- ♦ Lodhra
- ♦ Agnimanth
- ♦ Ahiphena (NK)
- ♦ Ajamoda (DK)
- ♦ Apamarga (DK)
- ♦ Asthishrunkhala
- ♦ Bakuchi
- ♦ Bruhati
- ♦ Chakramarda
- ♦ Dhanyaka
- ♦ Ela
- ♦ Gambhari



	<ul style="list-style-type: none"> <li>♦ Japa</li> <li>♦ Jatiphala</li> <li>♦ Jeeraka (DK)</li> <li>♦ Kalamegha</li> <li>♦ Kampillaka</li> <li>♦ Kulatha (NK)</li> <li>♦ Kumkum</li> <li>♦ Lajjalu</li> <li>♦ Lavanga</li> </ul>				
25	<b>2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b> <ul style="list-style-type: none"> <li>♦ Madanphala</li> <li>♦ Mandukaparni</li> <li>♦ Manjishta</li> <li>♦ Maricha</li> <li>♦ Meshashrunji</li> <li>♦ Methika</li> <li>♦ Musta</li> <li>♦ Nagkeshar</li> <li>♦ Nimba</li> <li>♦ Nirgundi</li> <li>♦ Palasha</li> <li>♦ Pashanabheda</li> <li>♦ Patha</li> <li>♦ Pippali</li> <li>♦ Punarnava</li> <li>♦ Rasna</li> <li>♦ Rasona</li> <li>♦ Sarapagandha</li> <li>♦ Sairayak</li> <li>♦ Sariva</li> <li>♦ Shallaki</li> <li>♦ Shalmali(Mocharasa)</li> <li>♦ Shankhapushpi</li> <li>♦ Shatavari</li> <li>♦ Shigru</li> <li>♦ Shunthi</li> <li>♦ Talisapatra (NK)</li> <li>♦ Trivrut</li> <li>♦ Tulasi</li> <li>♦ Twak</li> <li>♦ Usheera</li> <li>♦ Vacha</li> <li>♦ Varuna</li> <li>♦ Vasa</li> <li>♦ Vatsanabha</li> </ul>	3	40	29	20

	<ul style="list-style-type: none"> <li>♦ Vibhitaki</li> <li>♦ Vidanga</li> <li>♦ Yashtimadhu</li> </ul>			
<b>Total Marks</b>		<b>100</b>	<b>75 hr</b>	<b>36 hr</b>



CO1,CO2,CO3	Define Guna and describe its Panchabhoutikatva.	CK	MK	K	L&PP T,DIS ,LS	T- EW,P-VIV A,PRN,QZ	F&S	I	
CO1	State characteristics of Gurvadi Guna.	CK	MK	K	L&PP T,SD L	P-VIVA,PRN, QZ	F&S	I	
CO1,CO2,CO3	Discuss Gurvadiguna in context to its Karma on Dosha, Dhatu and Mala with examples.	CC	MK	KH	L&PP T,L& GD,F C	T- EW,P-VIV A,PRN,OSPE	F&S	I	
CO1,CO2,CO3	Enumerate & Summarize, clinical application of Gurvadi Guna with research updates.	CC	MK	KH	L&G D,BL, LS	T- EW,P- VIVA,PRN	F&S	I	
CO1,CO2,CO3	Enlist Paradiguna with examples.	CK	MK	K	L&G D,PE R	T-EMI,P-VIV A,PRN,P-POS	F&S	I	
CO1,CO2,CO3	Interpret clinical applications of Paradiguna.	CAP	MK	KH	L&PP T,DIS	T-EMI,P-VIV A,PRN,QZ	F&S	I	
CO1,CO2,CO3	Discuss research updates of Paradiguna.	CC	MK	KH	L,TP W,LS	T-EMI,P-VIV A,PRN,CR- RED	F&S	I	
<b>Topic 4 4. Rasa</b> (Lecture :7 hours, Non lecture: 4 hours)									
CO1,CO2,CO3	Define Rasa and interpret Meaning of “Rasa” in various contexts.	CK	MK	K	L&G D	P-VIVA,PUZ, M-CHT,INT	F&S	I	
CO1,CO2	Classify and compare shadarasa in relative correlation with taste of chemical constituents.	CK	MK	K	L&PP T,ED	P-VIVA,PUZ, M-CHT,INT	F&S	I	

					U				
CO1,CO2	State Rasa Utpatti and Panchabhoutika constitution of Shadrasa.	CK	MK	K	L&G D,PE R	P-VIVA,PUZ, M-CHT,INT	F&S	I	
CO1,CO2	Discuss Rasopalabdhhi.	CC	MK	KH	L&G D,SD L	P-VIVA,PUZ, M-CHT,INT	F&S	I	
CO1,CO2,CO 3	Interpret pathway of taste perception & sites of taste receptors in the body	CC	MK	KH	L&PP T,L_ VC	T- EW,T-OBT ,P-VIVA,PRN ,PUZ,INT	F&S	I	
CO1,CO2	Describe Guna and Lakshana of each Rasa.	CC	MK	KH	L&PP T	T-EMI,T- EW, P-VIVA,PRN, INT	F&S	I	
CO1,CO2	Explain karma of each rasa on Dosha, Dhatu and Mala with examples.	CC	MK	KH	L&PP T,BS	T-EMI,T- EW, P-VIVA,PUZ, M-CHT,INT	F&S	I	
CO1,CO2	Discuss Atiyoga of each rasa.	CC	MK	KH	L&PP T,PB L,PE R	T-EMI,P-VIV A,PRN,PUZ,I NT	F&S	I	
CO1,CO2,CO 3	Interpret Clinical application of each rasa.	CAP	MK	KH	L&PP T,DIS ,SDL, LS	T-EMI,T- EW, T-OBT,P- VIVA,INT	F&S	I	
CO1,CO2	Discuss research updates of Shadrasa.	CC	MK	KH	DIS,S DL,L S	T- EW,P-VIV A,PUZ,INT,C R-RED	F&S	I	

CO1,CO2	Define Anurasa.	CK	MK	K	L,LS	T-EMI,P-VIVA,INT	F&S	I	
CO1,CO2	Interpret relevance of Anurasa in clinical practice.	CAP	MK	KH	L&G D,FC	T-EMI,P-VIVA,PUZ,INT	F&S	I	
CO1,CO2	Describe with justification Rasa sevanakrama as Aushadha.	CC	MK	KH	L&PP T,DIS	T-EMI,T-EW, P-VIVA,PRN, M-CHT,M-POS	F&S	I	
<b>Topic 5 5. Vipaka</b> (Lecture :3 hours, Non lecture: 1 hours)									
CO1	Define Vipaka.	CK	MK	K	L	P-VIVA	F&S	I	
CO1	State Vipaka lakshana.	CK	MK	K	L&G D	P-VIVA,INT	F&S	I	
CO1	Describe the action of Trividha Vipaka on Dosha, Dhatu and Mala with examples.	CC	MK	KH	L&PP T,TP W,FC	T-EW,P-VIVA,PRN	F&S	I	
CO1,CO3	Interpret clinical application of Vipaka.	CAP	MK	KH	L&PP T,DIS ,SDL, LS	P-VIVA,QZ	F&S	I	
CO2	State Research updates of Vipaka.	CK	MK	K	L&PP T	P-VIVA,CR-RED	F&S	I	
CO1	Explain Vipakopalabधि (Determination of Vipaka) and Taratamya (Degree of variation).	CC	MK	KH	L&PP T,FC	P-VIVA,PUZ, M-CHT	F&S	I	
<b>Topic 6 6. Virya</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1	Define the lakshanas of Virya.	CK	MK	K	L,SD	P-VIVA,INT	F&S	I	



CO1,CO2	Discuss research updates of Prabhava.	CC	MK	KH	L&G D,SD L	T- EW,P-VIV A,CR-RED	F&S	I	
<b>Topic 8 8. Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO1	Interpret the interrelation of Rasa-Guna-Virya-Vipaka-Prabhava with respect to their strength- Pharmacodynamics.	CAP	MK	KH	L&PP T,TP W,PL	P-VIVA,CL- PR	F&S	I	
<b>Topic 9 9. Karma</b> (Lecture :9 hours, Non lecture: 5 hours)									
CO1	Define Karma.	CK	MK	K	L	T-OBT,P- VIVA,QZ	F&S	I	
CO1	Discuss Karma lakshana.	CC	MK	KH	L&G D	T-OBT,P- VIVA,QZ	F&S	I	
CO1,CO2,CO 4,CO5	Explain Deepan karma in relation with Appetizers.	CC	MK	KH	L&G D,BL	T- EW,T-OBT ,P-VIVA,QZ	F&S	I	
CO1,CO2,CO 3,CO4	Critically analyze Deepan dravyas with its gunas and application in various clinical conditions.	CAP	MK	KH	L&PP T,PB L,GB L	T-OBT,P- VIVA,QZ ,DEB	F&S	I	
CO1,CO2,CO 3,CO4	Explain Pachan karma in relation with Digestives.	CC	MK	KH	L&PP T	T-OBT,P- VIVA,QZ	F&S	I	
CO1,CO2,CO 3,CO4	Critically analyze Pachan dravyas with gunas and discuss its application in various clinical conditions.	CAN	MK	KH	L&PP T,PB L,PE R	T-EMI,T- OBT,P-VIVA	F&S	I	
CO1,CO2,CO	Explain Samshodhan karma in relation with contemporary	CC	MK	KH	L_VC	T-OBT,P-	F&S	I	



4	pharmacological action.				,PL	VIVA,QZ			
CO1,CO3,CO4	Discuss Samshohan karma and its clinical application.	CC	MK	KH	PBL,RP,PE R	T-EW,T-CS,T-OBT,P-VIVA	F&S	I	
CO1,CO2,CO3,CO4	Explain Samshamana karma in relation with contemporary pharmacological action.	CC	MK	KH	L&G D,BL	T-EMI,T-OBT,P-VIVA	F&S	I	
CO1,CO2,CO3,CO4	Describe Samshamana karma and its clinical application.	CC	MK	KH	L&PP T,CB L,PL	T-EMI,T-CS,P-VIVA,QZ	F&S	I	
CO1,CO2,CO3	Explain Anuloman karma in relation with Carminative.	CC	MK	KH	L_VC ,DIS	T-EMI,T-OBT,P-VIVA,DEB	F&S	I	
CO1,CO3	Describe Anuloman karma and its clinical application.	CC	MK	KH	L&PP T,PB L,LS	T-OBT,P-VIVA,QZ	F&S	I	
CO1,CO2,CO3,CO4	Explain Sransana karma in relation with contemporary pharmacological action.	CC	MK	KH	L&PP T	T-EMI,T-OBT,P-VIVA,DEB	F&S	I	
CO1,CO3	Discuss Sransan karma and its clinical application.	CC	MK	KH	L&PP T,PB L,LS	T-OBT,P-VIVA,QZ,DEB	F&S	I	
CO1,CO2,CO3,CO4	Explain Bhedana karma in relation with strong laxative action	CC	MK	KH	L_VC ,FC	T-EMI,T-OBT,P-VIVA,DEB	F&S	I	
CO1,CO3	Discuss Bhedan karma and its clinical application.	CC	MK	KH	L&PP T,DIS	T-OBT,P-VIVA,QZ	F&S	I	
CO1,CO2,CO3,CO4	Explain Rechan karma in relation with Purgative.	CC	MK	KH	L&PP T	T-EMI,T-OBT,P-VIVA	F&S	I	

CO1,CO3	Discuss Rechan karma and its clinical application.	CC	MK	KH	L&PP T,DIS	T-OBT,P- VIVA,QZ	F&S	I	
CO1,CO3	Discuss Chhedan karma and its clinical application.	CC	MK	KH	L&PP T,CB L,LS	T-EMI,T- OBT,P-VIVA	F&S	I	
CO1,CO2,CO 3,CO4	Explain Lekhan karma in relation with contemporary pharmacological action.	CC	MK	KH	L&G D,BL	T-EMI,T- OBT,P-VIVA	F&S	I	
CO1,CO3	Discuss Lekhan karma and its clinical application.	CC	MK	KH	L&PP T,DIS ,PL	T-OBT,P- VIVA,QZ ,DEB	F&S	I	
CO1,CO2,CO 3,CO4	Explain Grahi karma in relation with contemporary pharmacological action bowel binding.	CC	MK	KH	L_VC	T-EMI,T- OBT,P-VIVA	F&S	I	
CO1,CO3	Discuss of Grahi karma and its clinical application.	CC	MK	KH	L&G D,TB L	T-OBT,P- VIVA,QZ	F&S	I	
CO1,CO2,CO 3,CO4	Explain Stambhan karma in relation with contemporary pharmacological action.	CC	MK	KH	L&PP T,FC	T-EMI,T-OBT ,P-VIVA,DEB	F&S	I	
CO1,CO3	Discuss Stambhan karma and its clinical application.	CC	MK	KH	L&G D,PB L	T-EMI,T-OBT ,P-VIVA,DEB	F&S	I	
CO1	Discuss Madakari karma with examples.	CC	MK	KH	L,DIS	T-OBT,P- VIVA,QZ	F&S	I	
CO1,CO3	Discuss Pramathi karma and its clinical application.	CC	MK	KH	L&PP T,DIS	T-EMI,T- OBT,P-VIVA	F&S	I	
CO1	Discuss Abhishyandi karma with examples.	CK	MK	K	L,DIS	T-EMI,T-OBT	F&S	I	

						,P-VIVA,DEB			
CO1	Discuss Vyavayi karma with examples.	CC	MK	KH	L,PE R	T-EMI,T-OBT ,P-VIVA,DEB	F&S	I	
CO1	Discuss Vikashi karma with examples.	CC	MK	KH	L,DIS	T-OBT,P- VIVA,QZ	F&S	I	
CO1,CO2	Explain Rasayan karma in relation with Rejuvenators.	CC	MK	KH	L&PP T,DIS ,BL	T-EMI,P- VIVA,QZ	F&S	I	
CO1,CO3	Analyze types of Rasayan dravyas with its gunas and discuss its clinical application with research updates.	CAN	MK	KH	L&G D	T-EMI,T-OBT ,P-VIVA,DEB ,CR-RED	F&S	I	
CO1,CO2	Explain Vajeekaran karma in relation with Aphrodisiacs.	CC	MK	KH	L&G D,PL	T-OBT,P- VIVA,QZ	F&S	I	
CO1,CO2,CO 3	Critically Analyze the types of Vajeekaran dravyas with their guna karmas and discuss its clinical application with research updates	CAN	MK	KH	L&PP T,PB L,ML, LS	T-OBT,P- VIVA,QZ ,DEB,CR- RED	F&S	I	
CO1,CO2	Explain Medhya karma in relation with contemporary pharmacological actions.	CC	MK	KH	L&PP T	T-EMI,T-OBT ,P-VIVA,DEB	F&S	I	
CO1,CO2,CO 3	Critically analyze Medhya dravya and discuss its clinical application with research updates.	CAN	MK	KH	L&PP T,PL, PER	T-OBT,P- VIVA,QZ ,WP,CR-RED	F&S	I	
<b>Topic 10 10. Karmas of Dashemani Gana</b> (Lecture :12 hours, Non lecture: 3 hours)									
CO1,CO8	Discuss Charakokta Dashemani karmas with their rasa, guna, vipak, virya, dhosha karma, botanical identity & pharmaco-	CC	MK	KH	L&PP T,DIS	P-VIVA,P- REC,QZ ,M-	F&S	I	

	therapeutic action of individual drugs.				,FC,R EC	CHT,M-POS			
<b>Topic 11 11. Principles of General Pharmacology</b> (Lecture :15 hours, Non lecture: 1 hours)									
CO4,CO9	Define Pharmacology and discuss Principles of general Pharmacology.	CK	MK	K	L&PP T	PRN,QZ	F&S	I	
CO4,CO9	Discuss drug definition, drug dosage forms and route of drug administration.	CC	MK	KH	L_VC	T- EW,P- VIVA,QZ	F&S	I	
CO4,CO9	Explain pharmacokinetics (ADME) drug and pharmacodynamics.	CC	MK	KH	L_VC ,DIS	P-VIVA,PRN	F&S	I	
CO4,CO9	Discuss Drug dose, Principles of drug action, Mechanism of drug action & Bioavailability	CC	MK	KH	L_VC ,PER	P-VIVA,QZ	F&S	I	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting on CNS with examples of Anaesthetics, Sedative-Hypnotic, Antiepileptic, Antiparkinsonian, Antidepressants, Antianxiety and Opioid Analgesics Drugs	CC	MK	KH	L&PP T,PB L,PrB L,FC	T- EW,T-OBT ,P-VIVA,QZ ,C-INT	F&S	III	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting on Peripheral (somatic) Nervous System with examples of Skeletal Muscle Relaxants and Local Anaesthetics Drugs.	CC	MK	KH	L&PP T,PB L,FC	T- EW,T-OBT ,P-VIVA,QZ	F&S	III	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting on Autacoids and Related of Nonsteroidal Antiinflammatory (NSAIDs), Antipyretic and Analgesics Drug	CC	MK	KH	L&PP T,PB L,FC	T- EW,T-OBT ,P-VIVA,PRN	F&S	III	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting on Respiratory Disorders -	CC	MK	KH	L&PP T,PB	T-OBT,P- VIVA,PRN	F&S	III	

	Bronchodilators, Aerosols/ Inhalants, Expectorants and Anti tussives Drugs				L,BL				
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting on Cardiovascular Drugs as Antihypertensive and Antianginal Drugs	CC	MK	KH	L_VC ,FC	T-OBT,P- VIVA,PRN	F&S	III	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting on Kidney as Diuretics	CC	MK	KH	L&PP T,TP W,BL	T-OBT,P- VIVA,QZ	F&S	III	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting as Haematinics, Coagulants, Anticoagulants and Hypolipidaemic Drugs	CC	MK	KH	L&PP T,PB L,BL	T- EW,T- OBT,P-VIVA	F&S	III	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting on Gastrointestinal tract as Antacid, Carminatives, Digestants, Antiemetics, Laxatives, Antidiarrhoeal and Hepatoprotective Drugs	CC	MK	KH	L&PP T,L& GD,L _VC	T- EW,T-OBT ,P-VIVA,QZ	F&S	III	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting as Antibiotics and Antitubercular.	CC	MK	KH	L&PP T,FC, GBL	T- EW,P- VIVA,QZ	F&S	III	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting as <b>Antifungal, Antiviral, Antimalarial and Anthelmintic Drugs</b>	CC	MK	KH	L&PP T,PB L,GB L	T- EW,T-OBT ,P-VIVA,QZ	F&S	III	
CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting on Hormones and Related Drugs as Thyroid Hormone, Thyroid Inhibitors, Insulins, Oral Antidiabetic, Hormonal Contraceptives, Uterine Stimulants and Uterine Relaxants Drugs.	CC	MK	KH	L&PP T,BL, PER	T- EW,T-OBT ,P-VIVA,PRN	F&S	III	

CO9	Define, Describe mode of action & Discuss types with examples of following drugs acting on as Antiseptics , Disinfectants, Vaccines, Vitamins, Water imbalance and IV	CC	MK	KH	L&PP T,BL, PER	T- EW,T- OBT,P-VIVA	F&S	III	
<b>Topic 12 12. Mishraka Gana</b> (Lecture :6 hours, Non lecture: 2 hours)									
CO1,CO3	Explain Brihatpanchamoola composition.	CC	MK	KH	L&PP T,ED U	T- EW,P-VIV A,P-POS,QZ ,M-CHT	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Brihatpanchamoola.	CC	MK	KH	L&PP T,DIS ,TBL	T- EW,P-VIV A,P-POS,QZ ,M-CHT	F&S	III	
CO1,CO3	Explain Laghupanchamoola composition.	CC	MK	KH	L&G D	T- EW,P-VIV A,P-POS,QZ ,M-CHT	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Laghupanchamoola.	CC	MK	KH	L&PP T,DIS ,PL	T- EW,P-VIV A,P-POS,QZ	F&S	III	
CO1,CO3	Explain Vallipanchamoola composition.	CC	MK	KH	L&PP T	T- EW,P-VIV A,P-POS,QZ ,M-CHT	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Vallipanchamoola.	CC	MK	KH	L&G D,PE R	T- EW,P- VIVA,QZ	F&S	III	
CO1,CO3	Explain Kantakapanchamoola composition.	CC	MK	KH	L&PP T,BS,	T- EW,P- VIVA,QZ	F&S	III	

					TPW				
CO1,CO3	Describe Guna karma and combined therapeutic effect of Kantakapanchamoola.	CC	MK	KH	L&PP T,LS, PER	P-POS,QZ ,M- CHT	F&S	III	
CO1,CO3	Explain Trinapanchamoola composition.	CC	MK	KH	L_V C, PER	P-VIVA,P- EXAM,QZ	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Trinapanchamoola.	CC	MK	KH	L&PP T,CB L,PL	T- EW,P- VIVA,M-CHT	F&S	III	
CO1,CO3	Explain Panchavalkala composition.	CC	MK	KH	L&PP T,BL, GBL	P-VIVA,P- POS,QZ	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Panchavalkala.	CC	MK	KH	L&PP T,FC	T-CS,T-OBT, P-VIVA,QZ	F&S	III	
CO1,CO3	Explain Triphala composition	CC	MK	KH	L,DIS	T- EW,P- VIVA,P-POS	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Triphala.	CC	MK	KH	L&PP T,PE R	T-OBT,P-VIV A,P- EXAM,QZ	F&S	III	
CO1,CO3	Explain Trikatu composition.	CC	MK	KH	L&PP T,PL	T-EMI,P- VIVA,QZ	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Trikatu	CC	MK	KH	L&PP T,PL	T-OBT,P- VIVA,P-POS	F&S	III	
CO1,CO3	Explain Trimada composition	CC	MK	KH	L,DIS	T- EW,P- VIVA,QZ	F&S	III	

CO1,CO3	Describe Guna karma and combined therapeutic effect of Trimada.	CC	MK	KH	L&PP T,DIS ,TUT	T- EW,P- VIVA,QZ	F&S	III	
CO1,CO3	Explain Chaturusana composition.	CC	MK	KH	L&PP T	T-OBT,P- VIVA,P-POS	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Chaturusana.	CC	MK	KH	L&PP T,FC	P-VIVA,P- POS,QZ	F&S	III	
CO1,CO3	Explain Panchakola composition.	CC	MK	KH	L&PP T,L_ VC	P-VIVA,QZ	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Panchakola.	CC	MK	KH	L&PP T,DIS	T- EW,T-CS,P- VIVA,QZ	F&S	III	
CO1,CO3	Explain Shadusana composition.	CC	MK	KH	L&PP T,PL	T-OBT,P- VIVA,P-POS	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Shadusana	CC	MK	KH	L&PP T,FC	T- EW,P- VIVA,QZ	F&S	III	
CO1,CO3	Explain Chaturbeeja composition.	CC	MK	KH	L&PP T,L_ VC	T-OBT,P-VIV A,P-EXAM	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Chaturbeeja	CC	MK	KH	L&PP T,PE R	T- EW,P- VIVA,QZ	F&S	III	
CO1,CO3	Explain Trijataka composition.	CC	MK	KH	L_ VC ,DIS, SDL	T-OBT,P-VIV A,P-EXAM,P- POS	F&S	III	



CO1,CO3	Describe Guna karma and combined therapeutic effect of Trijataka	CC	MK	KH	L&PP T,PL	T- EW,P- VIVA,P-POS	F&S	III	
CO1,CO3	Explain Chaturajataka composition.	CC	MK	KH	L_V C, PER	T-OBT,P- VIVA,QZ	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Chaturajataka.	CC	MK	KH	L&PP T,DIS	T- EW,P- VIVA,P-POS	F&S	III	
CO1,CO3	Explain Panchatikta composition.	CC	MK	KH	L&PP T,FC	T-OBT,P-VIV A,P-REC,QZ	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Panchatikta.	CC	MK	KH	L&PP T,PL	T- EW,P- VIVA,P-POS	F&S	III	
CO1,CO3	Explain Chaturbhadra composition.	CK	MK	K	L,DIS	T-OBT,P- VIVA,QZ	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Chaturbhadra.	CC	MK	KH	L&PP T,FC	T-EMI,P- VIVA,QZ	F&S	III	
CO1,CO3	Explain Trikarshika composition.	CC	MK	KH	L,DIS	T-OBT,P-VIV A,P-EXAM	F&S	III	
CO1,CO3	Describe Guna karma and combined therapeutic effect of Trikarshika.	CC	MK	KH	L&PP T,DIS ,PL	T-OBT,P- VIVA,QZ	F&S	III	

**Topic 13 13. Nomenclature of dravya as per Nighantu, Vedic taxonomy and Botany** (Lecture :0 hours, Non lecture: 2 hours)

CO1	Describe the Nomenclature of dravya as per Raj Nighantu.	CC	MK	KH	L&PP T,FC, RP	P-VIVA,PRN, P-ID,QZ	F&S	III	
CO1	Explain the Nomenclature of dravya as per Vedic taxonomy.	CC	MK	KH	L&PP T	P-VIVA,P- ID,QZ	F&S	III	

CO1	Discuss the Nomenclature of dravya as per botany.	CC	MK	KH	L&PP T,BL, PER	P-VIVA,P- ID,QZ	F&S	III	
<b>Topic 14 14. Prashasta Bheshaja, Bheshaja Pariksha and drug evaluation method with correlation as per Pharmacognosy</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO1,CO5	Describe Prashasta Bheshaja.	CC	MK	KH	L&G D,PL	P-VIVA,QZ	F&S	III	
CO1,CO5	Explain Bheshaja Pariksha of Charaka samhita vimana sthana.	CC	MK	KH	L&G D,SD L,LS	P-VIVA,QZ ,M-CHT	F&S	III	
CO1,CO5	Discuss drug evaluation method in correlation with Pharmacognosy.	CC	MK	KH	L&PP T,DIS	P-VIVA,QZ	F&S	III	
<b>Topic 15 15. Dravyasangrahana and Drug collection methods as per GFCP (Good Field collection practices)</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Discuss Dravyasangrahana and Drug collection methods as per GFCP (Good Field collection practices).	CC	DK	KH	L&PP T,PE R	P-VIVA,PUZ, CHK	F&S	III	
CO1,CO2	Discuss Drug collection methods as per GFCP (Good Field collection practices).	CC	DK	KH	L&PP T,DIS ,PrBL	P-VIVA,PUZ, CHK	F&S	III	
<b>Topic 16 16. GCP (Good cultivation practices), seed bank, conservation of medicinal plants, knowledge about RET (Rear, Endangered &amp; Threatened ) medicinal plants.</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO2	Discuss good cultivation practices, seed bank, conservation of medicinal plants, knowledge about RET (Rear, Endangered & Threatened) medicinal plants.	CC	DK	KH	L&PP T,L_ VC,F C	P-VIVA,M- POS	F&S	III	

<b>Topic 17 17. Abhava Pratinidhi Dravya (substitutes)</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO1,CO7	Discuss the concept of Abhava pratinidhi dravya (substitutes) as per Bhavaprakasha.	CC	MK	KH	L&G D,BS, EDU	P-VIVA,QZ	F&S	III	
<b>Topic 18 18. Classifications and techniques of aqueous and alcoholic extracts</b> (Lecture :0 hours, Non lecture: 2 hours)									
CO2,CO6	Appraise the techniques of aqueous and alcoholic extracts of medicinal plants.	CC	DK	KH	L_VC ,D	P-VIVA,DOPS	F&S	III	
<b>Topic 19 19. Adverse drug reaction and Pharmacovigilance with recent updates</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO2,CO8	Explain adverse drug reaction and pharmacovigilance in ayurveda with recent updates.	CC	MK	KH	L&PP T,L& GD,L S	P-VIVA,PRN, QZ ,M-CHT	F&S	III	V-RS
<b>Topic 20 20. NMPB (National Medicinal Plant Board), CCRAS (Central Council of Research in Ayurveda Sciences), API ( Ayurvedic Pharmacopeia of India), GCTM ( Global Centre for Traditional Medicine), PCIMH ( Pharmacopeia Commission of Indian Medicine and Homeopathy)</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO2	State NMPB (National Medicinal Plant Board), CCRAS (Central Council of Research in Ayurveda Sciences), API ( Ayurvedic Pharmacopeia of India), GCTM ( Global Centre for Traditional Medicine) and PCIMH (Pharmacopeia Commission of Indian Medicine and Homeopathy).	CK	NK	K	SDL	P-VIVA,QZ ,INT	F&S	III	
<b>Topic 21 21. Vrikshayurveda and Ethno-medicine</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO2	Explain concept of Vrikshayurveda and Ethno medicine.	CC	NK	KH	L&G D,ML ,PER	P-VIVA,CR- RED	F&S	III	
<b>Topic 22 22. Network pharmacology and Bioinformatics</b> (Lecture :1 hours, Non lecture: 1 hours)									

CO2	Describe Network Pharmacology and Bioinformatics.	CC	NK	KH	L&G D,SD L,LS	P-VIVA,CR- RED	F&S	III	
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### Paper 2 Applied Dravyaguna

<b>A3</b> Course outcome	<b>B3</b> Learning Objective (At the end of the session, the students should be able to)	<b>C3</b> Doma in/sub	<b>D3</b> Must to know / desirable to know / Nice to know	<b>E3</b> Level Does/ Show s how/ Know s how/ Know	<b>F3</b> T-L meth od	<b>G3</b> Assessment  (Refer abbreviations)	<b>H3</b> Form ative/ summ ative	<b>I3</b> Term	<b>J3</b> Integr ation
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#### Topic 1 1. Beshjavacharaniya (Criteria's to be considered for selection of drugs in vyadhis) (Lecture :1 hours, Non lecture: 6 hours)

CO5	Interpret the selection of appropriate drugs in different vyadhis as per criteria's mentioned in Beshjavacharaniya (as per As. Sa. Su 23)	CAP	MK	KH	L&PP T,CB L,PrB L,SD L	T- EW,P- VIVA,QZ	F&S	II	H-RN ,H- SW
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#### Topic 2 2.1 Dravya (Drug) Nama-Guna-Karma Jnana (Lecture :45 hours, Non lecture: 10 hours)

CO3	Specify useful parts with its Rasapanchaka of following drugs.	CK	MK	K	L&G D,CB L,FC	T-OBT,P- VIVA	F&S	II	
CO4	Describe karma,agryakarma and dosha karma of following drugs.	CC	MK	KH	L&PP	T-EMI,T-OBT	F&S	II	

					T,DIS ,ML	,P-VIVA,QZ			
CO5	Explain Amayikaprayoga used in Vyadhi (Disease) pertaining to various Srotas and Vyadhiavastha (Stage).	CC	MK	KH	L&G D,BS, CBL	T-EMI,T- OBT,P-VIVA	F&S	II	
CO5	Indicate the Kalpana (dosage form), Matra (Dose), Anupana (Vehicle), Marga(Route), Sevana kala (Time of administration), Kalavadhi (Duration) and Pathya-pathya ) of following drugs.	CAP	MK	KH	L&PP T,DIS ,GBL	T-EMI,T-OBT ,P-VIVA,PRN	F&S	II	V-RS, H-SW
CO2	Enlist active phyto-constituents & important formulations Discuss research updates of following drugs.	CK	MK	K	L&PP T,ML	T-OBT,P-VIV A,CR-RED	F&S	II	
CO8	Enlist botanical name & family. Explain main synonyms as per Bruhatryees and Bhavaprakasha. Vernacular name (Hindi,English and local name) of following drugs.	CK	MK	KH	L&PP T,DIS	T-OBT,P- VIVA,QZ ,O- QZ	F&S	II	
CO8	Demonstrate external morphology-habit, root, leaf, stem, flower, inflorescence, fruit, seed and officinal useful parts of following drugs.	CC	MK	KH	L_VC ,DIS, BS	T-OBT,P- VIVA,O-QZ	F&S	II	
CO7	Describe varieties, grahyagrahyatwa Adulterants, substitute and toxic effects of following drugs wherever applicable	CC	MK	KH	L&G D	T- EW,T-OBT ,P-VIVA,QZ	F&S	II	H-AT
<b>Topic 3 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b> (Lecture :29 hours, Non lecture: 20 hours)									
CO3	Specify useful parts with its Rasapanchaka of following drugs	CK	MK	K	L&PP T,DIS	T-EMI,T-OBT ,P-VIVA,QZ	F&S	III	
CO4	Describe karma, agryakarma and dosha karma of following drugs.	CC	MK	KH	L&PP T,DIS ,BS	T-OBT,P- VIVA,QZ	F&S	III	
CO5	Explain Amayikaprayoga used in Vyadhi (Disease) pertaining to	CC	MK	KH	L&PP	T-OBT,P-	F&S	III	

	various Srotas and vyadhiavastha (Stage).				T,DIS ,CBL	VIVA,QZ			
CO5	Indicate the Kalpana(dosage form), Matra (Dose), Anupana (Vehicle), Marga (Route), Sevana kala (Time of administration), Kalavadhi (Duration) and Pathya-pathya ) of following drugs.	CAP	MK	KH	L&PP T,DIS ,ML	T-EMI,P- VIVA	F&S	III	V-RS, H-SW
CO2	Enlist active phyto-constituents & important formulations. Discuss research updates of following drugs.	CK	MK	K	L&G D,BS	T-EMI,T-OBT ,P-VIVA,QZ	F&S	III	
CO8	Enlist botanical name & family. Explain main Synonyms as per Bruhatryees and Bhavaprakasha. Vernacular name (Hindi, English and local name) of following drugs.	CK	MK	K	L&G D,FC, ML	T-OBT,P- VIVA,QZ	F&S	III	
CO8	Demonstrate external morphology-habit, root, leaf, stem, flower, inflorescence, fruit, seed and officinal useful parts of following drugs.	CC	MK	KH	L_VC ,ML	T-OBT,P- VIVA,QZ	F&S	III	
CO7	Describe varieties, grhyahrahyatwa, adulterants, substitute and toxic effects of following drugs wherever applicable.	CC	MK	KH	L&PP T,DIS ,EDU	T-EMI,T-OBT ,P-VIVA,PUZ	F&S	III	H-AT

**List of Practicals (Term and Hours)**

<b>PRACTICALS (Marks-100)</b>			
<b>S.No</b>	<b>List of Topics</b>	<b>Term</b>	<b>Hours</b>
1	1. Assessment and Understanding the relation between Parthivatwa & subjective/ objective parametric tests	1	10
2	2. Assessment of objective parametric measures of Guna	1	12
3	3. Assessment of Rasa	1	6
4	4. Comparative organoleptic and macroscopic examination	1	23
5	5. Microscopic Identification of genuine and adulterated drug	1	4
6	6. Demonstration of skills to identify the medicinal plants in the college garden.	1	10
7	7. Out campus visit (Cultivated gardens, Tissue culture lab, Herbaria, Pharmacognosy lab, Quality control lab and Forest plant demonstration)	1	10
8	8. Dravya prayoga	1	12
9	9. Physico-chemical study	2	8
10	10. Phytochemical	2	4
11	11. Thin Layer Chromatography (TLC) technique	2	2
12	12. Demonstration of skills to identify the medicinal plants in the college garden	2	10
13	13. Out campus visit (cultivated gardens & In-situ plant demonstration)	2	10
14	14. Ekala dravya prayoga	2	10
15	15. Different Cultivation technique including methods mentioned in Vrikshayurveda	2	6
16	16. Exercise on Network pharmacology	3	6
17	17. Preparations of digital herbarium	3	2
18	18. Demonstration of skills to identify the medicinal plants in the college garden	3	10
19	19. Out campus visit (cultivated gardens & In-situ plant demonstration)	3	10
20	20. Ekala dravya prayoga	3	10

**Table 4: Learning objectives (Practical)**

A4 Course outcome	B4 Learning Objective (At the end of the session, the students should be able to)	C4 Doma in/sub	D4 Must to know / desirable to know / Nice to know	E4 Level Does/ Shows how/ Knows how/ Know	F4 T-L meth od	G4 Assessment (Refer abbreviations)	H4 Form ative/ summ ative	I4 Term	K4 Integr ation
<b>Topic 1 1. Assessment and Understanding the relation between Parthivatwa &amp; subjective/ objective parametric tests</b>									
CO1,CO6	Observe the objective parametric measures to understand the relation between Parthivatwa by Density (bulk) of Asthishrnkhala, Sariva, Vidari, Maricha, Shatavari, Jambu, Godhuma & Ushira.	PSY-GUD	MK	KH	PT	P-VIVA	F&S	I	
CO1,CO6	Observe the objective parametric measures to understand the relation between Jaliyatwa by Viscosity, Moisture content of Kumari, Vidari, Sariva, Shunthi, Ikshu, Usheera, Kamala & Apamarga.	PSY-GUD	MK	KH	PT	P-VIVA	F&S	I	
CO1,CO6	Observe the objective parametric measures to understand the relation between Aagneyatwa by Moisture content of Shunthi, Shatavari, Maricha, Dhataki, Chitraka, Gokshura, Hingu & Chandana.	PSY-GUD	MK	KH	PT	P-VIVA	F&S	I	
CO1,CO6	Observe the objective parametric measures to understand the relation between Vayaviyatwa by Fat content & Bulk density of Usheera, Ashwagandha, Nimba, Vidari, Khadira, Tila, Jambu & Kapikacchu.	PSY-GUD	MK	KH	PT,D_ L	P-VIVA	F&S	I	



CO1,CO6	Observe the objective parametric measures to understand the relation between Aakashiyatwa by Bulk density of Usheera, Kumari, Apamarga, Jeeraka & Jatamansi.	PSY-GUD	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Participate in the methods of specific gravity (Solid) and bulk density of Asthishrukhalala, Sariva, Vidari, Maricha, Shatavari, Jambu, Godhum & Ushir by objective parameters measures to understand the relation between Parthivatwa.	AFT-RES	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Follow the methods of Viscosity, Moisture content & Specific gravity (Liquid) of Kumari, Vidari, Sariva, Shunthi, Ikshu, Usheera, Kamala & Apamarga by objective parameters measures to understand the relation between Jaliyatwa.	AFT-REC	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Describe the methods of pH and Moisture content of Shunthi, Shatavari, Maricha, Dhataki, Chitraka, Gokshura, Hingu & Chandan by objective parameters measures to understand the relation between Agneeyatwa.	AFT-REC	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Answer to the methods of Fat content , Specific gravity (liquid) & Bulk density of Usheera, Ashwagandha, Nimba, Vidari, Tila, Jambu & Kapikachhu by objective parameters measures to understand the relation between Vayaviyatwa.	AFT-RES	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Follow the methods of Bulk density of Ushira, Kumari, Apamarga, Jeeraka & Jatamansi by objective parameters measures to understand the relation between Akashiyatwa	AFT-REC	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Perform the objective parametric measures to understand the relation between Parthivatwa by Specific gravity (solid) of Asthishrnkhala, Sariva, Vidari, Maricha, Shatavari, Jambu, Godhuma & Ushira.	PSY-ADT	MK	SH	PRA	P-EXAM,P-PRF	F&S	I	

CO1,CO6	Perform the objective parametric measures to understand the relation between Jaliyatwa Specific gravity (Liquid) of Kumari, Vidari, Sariva, Shunthi, Ikshu, Usheera, Kamala & Apamarga.	PSY-ADT	MK	SH	PT	P-EXAM,P-PRF	F&S	I	
CO1,CO6	Perform the objective parametric measures to understand the relation between Aagneyatwa by pH of Shunthi, Shatavari, Maricha, Dhataki, Chitraka, Gokshura, Hingu & Chandana.	PSY-ADT	MK	SH	PT	P-EXAM,P-PRF	F&S	I	
CO1,CO6	Perform the objective parametric measures to understand the relation between Vayaviyatwa by Specific gravity (Liquid) of Usheera, Ashwagandha, Nimba, Vidari, Khadira, Tila, Jambu & Kapikacchu.	PSY-ADT	MK	SH	PT	P-EXAM,P-PRF	F&S	I	
<b>Topic 2 2. Assessment of objective parametric measures of Guna</b>									
CO1,CO6	Observe the assessment of objective parametric measures of Shatavari and Bala for its guru guna by Density (bulk).	PSY-GUD	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Observe the Specific gravity (Liquid and solid) of Shatavari and Bala for its guru guna.	PSY-GUD	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Observe the assessment of objective parametric measures of Yava and Dhanyaka for its Laghu guna by Density ( bulk)	PSY-GUD	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Demonstrate the Specific gravity (Liquid and solid) Yava and Dhanyaka for its Laghu guna.	PSY-GUD	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Observe the assessment of objective parametric measures of Snigdha guna drugs by total fat content, moisture content of Tila and Eranda	PSY-GUD	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO1,CO6	Demonstrate Swelling index of Snigdha guna drugs of Tila, and Eranda.	PSY-GUD	MK	KH	D_L,P RA	P-VIVA	F&S	I	
CO1,CO6	Observe the assessment of objective parametric measures of	PSY-	MK	KH	PT,D_ L	P-VIVA	F&S	I	

	Ruksha guna drugs by total fat content and moisture content of Kulattha & Vidanga	GUD			L				
CO1,CO6	Demonstrate Swelling index of Ruksha guna drugs of Kulattha & Vidanga	PSY-GUD	MK	KH	PT,D_L	P-VIVA	F&S	I	
<b>Topic 3 3. Assessment of Rasa</b>									
CO2,CO6	Perform the assessment of Rasa based on classical symptoms for each rasa dravyas.	PSY-ADT	MK	SH	PT,D_L	P-EXAM,P-PRF,INT	F&S	I	
<b>Topic 4 4.Comparative organoleptic and macroscopic examination</b>									
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of root of Ashwagandha, Chitraka, Manjistha, Musta, Shatavari, Vatsanabha and Yashtimadhu.	PSY-ADT	MK	SH	L_VC,PT,D_L	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Rhizome/Stolon of Haridra, Katuki, Shunthi and Vacha.	PSY-ADT	MK	SH	PT,D_L	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Stem of Asthishrinkhala and Guduchi.	PSY-ADT	MK	SH	PT,D_L	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Bark of Arjuna, Ashoka, Kutaja, Nimba and Twak.	PSY-ADT	MK	SH	BS,PT,D_L	P-EXAM,P-PRF	F&S	I	

CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Heart wood of Beejaka, Chandana and Khadira	PSY-ADT	MK	SH	BS,PT ,D_L	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Leaf of Kumari, Meshashringi and Vasa.	PSY-ADT	MK	SH	BS,PT ,D_L	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Flower of Dhataki, Kunkum (kesara) and Lavanga.	PSY-ADT	MK	SH	PT,D_ L	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Fruit of Amalaki, Aragavadha, Bhallataka, Bibhitaki, Gokshura, Haritaki, Madanphala, Maricha, Pippali and Vidanga.	PSY-ADT	MK	SH	D_L,P RA	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Phalaraja of Kampillaka.	PSY-ADT	MK	SH	PT,D_ L	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Seed of Bakuchi,Ela, Eranda, Jyotishmati	PSY-ADT	MK	SH	PT,D_ L	P-EXAM,P-PRF	F&S	I	

	and Kapikacchu.								
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Unorganized drugs of Guggulu, Hingu and Mocharasa.	PSY-ADT	MK	SH	PT,D_L	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Whole plant of Apamarga, Bhrungaraja, Bhumyamalaki, Brahmi, Kalmeghaand and Mandukaparni.	PSY-ADT	MK	SH	PT,D_L	P-EXAM,P-PRF	F&S	I	
CO6	Perform the comparative organoleptic characters (Taste, Colour, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks etc) of Galls of Karkatshrungi.	PSY-ADT	MK	SH	PT,D_L	P-EXAM,P-PRF	F&S	I	
<b>Topic 5 5. Microscopic Identification of genuine and adulterated drug</b>									
CO6	Perform the comparative microscopic examination of genuine and adulterated any two samples of Root / stem / leaf /bark / fruits (E.g. like Sariva / Manjishta / Vidanga / Maricha / Ashoka).	PSY-ADT	MK	SH	TUT,PT,D_L	P-EXAM,P-PRF	F&S	I	
<b>Topic 6 6. Demonstration of skills to identify the medicinal plants in the college garden.</b>									
CO8	Demonstrate identification features of college garden medicinal plants for their morphology, taxonomical keys, regional flora with therapeutic uses.	PSY-GUD	MK	KH	L_VC,ML,SDL,DG,FV	P-VIVA,P-EXAM,P-ID	F&S	I	
CO8	Participate actively in Identification of Medicinal plants.	AFT-RES	MK	SH	DG	P-VIVA,P-EXAM	F&S	I	

<b>Topic 7 7. Out campus visit (Cultivated gardens, Tissue culture lab, Herbaria, Pharmacognosy lab, Quality control lab and Forest plant demonstration)</b>									
CO8	Visit to observe the identification features of medicinal plants which are from cultivated or natural habitat / forest plant.	PSY-GUD	MK	KH	ML,S DL,D G	P-VIVA,P- EXAM	F&S	I	
CO8	Visit to observe the Tissue culture techniques of medicinal plants in local / nearby Tissue culture lab.	PSY-GUD	MK	KH	PT,D_ L	P-VIVA	F&S	I	
CO8	Visit to observe the herbaria of medicinal plants in nearby institute.	PSY-GUD	MK	KH	PT,D	P-VIVA	F&S	I	
CO6	Visit to observe the nearby AYUSH approved Quality control lab for quality control techniques.	PSY-GUD	MK	KH	L_VC ,PT,D _L	P-VIVA	F&S	I	
<b>Topic 8 8. Dravya prayoga</b>									
CO5	Observe the selection of Ekala Dravya (single drug) in various clinical conditions	PSY-GUD	MK	KH	DIS,C BL,S DL,T UT	P-VIVA,QZ	F&S	I	
CO5	Perform the selection of Ekala dravya prayoga in various clinical conditions by masked case sheets.	PSY-ADT	MK	SH	CBL, ECE	P-VIVA,P- EXAM	F&S	I	H-RN
<b>Topic 9 9. Physico-chemical study</b>									
CO6	Perform the foreign matter study of minimum 2 useful parts of medicinal plants.	PSY-ADT	MK	SH	PT,D_ L	P-VIVA	F&S	II	
CO6	Observe the Loss on drying (LoD) study of minimum 2 useful parts of medicinal plants.	PSY-GUD	MK	KH	TUT, PT,D_ L	P-VIVA	F&S	II	

CO6	Observe the Ash value and Extractive value of minimum 2 useful parts of medicinal plants.	PSY-GUD	MK	KH	PT,D_L	P-VIVA	F&S	II	
<b>Topic 10 10. Phytochemical</b>									
CO6	Perform Preliminary phytochemical study of minimum 2 medicinal plant extracts.	PSY-ADT	MK	SH	PT,D_L	P-VIVA,P-EXAM,P-PRF	F&S	II	
<b>Topic 11 11. Thin Layer Chromatography (TLC) technique</b>									
CO6	Observe the TLC (Thin layer chromatography) technique of one medicinal plant extract.	PSY-GUD	MK	KH	TUT,PT,D_L	P-VIVA,INT	F&S	II	
<b>Topic 12 12. Demonstration of skills to identify the medicinal plants in the college garden</b>									
CO8	Demonstrate identification features of college garden medicinal plants for their morphology, taxonomical keys, regional flora with therapeutic uses.	PSY-GUD	MK	KH	L_VC, DG	P-VIVA,P-EXAM,P-PRF	F&S	II	
CO8	Participate actively in Identification of Medicinal plants.	AFT-RES	MK	SH	DG	P-VIVA	F&S	II	
<b>Topic 13 13. Out campus visit (cultivated gardens &amp; In-situ plant demonstration)</b>									
CO8	Visit to observe the identification features of medicinal plants which are from cultivated or natural habitat / forest plant.	PSY-GUD	MK	KH	DG	P-VIVA	F&S	II	
<b>Topic 14 14. Ekala dravya prayoga</b>									
CO5	Perform the selection of Ekala dravya prayoga in various clinical conditions by masked case sheets.	PSY-ADT	MK	SH	DIS,CBL,ECE,D_BED	P-VIVA,P-EXAM	F&S	II	H-RN
CO5	Appraise the value of selection of Ekala Dravya Prayog in	AFT-	MK	SH	PBL,	P-VIVA,P-	F&S	II	H-RN

	various clinical conditions by providing masked case sheets.	VAL			CBL, CD	EXAM			
<b>Topic 15 15. Different Cultivation technique including methods mentioned in Vrikshayurveda</b>									
CO8	Demonstrate different cultivation technique of medicinal plants in garden.	PSY-GUD	MK	KH	L_VC ,DG	P-VIVA,INT	F&S	II	
CO8	Demonstrate different cultivation methods mentioned in Vrikshayurveda in garden.	PSY-GUD	MK	KH	DG	P-VIVA	F&S	II	
<b>Topic 16 16. Exercise on Network pharmacology</b>									
CO2	Conduct the Identification (Data mining) active constituents by Pubmed, IMPPAT or PubChem in digital library.	PSY-SET	MK	KH	DIS,D	P-VIVA,PA	F&S	III	
CO2	Conduct Target identification by Binding DB.	PSY-SET	MK	KH	D	P-VIVA	F&S	III	
CO2	Conduct Identification of disease gene by DisGeNET.	PSY-SET	MK	KH	TUT, D	P-VIVA	F&S	III	
CO2	Conduct GO (Gene ontology) enhancement analysis by KEGG Pathway, R ratio.	PSY-SET	MK	KH	D	P-VIVA	F&S	III	
CO2	Conduct Network construction by STRING, PPI network, cytoscope.	PSY-SET	MK	KH	D	P-VIVA	F&S	III	
<b>Topic 17 17. Preparations of digital herbarium</b>									
CO8	Prepare digital herbarium of minimum 10 medicinal plants during field visit with all parts of the plant with geo-tag photos.	PSY-ADT	MK	SH	L_VC ,W,T UT,D	P-SUR,RK	F&S	III	
<b>Topic 18 18. Demonstration of skills to identify the medicinal plants in the college garden</b>									
CO8	Demonstrate identification features of college garden medicinal	PSY-	MK	KH	L_VC	P-VIVA,P-	F&S	III	



	plants for their morphology, taxonomical keys, regional flora with therapeutic uses.	GUD			,DG	EXAM			
CO8	Participate actively in Identification of Medicinal plants.	AFT-RES	MK	SH	DG	P-VIVA,P-EXAM	F&S	III	
<b>Topic 19 19. Out campus visit (cultivated gardens &amp; In-situ plant demonstration)</b>									
CO8	Visit to observe the identification features of medicinal plants which are from cultivated or natural habitat / forest plant.	PSY-GUD	MK	KH	DG	P-VIVA	F&S	III	
<b>Topic 20 20. Ekala dravya prayoga</b>									
CO5	Perform the selection of Ekala dravya prayoga in various clinical conditions by masked case sheets.	PSY-ADT	MK	SH	CBL, ECE, D_BE D,PR A	P-VIVA,P-EXAM,RK	F&S	III	H-RN
CO5	Appraise the value of selection of Ekala Dravya Prayoga in various clinical conditions by providing masked case sheets.	AFT-VAL	MK	SH	PBL, CBL, CD	P-VIVA,P-EXAM	F&S	III	H-RN

**Table 4a: List of Practical**

S.No	Name of practical	Term	Activity	Practical hrs
1	1. Assessment and Understanding the relation between Parthivatwa & subjective/ objective parametric tests	1	<ul style="list-style-type: none"> <li>♦ <b>1.1 Assessment and Understanding the relation between Parthivatwa &amp; subjective/ objective parametric tests</b></li> <li>♦ Density (bulk)</li> <li>♦ Specific gravity (solid)</li> <li>♦ <b>Drugs to study</b> for e.g.- Asthishrnkhala, Sariva, Vidari, Maricha, Shatavari, Jambu, Godhuma &amp; Ushira</li> <li>♦ <b>1.2 Assessment and Understanding the relation between Jaliyatwa &amp; subjective/ objective parametric tests</b></li> <li>♦ Viscosity</li> <li>♦ Specific gravity</li> <li>♦ Moisture content</li> <li>♦ <b>Drugs to study</b> for e.g.- Kumari, Vidari, Sariva, Shunthi, Ikshu, Usheera, Kamala &amp; Apamarga</li> <li>♦ <b>1.3 Assessment and Understanding the relation between Aagneyatwa &amp; subjective/ objective parametric tests</b></li> <li>♦ pH</li> <li>♦ Moisture content</li> <li>♦ <b>Drugs to study</b> for e.g.: Shunthi, Shatavari, Maricha, Dhataki, Chitraka, Gokhura, Hingu &amp; Chandana</li> <li>♦ <b>1.4 Assessment and Understanding the relation between Vayaviytwa &amp; subjective/ objective parametric tests</b></li> <li>♦ Fat content</li> <li>♦ Specific gravity</li> <li>♦ Density (bulk)</li> <li>♦ <b>Drugs to study</b> for e.g. : Usheera, Ashwagandha, Nimba, Vidari, Khadira, Tila, Jambu &amp; Kapikacchu</li> <li>♦ <b>1.5 Assessment and</b></li> </ul>	10

			<p><b>Understanding the relation between Aakashiyatwa &amp; subjective/ objective parametric tests</b></p> <ul style="list-style-type: none"> <li>◆ Density (Bulk)</li> <li>◆ <b>Drugs to study</b> for e.g.: Usheera, Kumari, Apamarga, Jeeraka &amp; Jatamansi</li> </ul>	
2	2. Assessment of objective parametric measures of Guna	1	<ul style="list-style-type: none"> <li>◆ <b>2.1 Assessment of objective parametric measures Guru &amp; Laghu Guna</b></li> <li>◆ Density (bulk)</li> <li>◆ Specific gravity (Liquid and solid)</li> <li>◆ Drugs to study for e.g. : <b>Guru:</b> Shatavari, Bala ; <b>Laghu:</b> Yava, Dhanyaka</li> <li>◆ <b>2.2 Assessment of objective parametric measures of Snigdha and Ruksha guna drugs</b></li> <li>◆ Total fat content</li> <li>◆ Moisture content</li> <li>◆ Swelling index</li> <li>◆ <b>Drugs to study</b> for e.g. : <b>Snigdha:</b> Tila, Eranda ; <b>Ruksha:</b> Kullatha, Vidanga</li> </ul>	12
3	3. Assessment of Rasa	1	<p><b>Assessment of Rasa based on classical symptoms for each rasa dravyas.</b> One Example For each rasa</p>	6
4	4. Comparative organoleptic and macroscopic examination	1	<ul style="list-style-type: none"> <li>◆ <b>Comparative organoleptic (Taste, Color, Smell, Sound, Touch) and macroscopic examination (Size, Shape, Fracture, External markings like lenticels, ridges, nodes, furrows, cracks, etc)of the following group of drugs.</b></li> <li>◆ <b>a. Root:</b> Aswagandha, Chitraka,</li> </ul>	23

			<p>Manjistha, Musta, Shatavari, Vatsanabha, Yashtimadhu.</p> <ul style="list-style-type: none"> <li>♦ <b>b. Rhizome/Stolon:</b> Haridra, Katuki, Shunthi, Vacha.</li> <li>♦ <b>c. Stem:</b> Asthishrinkhala, Guduchi.</li> <li>♦ <b>d. Bark:</b> Arjuna, Ashoka, Kutaja, Nimba, Twak.</li> <li>♦ <b>e. Heart wood:</b> Beejaka, Chandana, Khadira.</li> <li>♦ <b>f. Leaf:</b> Kumari, Meshashringi, Vasa.</li> <li>♦ <b>g. Flower:</b> Dhataki, Kunkum (kesara), Lavanga.</li> <li>♦ <b>h. Fruit:</b> Amalaki, Aragavadha, Bhallataka, Bibhitaki, Gokshura, Haritaki, Madanphala, Maricha, Pippali, Vidanga.</li> <li>♦ <b>i. Phalaraja:</b> Kampillaka</li> <li>♦ <b>j. Seed:</b> Bakuchi, Ela, Eranda, Jyotishmati, Kapikacchu</li> <li>♦ <b>k. Unorganized drugs:</b> Guggulu, Hingu, Mocharasa</li> <li>♦ <b>l. Whole plant:</b> Apamarga, Bhrungaraja, Bhumyamalaki, Brahmi, Kalmegha, Mandukaparni.</li> <li>♦ <b>m. Galls:</b> Karkatshrungi</li> </ul>	
5	5. Microscopic Identification of genuine and adulterated drug	1	<ul style="list-style-type: none"> <li>♦ <b>Microscopic identification of genuine and adulterated drug, minimum 2 samples from Root/stem/leaf /bark/fruits.</b></li> <li>♦ (E.g. Sariva/Manjishta/Vidanga/Maricha/Ashoka)</li> </ul>	4
6	6. Demonstration of skills to identify the medicinal plants in the college garden.	1		10
7	7. Out campus visit (Cultivated gardens, Tissue culture lab, Herbaria, Pharmacognosy)	1	<ul style="list-style-type: none"> <li>♦ <b>General instructions regarding combined educational visit</b></li> </ul>	10

lab, Quality control lab and Forest plant demonstration)

- ♦ Combined educational visit can be planned wherever feasible as, for **Dravyaguna**- Cultivated gardens, Tissue culture lab, Herbaria, Pharmacognosy lab, Forest plant demonstration ; for **Agadatantra**- forensic lab, snake park, pollution control board and snake venom unit; for **Swasthvrutta** -Yoga and naturopathy center , Milk dairy plant, Water Purification plant, Sewage treatment plant, Leprosy rehabilitation Centre & for **Rasashastra**- GMP certified Lab , Drug Analysis Lab
- ♦ **SOP for Out campus Field Visits**
- ♦ **Theme-Based Visits:** Plan visits based on specific educational themes ( Deshemani Ganas, Family wise), selecting locations relevant to the theme and collaborating with local experts.
- ♦ **Dress Code:** Participants must wear jean paints and T shirts, closed-toe shoes, a hat or cap for sun protection, and weather-appropriate gear such as jackets or raincoats.
- ♦ **Essential Materials:** Each participant should carry a water bottle, a stick (optional), materials for sample storage (newspaper, blotting paper, secateurs, plastic bags), a cap, goggles, and a packed lunch or snacks in a suitable container.
- ♦ **Safety Precautions:** Conduct a safety briefing before the visit, outlining emergency procedures, collecting medical information, and emphasizing expected behaviors' during the trip.
- ♦ **Itinerary:** Develop a detailed itinerary with activities and a timeline, considering the chosen theme and objectives of the visit.
- ♦ **Public Address System (PA System):** If necessary, provide a portable PA system with a

			<p>microphone, amplifier, and power source for effective communication with larger groups.</p> <ul style="list-style-type: none"> <li>♦ <b>Test the PA System:</b> Prior to the visit, ensure the PA system is in working order and audible, conducting necessary tests to guarantee functionality.</li> <li>♦ <b>Responsible Usage:</b> Use the PA system judiciously, speaking clearly and at an appropriate volume, while encouraging participants to utilize the system for questions or clarifications.</li> <li>♦ <b>Follow-up Activities:</b> Organize post-visit discussions and assignments to reinforce learning, encourage knowledge sharing, and facilitate deeper exploration of the theme.</li> <li>♦ <b>Review and Revise:</b> Regularly update and adapt this SOP to comply with safety standards, educational objectives, and local regulations.</li> </ul>	
8	8. Dravya prayoga	1	<ul style="list-style-type: none"> <li>♦ <b>8.1 (Part I) Demonstration of selecting appropriate Ekala dravya as per clinical conditions.</b></li> <li>♦ <b>8.2 (Part II) Selection of Ekala dravya prayoga in various clinical conditions by providing masked case sheets per srotasa (5 cases in each term)</b></li> </ul>	12
9	9. Physico-chemical study	2	<ul style="list-style-type: none"> <li>♦ <b>Physicochemical study of medicinal plant. (minimum 2 drugs)</b></li> <li>♦ a. Foreign matter</li> <li>♦ b. Loss on drying</li> <li>♦ c. Ash value</li> <li>♦ d. Extracts</li> </ul>	8

			<ul style="list-style-type: none"> <li>♦ <b>Note: The same plant should be used for all the tests</b></li> </ul>	
<b>10</b>	10. Phytochemical	2	<ul style="list-style-type: none"> <li>♦ <b>Preliminary phytochemical study of medicinal plant. (minimum 2 drugs)</b></li> </ul>	4
<b>11</b>	11. Thin Layer Chromatography (TLC) technique	2	<ul style="list-style-type: none"> <li>♦ <b>TLC technique of medicinal plant (any one)</b></li> </ul>	2
<b>12</b>	12. Demonstration of skills to identify the medicinal plants in the college garden	2		10
<b>13</b>	13. Out campus visit (cultivated gardens & In-situ plant demonstration)	2		10
<b>14</b>	14. Ekala dravya prayoga	2	<ul style="list-style-type: none"> <li>♦ <b>Selection of Ekala dravya prayoga in various clinical conditions by providing masked case sheets. (5 cases in each term)</b></li> </ul>	10
<b>15</b>	15. Different Cultivation technique including methods mentioned in Vrikshayurveda	2		6
<b>16</b>	16. Exercise on Network pharmacology	3	<ul style="list-style-type: none"> <li>♦ <b>Exercise on Network Pharmacology</b></li> <li>♦ <b>1st activity:</b> Identification (Data mining) active constituents by Pubmed, IMPPAT or PubChem.</li> <li>♦ <b>2nd activity:</b> Target identification by BindingDB.</li> </ul>	6

			<ul style="list-style-type: none"> <li>♦ <b>3rd activity:</b> Identification of disease gene by DisGeNET.</li> <li>♦ <b>4th activity:</b> GO enhancement analysis by KEGG Pathway, R ratio.</li> <li>♦ <b>5th step:</b> Network construction by STRING, PPI network, sytoscope.</li> </ul>	
<b>17</b>	17. Preparations of digital herbarium	3	<ul style="list-style-type: none"> <li>♦ <b>Preparations of digital herbarium of minimum 10 drugs with all parts of the plant (with geo-tag photos) by compulsory field visit</b></li> </ul>	2
<b>18</b>	18. Demonstration of skills to identify the medicinal plants in the college garden	3		10
<b>19</b>	19. Out campus visit (cultivated gardens & In-situ plant demonstration)	3		10
<b>20</b>	20. Ekala dravya prayoga	3	<b>Selection of Ekala dravya prayoga in various clinical conditions by providing masked case sheets.(5 cases in each term)</b>	10
<b>Total Hr</b>				<b>175</b>

### Activity

<b>CO</b>	<b>Topic name</b>	<b>Activity Details</b>	<b>Hours#</b>
CO1,CO3	Dravyaguna Vigyana.	<ul style="list-style-type: none"> <li>♦ <b>Group activity</b> – Assignments are to be given to the students to prepare 2-3 flash cards on importance of Dravyaguna Vigyana in clinical practice.</li> </ul>	1



CO1,CO5,CO8	Dravya	<ul style="list-style-type: none"> <li>♦ <b>Segregation</b> of dry drugs based on Panchabhoutika characteristics. Various Dravyas are given to the students for segregation of dravyas according to Panchabhoutik constitution</li> <li>♦ <b>Classify</b> live plants based on Panchabhoutika characteristics in garden. ( Details mentioned in Rasavaisheshik Sutra 2 chapter 101-111)</li> <li>♦ <b>Quiz</b> – based on classifications of dravyas</li> <li>♦ <b>Brain storming</b> - Activity should be assigned to the students to search in samhitas related to classification of dravyas as Prayogabheda, Doshagnabheda and Karmbheda. Prepare the list of specific assigned classification for group of students.</li> </ul>	4
CO1,CO2,CO3	Guna Panchabhoutikatva, characteristics and classification.	<ul style="list-style-type: none"> <li>♦ <b>Matching</b> of Gurvadi guna with its karma</li> <li>♦ <b>Animated Power point</b> Presentation on Guna.</li> <li>♦ <b>Brain storming</b> - To search in Chikitsasthana of samhitas regarding clinical application of Gurvadi guna and Paradi guna</li> </ul>	2
CO1,CO2,CO3	Rasa	<ul style="list-style-type: none"> <li>♦ <b>Game based activity</b> by closing the eyes they should ask to identify the taste</li> <li>♦ <b>Activity based learning</b> enlisting the dravyas of specific taste</li> <li>♦ <b>Matching activity</b> -Matching of specific Rasas with their Guna &amp; Karma</li> <li>♦ <b>Making of Flash cards</b>- Cards with information regarding different concepts of Rasas</li> </ul>	4

CO1,CO2,CO3	Vipak	<ul style="list-style-type: none"> <li>♦ <b>Flash cards</b> - Preparing flash cards containing pictures of dravya to identify dravya and its vipaka</li> <li>♦ <b>Preparing charts</b> of 20 dravyas with ayathartha vipaka and yatharth vipaka</li> </ul>	1
CO1,CO2,CO3	Virya	<ul style="list-style-type: none"> <li>♦ <b>Talk and chalk activity</b> by students on Dwividha virya and ashtavidha virya.</li> <li>♦ <b>Making charts</b> of dravyas from Bhavaprakash nighantu regarding Dwividha virya- 25 Sheeta Virya dravyas &amp; 25 Ushna Virya Dravyas.</li> </ul>	2
CO1,CO2,CO3	Prabhav	<ul style="list-style-type: none"> <li>♦ <b>Puzzle</b> – Segregating the dravyas based on Samanpratyayarabdha, Vichtrapratyayarabdha and Prabhava.</li> </ul>	1
CO1	Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava with respect to their strength - Pharmacodynamics	<ul style="list-style-type: none"> <li>♦ <b>Making flow charts</b> regarding the rules explained in relation with concepts of dravyaguna</li> <li>♦ <b>Group Discussion</b> - Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava with respect to their strength - Pharmacodynamics</li> </ul>	2
CO1,CO2,CO3,CO4,CO5	karma	<ul style="list-style-type: none"> <li>♦ <b>Case base learning</b>-Taking different clinical conditions &amp; selecting appropriate karma</li> <li>♦ <b>Think, Pair and share based activity</b>- Sepecific problem has to be given,</li> </ul>	5

		<p>student should be allowed to think and discuss about appropriate karmas</p> <ul style="list-style-type: none"> <li>♦ <b>Gamification</b>-Pairing Karma with the drugs.</li> <li>♦ <b>Role play for identification of specific karma</b>- Asking one student to enact &amp; others to find out Karma</li> <li>♦ <b>Presentation</b>- On concept of Karma, types of karma &amp; Individual Karma.</li> <li>♦ <b>Enlisting specific karma</b>-In relation to dravyas from Bruhatrayee &amp; Sharangdhara samhita</li> </ul>	
CO1,CO8	Karmas of Dashemani	<ul style="list-style-type: none"> <li>♦ <b>Cramming</b> –Memorizing the dravyas from specific ganas</li> <li>♦ <b>Fish bowl activity</b> written chits of drugs picked by students and should say the name of the Gana</li> <li>♦ <b>Shloka recitation</b>- Shlokas of Dashemani Gana (Ch. Su. 4)</li> <li>♦ <b>Symposia</b>- Short discussion on various clinical applications of Dashemani Gana</li> </ul>	3
CO4,CO9	Principles of General Pharmacology	<ul style="list-style-type: none"> <li>♦ <b>Video</b>: Showing relevant videos regarding principles of pharmacology and mode of action</li> <li>♦ <b>Mobile based learning</b> –Searching about pharmacology in enlisted websites</li> </ul>	1
CO1,CO3	Mishrak Gana	<ul style="list-style-type: none"> <li>♦ <b>GBL</b>-Identification of mishrak gana by using clues of utility of specific mishrak gana from samhita and chikitsa grantha</li> <li>♦ <b>Matching</b> of dravyas with specific mishraka Gana</li> <li>♦ <b>Role play</b> –enacting individual and combined actions of composition for e.g. Triphala - Individulaly they should enact</li> </ul>	2

		<p>as Haritaki, Bibhitaki and Aamalaki explaining their karmas, then they should come together depicting Triphala.</p> <ul style="list-style-type: none"> <li>♦ <b>Self-directed learning-</b> Mobile based learning on Mishraka Gana</li> </ul>	
CO1	Nomenclature of dravya as per Nighantu, Vedic taxonomy and botany	<ul style="list-style-type: none"> <li>♦ <b>Bulletin boards :</b> Highlighting significant points of nomenclature</li> <li>♦ <b>Demo in garden :</b> Demonstration of the dravyas on the basis of various criteria's of nomenclature</li> <li>♦ <b>Symposium</b> by making groups of specific criteria for nomenclature and asked to present synonyms based on that particular criteria allotted to the group e.g. Upama , Rudhi, Prabhav, Deshokti, Swabhavatha, Lanchana &amp; Guna</li> </ul>	2
CO1,CO5	Prashasta Bhashaja, BhashajaPariksha and drug evaluation method with correlation as per Pharmacognosy	<ul style="list-style-type: none"> <li>♦ <b>Read aloud :</b> Student come on the Dias and read with loud voice</li> <li>♦ <b>Self -directed learning -</b> Charak Samhita Vimansthana Chapter 8</li> </ul>	2
CO1,CO7	Abhavapratidhidravya (substitutes)	<ul style="list-style-type: none"> <li>♦ <b>Self-directed learning:</b> Self study on Abhavapratidhidravya (substitutes) from Bhavaprakasha</li> </ul>	1
CO2,CO6	Classifications and techniques of aqueous and alcoholic extracts	<ul style="list-style-type: none"> <li>♦ <b>Demo in lab</b></li> <li>♦ <b>Video</b></li> </ul>	2
CO2	Adverse drug reaction and Pharmacovigilance with recent updates	<ul style="list-style-type: none"> <li>♦ <b>PBL:</b> Story telling about reported cases</li> </ul>	2

		<ul style="list-style-type: none"> <li>♦ <b>Survey</b> : visit to pharmacovigilance cell at institution</li> <li>♦ <b>Guest lecture</b> : Activities of pharmacovigilance cell</li> </ul>	
CO8	Vrikshayurveda and ethnomedicine	<ul style="list-style-type: none"> <li>♦ <b>Videos</b>- Showing videos on cultivation practices and Ethnomedicine</li> </ul>	1
CO2	Network Pharmacology & Bioinformatics	<ul style="list-style-type: none"> <li>♦ <b>Video</b></li> <li>♦ <b>Presentation</b></li> </ul>	1
CO5	<b>Bheshajavacharaniya</b>	<ul style="list-style-type: none"> <li>♦ <b>Making charts</b> on Various Rasa dravya indicated in specific vyadhis for eg.</li> <li>♦ <b>Tikta rasa</b> in Jvara &amp; Kushtha,</li> <li>♦ <b>Katu rasa</b> in Amavata,</li> <li>♦ <b>Kashaya rasa</b> in Pakwatisara, and Raktastambhana,</li> <li>♦ <b>Madhur rasa</b> in Dhatu kshya janya vyadhi ,</li> <li>♦ <b>Amla &amp; Lavana rasa</b> in Udavarta, Udara, Gulma,also used as Agnideepana, Mudhavatanulomana, Pachana</li> </ul>	6
CO2,CO3,CO4,CO5,CO7,CO8	<b>2.Dravya (Drug) Nama-Guna-Karma Jnana</b>	<ul style="list-style-type: none"> <li>♦ <b>Game base activity</b>- Activity based learning as the chits are prepared of different karmas , those are circulated among the students, once the circulation stops then the student with the chit will be asked to read the karma mentioned in the chit and to explain with examples.</li> <li>♦ <b>CBL</b> ( Case based learning) <b>and PBL</b> ( Problem based learning) activities taken for understanding of Karma in specific clinical scenario</li> </ul>	08

		<ul style="list-style-type: none"> <li>♦ <b>Segregation of dravyas</b> mentioned in syllabus according to Dashemani Gana</li> <li>♦ <b>Searching of Mishrak gana</b> from samhita and chikitsa granths for its utility</li> <li>♦ <b>Collecting information</b> about Grahya and Agahya dravyas mentioned in the syllabus with their characteristics</li> </ul>	
CO2,CO3,CO4,CO5,CO7,CO8	<b>3.Dravya (Drug) Nama-Guna-Karma Jnana</b>	<ul style="list-style-type: none"> <li>♦ <b>Matching</b> Rasapanchak, Rogagnata, Agryakarma of dravya</li> <li>♦ <b>Making of charts</b> regarding Aamayika Prayogas, Agrya Karma &amp; Specific Kalpana</li> <li>♦ <b>Case based activity</b>- one particular disease &amp; suitable plants in order</li> <li>♦ <b>Critical reading</b> with the help of different indexed research articles</li> <li>♦ <b>Quiz</b></li> </ul>	17
CO2,CO3,CO4,CO5,CO7,CO8	<b>3.Dravya (Drug) Nama-Guna-Karma Jnana</b>	<ul style="list-style-type: none"> <li>♦ Moc practical -</li> <li>♦ 1) 15 dry &amp; 15 wet <b>sample dravya spotting test</b></li> <li>♦ <b>Test</b> should include at least one each from Leaf, Stem, Root, Rhizome,Gall, Flower, Fruit , Seed, Bark &amp; Resin.</li> <li>♦ Each spot should be solved in 1 minute so 30 minutes activity should be conducted.</li> <li>♦ 2) <b>Skill based assessment</b> -There shall be three components in skill assessment</li> <li>♦ A. Identify and separate Grahya &amp; Agrahya of given sample</li> <li>♦ B. Identifying and grouping of drugs of given Mishraka Gana</li> <li>♦ C. Understand the clinical scenario and identify five suitable single drug</li> <li>♦ <b>Instructions:</b></li> <li>♦ Spotting stations are to be numbered as per the batch. Each spotting station contain: A. Mixture of Grahya &amp; Agrahya B. Name of Misraka Gana and</li> </ul>	05

		<p>C. Clinical Scenario. Students are allotted with the spotting station by lottery method.</p> <p>♦ <b>Arrangement of Spotting Stations:</b></p> <p>♦ A. Identify and separate Grahya &amp; Agrahya of Given Sample: Sufficient quantity (approximately 20 gm of Vidanga &amp; Maricha ) of mixture of Grahya and Agrahya dravya to be provided. There shall be two empty bowels each one labelled as 'Grahya' and 'Agrahya'. Students are asked to separate the given sample into Grahya and Agrahya. There shall be different drugs for each station.</p> <p>♦ B. Identifying and grouping of drugs of given Misraka Gana: Each station shall contain one label containing name of the Misraka Gana with question 'Recollect the drugs belonging to the given Misraka Gana, identify those drugs, collect and make a group. There shall be empty bowl of sufficient size as per the given Gana for collection of drugs.</p> <p>♦ C. Understand the clinical scenario and identify five suitable 5 single drugs: Provide the clinical scenario in not less than 100 words and not more than 200 words with or without investigation reports shall be provided at each spotting station (preferably separate cases for each station). Students are asked to go through the scenario and understand the clinical conditions , select 1 single drug, identify, collect and place it in the bowl given for the same. Select five suitable drugs and write as per preference base.</p>	
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# Hours indicated are included in calculations of Table 3 and 4

**Table 5- Teaching learning method**

Sr No	Teaching learning methods in the course	No of Activities
1	Lecture	13

2	Lecture with Power point presentation	100
3	Lecture & Group Discussion	35
4	Lecture with Video clips	19
5	Discussions	42
6	Brainstorming	7
7	PBL	14
8	CBL	7
9	Project-Based Learning	3
10	TBL	3
11	Team project work	5
12	Flipped classroom	22
13	Blended Learning	13
14	Edutainment	4
15	Mobile learning	7
16	Role plays	3
17	Self-directed learning	14
18	Game-Based Learning	6
19	Library Session	18
20	Peer learning	16
21	Recitation	1
22	Tutorial	2
23	Presentations	20
24	Demonstration	1

These are overall teaching learning methods listed in Table 3 and 4. Teachers can select the best possible method amongst the given methods as per objective, available time etc.

**Table 6: Assessment Summary: Assessment is subdivided in A to H points**

#### 6 A-Number of Papers and Marks Distribution

Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand Total
			Practical	Viva	Elective	IA	Sub Total	



AyUG-DG	2	200	100	70	-	30	200	400
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**6 B - Scheme of Assessment (formative and Summative)**

PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
	First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
Second	3 PA & First TT	3 PA & Second TT	3 PA & UE **

**PA:** Periodical Assessment; **TT:** Term Test; **UE:** University Examinations.

\*\* University Examination shall be on entire syllabus

## 6 C - Calculation Method for Internal assessment Marks

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A 1	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 30 Marks (D/15*30)	Term Test (Marks converted to 30)	Sub Total _/60 Marks	Term Assessment (.../30)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert to 30 marks.							

## 6 D - Evaluation Methods for Periodical Assessment

S. No	Evaluation Methods
1	Activities Indicated in Table 3 - Column G3 as per Indicated I, II or III term in column I3

Evaluation Methods in MSE

1. Practical / Clinical Performance
2. Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
3. Open Book Test (Problem Based)
4. Summary Writing (Research Papers/ Samhitas)
5. Class Presentations; Work Book Maintenance
6. Problem Based Assignment
7. Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)

## 6 E Question Paper Pattern

### II PROFESSIONAL BAMS EXAMINATIONS AyUG-DG

#### PAPER-1

Time: 3 Hours Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

		<b>Number of Questions</b>	<b>Marks per question</b>	<b>Total Marks</b>
Q 1	MULTIPLE CHOICE QUESTIONS (MCQ)	20	1	20
Q 2	SHORT ANSWER QUESTIONS (SAQ)	8	5	40
Q 3	LONG ANSWER QUESTIONS (LAQ)	4	10	40
				100

Similar for Paper II (If ,

## 6 F Distribution of theory examination

<b>Paper 1 Fundamental Dravyaguna</b>						
<b>Sr. No</b>	<b>A List of Topics</b>	<b>B Term</b>	<b>C Marks</b>	<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
1	<b>1.Dravyaguna Vigyana</b>	1	1	Yes	No	No
2	<b>2.Dravya</b>	1	6	Yes	Yes	No
3	<b>3. Guna</b>	1	11	Yes	No	Yes
4	<b>4. Rasa</b>	1	11	Yes	No	Yes
5	<b>5. Vipaka</b>	1	6	Yes	Yes	No
6	<b>6. Virya</b>	1	6	Yes	Yes	No
7	<b>7. Prabhava</b>	1	5	No	Yes	No
8	<b>8. Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava</b>	1	1	Yes	No	No
9	<b>9. Karma</b>	1	11	Yes	No	Yes
10	<b>10. Karmas of Dashemani Gana</b>	1	5	No	Yes	No
11	<b>11. Principles of General Pharmacology</b>	3	20	Yes	Yes	Yes
12	<b>12. Mishraka Gana</b>	3	6	Yes	Yes	No
13	<b>13. Nomenclature of dravya as per Nighantu, Vedic taxonomy and Botany</b>	3	1	Yes	No	No
14	<b>14. Prashasta Bheshaja, Bheshaja Pariksha and drug evaluation method with correlation as per Pharmacognosy</b>	3	1	Yes	No	No
15	<b>15. Dravyasangrahana and Drug collection methods as per GFCP (Good Field collection</b>	3	1	Yes	No	No

	practices)					
16	<b>16. GCP (Good cultivation practices), seed bank, conservation of medicinal plants, knowledge about RET (Rear, Endangered &amp; Threatened ) medicinal plants.</b>	3	1	Yes	No	No
17	<b>17. Abhava Pratinidhi Dravya (substitutes)</b>	3	1	Yes	No	No
18	<b>18. Classifications and techniques of aqueous and alcoholic extracts</b>	3	1	Yes	No	No
19	<b>19. Adverse drug reaction and Pharmacovigilance with recent updates</b>	3	1	Yes	No	No
20	<b>20. NMPB (National Medicinal Plant Board), CCRAS (Central Council of Research in Ayurveda Sciences), API ( Ayurvedic Pharmacopeia of India), GCTM ( Global Centre for Traditional Medicine), PCIMH ( Pharmacopeia Commission of Indian Medicine and Homeopathy)</b>	3	1	Yes	No	No
21	<b>21. Vrikshayurveda and Ethno-medicine</b>	3	1	Yes	No	No
22	<b>22. Network pharmacology and Bioinformatics</b>	3	2	Yes	No	No
<b>Total Marks</b>			<b>100</b>			

<b>Paper 2 Applied Dravyaguna</b>						
<b>Sr. No</b>	<b>A List of Topics</b>	<b>B Term</b>	<b>C Marks</b>	<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
23	<b>1. Bshajavacharaniya (Criteria's to be considered for selection of drugs in vyadhis)</b>	2	5	Yes	No	No
24	<b>2.1 Dravya (Drug) Nama-Guna-Karma Jnana</b>	2	55	Yes	Yes	Yes

25	<b>2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</b>	3	40	Yes	Yes	Yes
<b>Total Marks</b>			<b>100</b>			

<b>Paper No:1</b>		
<b>Question No</b>	<b>Type of Question</b>	<b>Question Paper Format</b>
<b>Q1</b>	<p><b>Multiple choice Questions</b>  <b>20 Questions</b>  <b>1 mark each</b>  <b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b>  <b>Desirable to know - 3 MCQ</b>  <b>Nice to know part - 2 MCQ</b></p>	<ol style="list-style-type: none"> <li>1. 1.Dravyaguna Vigyana</li> <li>2. 2.Dravya</li> <li>3. 3. Guna</li> <li>4. 4. Rasa</li> <li>5. 5. Vipaka</li> <li>6. 6. Virya</li> <li>7. 8. Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava</li> <li>8. 12. Mishraka Gana / 9. Karma</li> <li>9. 11. Principles of General Pharmacology</li> <li>10. 12. Mishraka Gana</li> <li>11. 13. Nomenclature of dravya as per Nighantu, Vedic taxonomy and Botany</li> <li>12. 14. Prashasta Bsheshaja, Bsheshaja Pariksha and drug evaluation method with correlation as per Pharmacognosy</li> <li>13. 15. Dravyasangrahana and Drug collection methods as per GFCP (Good Field collection practices)</li> <li>14. 16. GCP (Good cultivation practices), seed bank, conservation of medicinal plants, knowledge about RET (Rear, Endangered &amp; Threatened ) medicinal plants.</li> <li>15. 17. Abhava Pratinidhi Dravya (substitutes)</li> <li>16. 18. Classifications and techniques of aqueous and alcoholic extracts</li> <li>17. 19. Adverse drug reaction and Pharmacovigilance with recent updates</li> <li>18. 20. NMPB (National Medicinal Plant Board), CCRAS (Central Council of Research in Ayurveda Sciences), API ( Ayurvedic Pharmacopeia of India), GCTM ( Global Centre for Traditional Medicine), PCIMH ( Pharmacopeia Commission of Indian Medicine and Homeopathy)</li> <li>19. 21. Vrikshayurveda and Ethno-medicine</li> <li>20. 22. Network pharmacology and Bioinformatics</li> </ol>
<b>Q2</b>	<p><b>Short answer Questions</b>  <b>Eight Questions</b>  <b>5 Marks Each</b></p>	<ol style="list-style-type: none"> <li>1. 2.Dravya</li> <li>2. 5. Vipaka</li> <li>3. 6. Virya</li> <li>4. 7. Prabhava</li> <li>5. 10. Karmas of Dashemani Gana</li> </ol>

	<p><b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b></p> <p><b>Desirable to know - 1 SAQ</b></p> <p><b>No questions on Nice to know</b></p>	<p><b>6. 11. Principles of General Pharmacology</b></p> <p><b>7. 11. Principles of General Pharmacology</b></p> <p><b>8. 12. Mishraka Gana</b></p>
<b>Q3</b>	<p><b>Long answer Questions</b></p> <p><b>Four Questions</b></p> <p><b>10 marks each</b></p> <p><b>All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable to know</b></p>	<p><b>1. 3. Guna</b></p> <p><b>2. 4. Rasa</b></p> <p><b>3. 9. Karma</b></p> <p><b>4. 9. Karma</b></p>
<b>Paper No:2</b>		
<b>Question No</b>	<b>Type of Question</b>	<b>Question Paper Format</b>
<b>Q1</b>	<p><b>Multiple choice Questions</b></p> <p><b>20 Questions</b></p> <p><b>1 mark each</b></p> <p><b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b></p> <p><b>Desirable to know - 3 MCQ</b></p> <p><b>Nice to know part - 2 MCQ</b></p>	<p><b>1. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>2. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>3. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>4. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>5. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>6. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>7. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>8. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>9. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>10. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>11. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>12. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p> <p><b>13. 2.2 Dravya (Drugs) Nama -Guna-Karma-Jnana</b></p>



		<p>14. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>15. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>16. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>17. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>18. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>19. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>20. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p>
<b>Q2</b>	<p><b>Short answer Questions</b> <b>Eight Questions</b> <b>5 Marks Each</b> <b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b> <b>Desirable to know - 1 SAQ</b> <b>No questions on Nice to know</b></p>	<p>1. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>2. 2.1 Dravya (Drug) Nama-Guna-Karma Jnana</p> <p>3. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>4. 2.1 Dravya (Drug) Nama-Guna-Karma Jnana</p> <p>5. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>6. 2.1 Dravya (Drug) Nama-Guna-Karma Jnana</p> <p>7. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>8. 2.1 Dravya (Drug) Nama-Guna-Karma Jnana</p>
<b>Q3</b>	<p><b>Long answer Questions</b> <b>Four Questions</b> <b>10 marks each</b> <b>All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable to know</b></p>	<p>1. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>2. 2.1 Dravya (Drug) Nama-Guna-Karma Jnana</p> <p>3. 2.2 Dravya (Drugs) Nama -Guna-Karma- Jnana</p> <p>4. 2.1 Dravya (Drug) Nama-Guna-Karma Jnana</p>

## 6 H Distribution of Practical Exam

S.No	Heads	Marks
1	<p>1) <b>15 dry &amp; 15 wet sample dravya spotting test- 30 minutes</b> Test should include at least one each from Leaf, Stem, Root, Rhizome, Gall, Flower, Fruit, Seed, Bark &amp; Resin.</p>	30
2	<p>2) <b>Skill based assessment</b> -There shall be three components in skill assessment</p> <p>A. Identify and separate Grahya &amp; Agrahya of given sample- 10 minutes</p> <p>B. Identifying and grouping of drugs of given Mishraka Gana- 10 minutes</p> <p>C. Understand the clinical scenario and identify five suitable single drug- 10 minutes</p> <p><b>Instructions:</b></p> <ul style="list-style-type: none"> <li>♦ Spotting stations are to be numbered as per the batch. Each spotting station contain: A. Mixture of Grahya &amp; Agrahya B. Name of Misraka Gana and C. Clinical Scenario. Students are allotted with the spotting station by lottery method.</li> </ul> <p><b>Arrangement of Spotting Stations:</b></p> <p>A. Identify and separate Grahya &amp; Agrahya of Given Sample: Sufficient quantity (approximately 20 gm of Vidanga &amp; Maricha ) of mixture of Grahya and Agrahya dravya to be provided. There shall be two empty bowels each one labelled as 'Grahya' and 'Agrahya'. Students are asked to separate the given sample into Grahya and Agrahya. There shall be different drugs for each station.</p> <p>B. Identifying and grouping of drugs of given Misraka Gana: Each station shall contain one label containing name of the Misraka Gana with question 'Recollect the drugs belonging to the given Misraka Gana, identify those drugs, collect and make a group. There shall be empty bowl of sufficient size as per the given Gana for collection of drugs.</p> <p>C. Understand the clinical scenario and identify five suitable 5 single drugs: Provide the clinical scenario in not less than 100 words and not more than 200 words with or without investigation reports shall be provided at each spotting station (preferably separate cases for each station). Students are asked to go through the scenario and understand the clinical conditions, select 1 single drug, identify, collect and place it in the bowl given for the same. Select five suitable drugs and write as per preference base.</p>	30
3	<p>3. QC practical (30 minutes)-Performance based components</p> <ul style="list-style-type: none"> <li>♦ 3.1. Comparison Macroscopic evaluation of one genuine and one</li> </ul>	40

	<p>adulterant sample -10 marks- 15 minutes</p> <ul style="list-style-type: none"> <li>♦ 3.2. Panchamahabhoutikatwa assessment by parametric measures by pH of a given sample phant/ Kwatha - ( Concern drug Phant / Kwatha should be prepared by college for pH analysis )- 10 marks - 15 minutes</li> <li>♦ 3.3. Panchabhaoutikatwa assessment by parametric measures by Specific Gravity of a given sample Phat/ Kwatha (Concern drug Phant/ Kwatha should be prepared by college for Specific Gravity)- 20 marks- 30 minutes</li> </ul>	
4	<p>4. Viva voce (10 minutes per student) Questions should be asked on following topics -</p> <ul style="list-style-type: none"> <li>♦ 1. Fundamentals (Dravya, Guna, Rasa, Vipaka, Veerya &amp; Prabhav)- 3 questions- 15 marks</li> <li>♦ 2. Karmas, Dashemani, Mishrak Gana- 3 questions- 15 marks</li> <li>♦ 3. Pharmacology &amp; Network pharmacology- 3 questions- 15 marks</li> <li>♦ 4. Clinical application of drugs- 3 questions - 15 marks</li> <li>♦ 5. Viva on practical records -06 marks</li> <li>♦ 6. Communication skill (4 marks )</li> </ul>	70
5	5. Internal Assessment	30
<b>Total Marks</b>		<b>200</b>

## References Books/ Resources

S.No	Book	Resources
1	Dravya Guna Shastram	Vaidya G.A. Phadke, Pradnya Mudranalaya, Vaidya Vamanrao Deenanath Shuddhaayurved Pathyakrama Samitee, Dadabhai Navroji Path, Mumbai
2	Bhavaprakasha	Sri Brahmasankara Mishra and Sri Rupalalaji vaishya, Chaukhamba Sanskrit Series office, Varanasi,
3	Aushadhi Vigyna Shastra (Ayurvedic Pharmacology)	Sri. Vishvanatha Dwidevi ,Shri Baidyanath Ayurved Bhavan Pvt Ltd; Nagpur
4	Ayurvediya Aushadkarma Vigyana	Acharya V.J. Thakar, Gujurat Ayurveda University, Jamnagar
5	Bhava Prakash Nighantu	Vd. Krishna Chandra Chuneekar Commentary, Chaukhambha Sanskrit Sansthan, Varanasi
6	Classical Uses of Medicinal Plants	Acharya Priyavrata Sharma ,Chaukhamba Visvabharati, Varanasi
7	Some Controversial Drugs in Indian Medicine	Dr. Bapalal, Vaidya,Chaukhambha Orientalia, Varanasi
8	Dravyaguna Kosha	Acharya Priyavrata Sharma, Chaukhambha Orientalia, Delhi
9	Dravyaguna Vigyana (Vol.1-3)	Dr. Gyanendra Pandey, Chaukhambha Krishnadas Academy, Varanasi
10	Dravyaguna Vigyana (Vol. 1-2)	Acharya Yadavji Tikramji,Baidyanath Ayurved Bhavan Ltd
11	Dravyaguna Vigyana (Vol. 1-5)	Acharya Priyavrata Sharma, Chaukhambha Bharti Academy, Varanasi
12	Nighantu Adarsh (Vol. 1-2)	Vd.G.Bapa Lal, Chaukhambha Bharti Academy, Varanasi
13	Ayurvedic Pharmacology & Therapeutic Uses of Medicinal Plants Dravyagunavignyan	Vaidya V M Gogte, Chaukhambha Publications, New Delhi
14	Dravyagunavijnana(Part I and II)	Prof.D.S.Lucas, Chaukhamba Visvabharati, Varanasi
15	Glossary of Vegetable Drugs in Brihatrayi	Thakur Balwant Singh & Vd. Krishna Chandra Chuneekar,Chaukhamba Amarbharti Prakashakan, Varanasi
16	Introduction to Dravyaguna(English)	Acharya Priyavrata Sharma ,Chaukhambha Orientalia, Varanasi
17	A Text Book of Dravyaguna Vijnana (Vol 1,2 & 3)	Dr. Prakash L.Hegde and Dr. Harini A.,Chaukhambha Publications, New Delhi
18	Raspanchaka	Prof. Shiv Charan Dhyani,Chaukhambha Krishnadas Academy, Varanasi

19	Dravyaguna Siddhanta	Prof. Shiv Charan Dhyani,Chaukhambha Krishnadas Academy, Varanasi
20	The Ayurvedic Pharmacopoeia of India, Part I Vol. 1-VII	Ministry of AYUSH. India, New Delhi
21	Medicinal Plants used in Ayurveda (2nd Edition)	Rashtriya Ayurveda Vidyapeeth, New Delhi
22	Plants of Bhavaprakash (English)	Prof.K.C.Chunekar & Dr. N.P. Hota,Rashtriya Ayurveda Vidyapeeth, New Delhi.
23	Database of Medicinal Plants used in Ayurveda Vol. 1 to 8	CCRAS New Delhi
24	A Text Book of Dravyaguna Vijnana (Vol.1 to 2)	Dr. J. L. N Sastry and Dr. Tanuja M Nesari.
25	Dravyaguna Vigyana (Vol.1to 2)	Dr. Manasi Deshpande and Dr Arvind Deshpande, <i>Chaukhamba Sanskrit</i> Pratisthan. New Delhi
26	Essentials of Medical Pharmacology	K.D.Tripathi. <b>Jaypee Brothers Medical Publishers (P) Ltd</b>
27	Pharmacological basis of Medical Practice	Goodman & Gillman,McGraw-Hill Education
28	Pharmacology and Pharmacotherapeutics	Satoskar Bhandarkar & Ainapure,Popular Prakashan Mumbai
29	Textbook of Pharmacognosy	Trease & Evans, Elsevier publication
30	Textbook of Pharmacognosy	Tyler, Brady & Robber,Lea & Febiger, USA
31	Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals	Pulok K Mukharjee, Elsevier
32	Ausadhinamarupa vijnanam (Vol. 1 and 2)	Dr Sanjeev Kumar Lale.,Mr. Hemraj Lale, Indore
33	Practical Pharmacognosy	Dr. K. R.. Khandelwal and Dr. Vrunda Sethi , Nirali Prakashan Pune
34	Pharmacognosy	S.B. Gokhale, C.K. Kokate and A.P. Purohit
35	Botany of commonly used medicinal Plants with Diagnostic keys	Dr. Hema Sane and Dr. Yogini Kulkarni. Vision Publication Pune
36	Basic Bioinformatics	S Gladis Hepsyba Helen,MJP Publishers
37	Pharmacovigilance in Ayurveda	Manjunath Ajanal, B S Prasad, Shreddha U Nayak, Chaukhambha Prakashak, Varanasi
38	Cultivation Of Medicinal And Aromatic Crops	Azhar Ali Farooqi, B. S. Sreeramu, Universities Press (India) Pvt. Ltd. Hyderabad

39	WHO Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants	World Health Organization, World Health Organization, Geneva
40	Medicinal Plants: Biodiversity, Sustainable Utilization and Conservation	K. Thammastiri, Chunlin Long, Henrik Lutken, Shaik Mahammad Khasim, Springer Link
41	Network Pharmacology	Shao Li, Springer Link
42	Vrikshayurveda - Ancient Science of Plant Life and Plant Care	S. Rajasekharan, G.S. Unnikrishnan Nair, Kerala State Biodiversity Board, Kerala
43	Evidence-Based Validation of Herbal Medicine - Translational Research on Botanicals	Pulok K. Mukherjee, Elsevier Science
44	Research updates of Gurvadiguna	<ul style="list-style-type: none"> <li>♦ 1. Vaidyabhushanam K. Raghavan Tirumulpad. Rasavaisheshika. (Text with commentary). Arya Vaidya Sala, Kottakkal Malappuram Dist., Kerala.</li> <li>♦ 2. Interactive workshop on Ayurveda (Dravyaguna), Published by Rashtriya Ayurveda Vidyapeetha, New Delhi.</li> <li>♦ 3. Mishra S, Dwivedi RR, Ravishankar B. Conceptual and applied study of Snigdha and Ruksa Guna with special reference to Rasa-raktagata Sneha (hyperlipidemia). Ayu. 2011 Apr;32(2):200-6.</li> <li>♦ 4. Nair JU, Vyas HA, Nariya MB. An experimental study to evaluate <i>Gunasankarya</i> (combination of properties). Ayu. 2021 Oct-Dec;42(4):169-174.</li> <li>♦ 5. Gupta, Monika &amp; Gudipudi, Sarvabhooma &amp; Pujar, Rashmi &amp; Gopikrishna, S. (2019). Clinical aspect of Guna Siddhanta with special reference to Trisutra Ayurveda. 6. 2407-2414.</li> </ul>
45	Research updates of Paradiguna	<ul style="list-style-type: none"> <li>♦ 1. Vaidyabhushanam K. Raghavan Tirumulpad. Rasavaisheshika. (Text with commentary). Arya Vaidya Sala, Kottakkal Malappuram Dist., Kerala.</li> <li>♦ 2. Interactive workshop on Ayurveda (Dravyaguna), Published by Rashtriya Ayurveda Vidyapeetha, New Delhi.</li> <li>♦ 3. Gupta, Monika &amp; Gudipudi, Sarvabhooma &amp; Pujar, Rashmi &amp; Gopikrishna, S. (2019). Clinical aspect of Guna Siddhanta with special reference to Trisutra Ayurveda. 6. 2407-2414.</li> </ul>

46	Research updates of Shadrasa	<ul style="list-style-type: none"> <li>◆ 1. Vaidyabhushanam K. Raghavan Tirumulpad. Rasavaishika. (Text with commentary). Arya Vaidya Sala, Kottakkal Malappuram Dist., Kerala.</li> <li>◆ 2. Interactive workshop on Ayurveda (Dravyaguna), Published by Rashtriya Ayurveda Vidyapeetha, New Delhi.</li> <li>◆ 3. Standard Protocol for quality assessment of Raw medicinal plants materials on the basis of Rasa.</li> <li>◆ Ref: <a href="https://aiia.gov.in/wp-content/uploads/2021/12/RASA.pdf">https://aiia.gov.in/wp-content/uploads/2021/12/RASA.pdf</a></li> <li>◆ 4. Rath SK, Panja AK, Nagar L, Shinde A. The scientific basis of rasa (taste) of a substance as a tool to explore its pharmacological behavior. Anc Sci Life. 2014 Apr-Jun;33(4):198-202.</li> <li>◆ 5. Gilca M, Dragos D. Extraoral Taste Receptor Discovery: New Light on Ayurvedic Pharmacology</li> </ul>
47	Research updates of Vipaka	<ul style="list-style-type: none"> <li>◆ 1. Vaidyabhushanam K. Raghavan Tirumulpad. Rasavaishika. (Text with commentary). Arya Vaidya Sala, Kottakkal Malappuram Dist., Kerala.</li> <li>◆ 2. Interactive workshop on Ayurveda (Dravyaguna), Published by Rashtriya Ayurveda Vidyapeetha, New Delhi.</li> <li>◆ 3. Ranade AV, Shirolkar A, Pawar SD. Gut microbiota: One of the new frontiers for elucidating fundamentals of <i>Vipaka</i> in Ayurveda. Ayu. 2019 Apr-Jun;40(2):75-78.</li> </ul>
48	Research updates of Virya	<ul style="list-style-type: none"> <li>◆ 1. Vaidyabhushanam K. Raghavan Tirumulpad. Rasavaishika. (Text with commentary). Arya Vaidya Sala, Kottakkal Malappuram Dist., Kerala.</li> <li>◆ 2. Interactive workshop on Ayurveda (Dravyaguna), Published by Rashtriya Ayurveda Vidyapeetha, New Delhi.</li> </ul>

49	Research updates of Prabhava	<ul style="list-style-type: none"> <li>♦ 1. Vaidyabhushanam K. Raghavan Tirumulpad. Rasavaishika. (Text with commentary). Arya Vaidya Sala, Kottakkal Malappuram Dist., Kerala.</li> <li>♦ 2. Interactive workshop on Ayurveda (Dravyaguna), Published by Rashtriya Ayurveda Vidyapeetha, New Delhi.</li> </ul>
50	Research updates of Karma	<ul style="list-style-type: none"> <li>♦ 1. Vaidyabhushanam K. Raghavan Tirumulpad. Rasavaishika. (Text with commentary). Arya Vaidya Sala, Kottakkal Malappuram Dist., Kerala.</li> <li>♦ 2. Interactive workshop on Ayurveda (Dravyaguna), Published by Rashtriya Ayurveda Vidyapeetha, New Delhi.</li> </ul>



## Abbreviations

### Assessment

S.No	Short form	Discription
1	T-EMI	Theory extended matching item
2	T- EW	Theory Essay writing
3	T- MEQs	Theory MEQs
4	T-CRQs	Theory CRQs
5	T-CS	Theory case study
6	T-OBT	Theory open book test
7	P-VIVA	Practical Viva
8	P-REC	Practical Recitation
9	P-EXAM	Practical exam
10	PRN	Presentation
11	P-PRF	Practical Performance
12	P-SUR	Practical Survey
13	P-EN	Practical enact
14	P-RP	Practical Role play
15	P-MOD	Practical Model
16	P-POS	Practical Poster
17	P-CASE	Practical Case taking
18	P-ID	Practical identification
19	P-PS	Practical Problem solving
20	QZ	Quiz
21	PUZ	Puzzles
22	CL-PR	Class Presentation,
23	DEB	Debate
24	WP	Word puzzle
25	O-QZ	Online quiz

26	O-GAME	Online game-based assessment
27	M-MOD	Making of Model
28	M-CHT	Making of Charts
29	M-POS	Making of Posters
30	C-INT	Conducting interview
31	INT	Interactions
32	CR-RED	Critical reading papers
33	CR-W	Creativity Writing
34	C-VC	Clinical video cases,
35	SP	Simulated patients
36	PM	Patient management problems
37	CHK	Checklists
38	OSCE	OSCE
39	OSPE	OSPE,
40	Mini-CEX	Mini-CEX
41	DOPS	DOPS
42	CWS	CWS
43	RS	Rating scales
44	RK	Record keeping
45	COM	Compilations
46	Portfolios	Portfolios
47	Log book	Log book
48	TR	Trainers report
49	SA	Self-assessment
50	PA	Peer assessment
51	360D	360-degree evaluation
52	TT-Theory	Theory
53	PP-Practical	Practical
54	VV-Viva	Viva

## Domain

S.No	Short form	Discription
1	CK	Cognitive/Knowledge
2	CC	Cognitive/Comprehension
3	CAP	Cognitive/Application
4	CAN	Cognitive/Analysis
5	CS	Cognitive/Synthesis
6	CE	Cognitive/Evaluation
7	PSY-SET	Psychomotor/Set
8	PSY-GUD	Psychomotor/Guided response
9	PSY-MEC	Psychomotor/Mechanism
10	PSY-ADT	Psychomotor Adaptation
11	PSY-ORG	Psychomotor/Origination
12	AFT-REC	Affective/ Receiving
13	AFT-RES	Affective/Responding
14	AFT-VAL	Affective/Valuing
15	AFT-SET	Affective/Organization
16	AFT-CHR	Affective/ characterization

## T L method

S.No	Short form	Discription
1	L	Lecture
2	L&PPT	Lecture with Power point presentation
3	L&GD	Lecture & Group Discussion
4	L_VC	Lecture with Video clips
5	DIS	Discussions
6	BS	Brainstorming
7	IBL	Inquiry-Based Learning
8	PBL	PBL
9	CBL	CBL
10	PrBL	Project-Based Learning
11	TBL	TBL
12	TPW	Team project work
13	FC	Flipped classroom
14	BL	Blended Learning
15	EDU	Edutainment
16	ML	Mobile learning
17	ECE	ECE
18	SIM	Simulation
19	RP	Role plays
20	SDL	Self-directed learning
21	PSM	Problem solving method
22	KL	Kinesthetic Learning
23	W	Workshops
24	GBL	Game-Based Learning
25	D-M	Demo on Model

26	LS	Library Session
27	PL	Peer learning
28	RLE	Real life experience
29	REC	Recitation
30	SY	Symposium
31	TUT	Tutorial
32	PER	Presentations
33	PT	Practical
34	XRy	X ray identification
35	CD	Case diagnosis
36	LRI	Lab report interpretation
37	DA	Drug analysis
38	D	Demonstration
39	D_BED	Demonstration bedside
40	D_L	Demonstration Lab
41	DG	Demonstration Garden
42	FV	Field visit
43	PRA	Practical

॥ आयुषे सर्वलोकानाम् ॥



**Course curriculum for Second Professional BAMS**

**(PRESCRIBED BY NCISM)**

# **Rasashastra evam Bhaishajyakalpana**

**(SUBJECT CODE : AyUG-RB)**

**(Applicable from 2021-22 batch, from the academic year 2023-24 onwards for 5 years or until further notification by NCISM, whichever is earlier)**

**BOARD OF AYURVEDA**

**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE NEW DELHI-  
110058**

NCISM

## II Professional Ayurvedacharya (BAMS)

**Subject Code : AyUG-RB**

### Summary

Total number of Teaching hours: 450			
Lecture hours(LH)-Theory		150	150(LH)
Paper I	75		
Paper II	75		
Non Lecture hours(NLH)-Theory		300	300(NLH)
Paper I & II	90		
Non Lecture hours(NLH)-Practical			
Paper I & II	210		

Examination (Papers & Mark Distribution)					
Item	Theory Component Marks	Practical Component Marks			
		Practical	Viva	Elective	IA
Paper I	100	100	70	-	30
Paper II	100				
Sub-Total	200	200			
Total marks	400				

**Important Note:-**The User Manual II BAMS is a valuable resource that provides comprehensive details about the curriculum file. It will help you understand and implement the curriculum. Please read the User Manual II before reading this curriculum file. The curriculum file has been thoroughly reviewed and verified for accuracy. However, if you find any discrepancies, please note that the contents related to the MSE should be considered authentic.

In case of difficulty and questions regarding curriculum write to [cur.imp@ncismindia.org](mailto:cur.imp@ncismindia.org)

## PREFACE

Ayurvedic physician, Pranabhisara Vaidya, makes efforts for his task of management of diseases and maintenance of health. For this role his tool is Potent medicine and tactful techniques acquired from profound knowledge of classics.

Bheshaja is important in chikitsa chatushpada. Prepared personally or purchased or prescribed, the medicines must be potent. Identity, Purity, Quality, Stability, Safety and Efficacy all factors must be assessed carefully so that extensive therapeutic utility without any adverse drug reaction can be achieved. Education of Ayurvedic Pharmaceutics i. e. Ayurvediya Aushadhi Nirmana Shastra must provide foundation through guidance for academicians, Researchers, entrepreneurs and clinicians. Yogavijyana and prayogavijnyana isthat expected foundation. Ayurvedic classics expect yuktijna, siddhahasta, sarva bhaishajya kovid ( carak su. 20/22) physician as an outcome of studying Ayurveda.

To achieve the programme outcome of the Professional BAMS course of NCISM , this particular subject contributes a lot by providing thorough multidimensional knowledge in cognitive domain, hands on training of pharmaceutical processing in Psychomotor domain and ethical attitudes towards drug development in affective domain.

. The thought process by which Rasa Bheshaja Yogas reaches yojana- administration is very much important. Dose, Duration, Time and Route of administration, anupana all such factors are unique features of holistic Ayurvedic Practice. Acquiring details of these topics along with practical application with understanding its significance is the course objective of the subject RS& BK. The main Goal is to cater professional Competency in Ayurvedic Pharmaceutics and make them capable to select proper / effective yoga and administer it safely.

It is the need of time to make some addition in the current teaching and learning process of Rasashastra & Bhaishajya Kalpana to make it more relevant, practical and contemporary. New teaching technology tools will certainly be helpful in the effective delivery of knowledge of Rasashastra & Bhaishajya Kalpana. As per the revised regulation, the nomenclature of the subject is Ayurvediya Aushadhi Nirmana Vigyana as paper I and Ayurvediya Aushadhi Prayoga Vigyana as paper II for Second Professional BAMS course.

In this revision, NCISM has tried its best to take Rasashastra & Bhaishajya Kalpana teaching beyond the four walls of the classroom and get it connected with present global needs. For effective content delivery create interest in the subject it becomes evident to teach Rasashastra & Bhaishajya Kalpana with practical demonstrations. In order to facilitate proficiency in pharmaceutical preparation and its application in clinical practice, more non-lecture classes are allotted . Teaching methodology guidelines are provided which shall be followed while teaching, to make baseline uniformity in the process of learning. Activity-based learning will enable the internalization of the concepts and will build a strong platform while learning other subjects of Ayurved.



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**Course Code and Name of Course**

<b>Course code</b>	<b>Name of Course</b>
AyUG-RB	Rasashastra evam Bhaishajyakalpana

**Table 1- Course learning outcomes and matched PO**

<b>SR1 CO No</b>	<b>A1 Course learning Outcomes (CO) AyUG-RB At the end of the course AyUG-RB, the students should be able to-</b>	<b>B1 Course learning Outcomes matched with program learning outcomes.</b>
CO1	Demonstrate application of principles of Ayurvediya Aushadhi Nirmana (Ayurvedic Pharmaceutics)	PO1,PO5,PO7
CO2	Demonstrate application of principles of Ayurvediya Aushadhi Prayoga Vigyana (Clinical Pharmacology)	PO1,PO5,PO7
CO3	Prepare Ayurvedic formulations in adherence to quality control parameters for raw materials, in-process and finished products	PO1,PO3,PO4,PO5, PO6,PO7,PO8
CO4	Justify rationality of selection and administration of Ayurvedic formulations	PO3,PO5,PO6,PO7, PO8,PO9
CO5	Demonstrate application of ethical, legal and regulatory aspects of manufacturing and sale of Ayurvedic formulations.	PO2,PO8,PO9
CO6	Appraise research in current and emerging trend in Ayurvedic pharmaceuticals and allied sciences.	PO7,PO9

**Table 2 : Contents of Course**

<b>Paper 1 Ayurvediya Aushadhi Nirmana Vigyana</b>					
<b>Sr. No</b>	<b>A2 List of Topics</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
1	<p><b>1.Chronological development of Ayurvediya Aushadhi Nirmana</b>                      Definition, chronological development, significance and scope of Rasashastra and Bhaishajya Kalpana. Concept of Rasashala , Rasa-mandapa and Bheshajagara Concept of Rasa-Rasayana Briefing on Indians are first to prepare metal based medicines and Recent development in Ayurvedic Pharmaceuticals.</p>	1	05	2	1
2	<p><b>2.Paribhasha ( Terminology)</b>                      1. Definition and Importance of Paribhasha                      2. Word Derivation- Aushadha, Bheshaja, Kalpana, Kashaya, Pancha kashaya Yoni, Samskara                      3.Dravya/Varga Paribhasha- (Classical Names, English names,Chemical Composition/ Formula)                      A) Rasa, Maharasa, Uparasa, Dhatuvarga, Upadhatu, Ratna, Uparatna, Sudhavarga, Sikatavarga, Lavanavarga, Visha, Upavisha, Kajjali, Mitrpanchaka, Dravaka Gana,                      B) Sandigdha(Contraversial): Vaikranta, Chapala, Rasanjana, Pushpanjana, Vahnijara, Girisindura, Kankushtha.                      C) Anupalabdha (Not Available): Rasaka, Sauviranjana                      D) Krutrima (Artificial): Sasyaka, Gandhaka, Kasisa, Rasanjana, Hingula                      E) Pratinidhi (Substitute) : Vajrabhave Vaikranta, Suvarna-Suvarna Makshika                      4. Prakriya Paribhasha-                      A) Shodhana: Types of Shodhana, Samanya Shodhana, Vishsha Shodhana, Different techniques used for Shodhana, Swedana, Mardana, Dhalana, Nirvapa, Nirjaleekarana, Nimajjana, Bhavana,Bharjana                      B) Marana,: Definition, Importance of Marana, Types of Marana- Agnipaka Method, Putapaka Method, Kupipakwa Method, Bhanupaka Method, Swanga Sheeta                      C) Amrutikarana, Lohitikarana                      D) Sattvapatana, Shuddhavarta, Beejavarta                      E) Druti: Definition, Druti lakshana                      F) Parada Samskara: Definition, Importance, Ashtasamskara                      Parada Jaranaa, Murchchhana, Names of Parad-Bandhas                      5) Pramanikarana Paribhasha (Terms for Standardization)-                      A) Grahy-Agrahyattva, Siddhilakshana                      B) Bhasma pariksha: Varitara, Rekhapurnata, Unama,</p>	1	10	8	4

	<p>Slakshnattva, Sukshma, Anjana Sannibha, Dantagre na Kachakacha Bhavati, Varna, Avami, Apunarbhava, Niruttha, Gata Rasattva, Nischandrattva, Niramlattva, Nirdhumattva, Jihvagre adahyamanattva, Dadhi/ Nimbu Pariksha,</p> <p>6) Puraka Paribhasha (Supplementary)- Rudra Bhaga, Dhanvantari Bhaga 7) Mana-Paribhasha-</p> <p>A) Definition, Classical Types  B) Classical and Modern- Conversion chart as per AFI, Scientific Metrology  C) Essential Kala- mana.</p>				
3	<p><b>3.Adharbhuta Siddhanta (Application of fundamental principles )</b>  <b>Dravya Sangrha and Samrakshana</b></p> <ul style="list-style-type: none"> <li>• Time of drug Collection</li> <li>• General Rules</li> <li>• Specific time for specific plant part collection</li> <li>• Time of the day for drug collection</li> <li>• Collection of Pranija Dravya</li> <li>• Place of Drug collection Bhumi mahabhuta predominance</li> </ul> <ul style="list-style-type: none"> <li>• Places from where drugs should not be collected</li> <li>• Stage of drug collection</li> <li>• Rule of Duplication(Dwiguna Mana Ganana)</li> <li>• Ardra and Shushka Dravya mana</li> <li>• Dravya Sangraha Vidhi and Dravya samrakshana</li> <li>• Rasa, Guna, Virya ,Vipaka, Prabhava</li> </ul> <p><b>Anukta Visheshokta grahana:</b> Considering Anukta Dravya  <b>Aushadha Namakarana:</b> Naming a Preparation  <b>Aushadha Sevana Kala:</b> Time of Drug Administration  <b>Saveeryata Avadhi</b> (Shelf life of different kalpana)  <b>Aushadha Matra:</b>Dosage / Posology  <b>Anupana &amp; Sahapana (Adjuvant)</b>  <b>Yougika Dravya Siddhanta(Drug Combination)</b></p>	1	05	4	2
4	<p><b>4.Yantropakaranani- I (Equipments and machineries)</b>  <b>Principles involved, currently used yantras, their correlation, utility, and Instruments used in Large scale Production</b> Dola Yantra  Valuka Yantra  Putra Yantra  Khalwa Yantra  Patana Yantra  Darvika Yantra  Ulukhala Yantra  Patala Yantra  Kupi Yantra  Arkapatana Yantra  Pithara Yantra</p>	1	05	6	4

	Sharava Yantra Palika Yantra Sthali Yantra Swedana Yantra Vidyadhara Yantra <b>Modern Machinery-Grinder</b> Disintegrator Pulverizer Powder Mixer Mechanical sifter Ball mill Granulator Dryer Tablet compressing machine Pills making machine Coating pan Polishing pan End runner machine Edge runner machine Capsule filling machine Ointment mixer Tube filling machine Sieves & Meshes Liquid filling machine Distillation plant Strip packing machine Pouch filling machine Pyrometer				
5	<b>5.Yantropakaranani -II (Equipments, fuel and Heating Devices)</b> <b>Principle involved, importance of temperature, currently used heating devices utility, quantum of heat and Instruments used in Large scale Production Puta-</b> Chandra Puta Surya Puta Maha Puta Gaja Puta Varaha Puta Kukkuta Puta Kapota Puta Lavak Puta Budhar Puta Gorvara Puta Valuka Puta Kumbha / Bhandra Puta <b>Musha</b> Samanya Musha Crucibles- Silica Mudra	1	05	5	4

	<p>Sandhi Bandhan Material</p> <p><b>Koshthi-</b> Chullika Angar Koshthi Satwapatan Bhrashtri Gas Stove Hot Plate Heating Mantle Induction Stove Hot Air Oven Muffle Furnace- Horizontal and Vertical</p> <p><b>Heating Material-</b> Solid- Kashtha, coal(wooden / stone), Kshara, Lavana, Valuka, Shakrit, Dhanya Drava- Jala/ steam, Taila Indirect heating- Dhanya Rashi, Bhugarbha sthapana</p>				
6	<p><b>6.Kalpna Nirmana I (Primary &amp; Secondary dosage forms)</b> <b>Definition, classification with suitable examples, reference ingredients, quantity, method of preparation, principle involved, instruments used in small and large scale production, siddhi lakshana, storage, shelf life, modern aspect of related preparation of the following Panchavidha Kashya Kalpna (Primary dosage forms):</b> Swarasa, Kalka, Kwatha, Hima, Phanta <b>Upaklpna (Secondary dosage forms):</b> <b>Kalka:</b> Churna Kalpna <b>Kwatha:</b> Pramathya Kalpna, Paniya Kalpna, Ushnodaka, Ksheera Paka Kalpna, Laksha Rasa, Mamsa Rasa  <b>Hima Kalpna :</b> Mantha Kalpna, Udaka Kalpna, Panaka Kalpna <b>Phanta Kalpna:</b> Arka</p>	1	10	6	4
7	<p><b>7.Kalpna Nirmana-II (Method of Preparation of different dosage forms&amp; Dietary Supplements) )</b> <b>Avaleha</b> Definition, reference, essential ingredients, general method of preparation, specific rules of avaleha preparation, importance of temperature, siddhi lakshana, shelf life with examples i.e Vasavaleha, Kushmanda avaleha, research updates on Avaleha Kalpna, market survey <b>Sneha Kalpna</b> Aims of Sneha Kalpna, definition,reference, essential ingredients, general method of preparation, specific rules of sneha preparation, importance of temperature, gritha murchana, taila murchana, sneha siddhi lakshana, types of snehapaka, Patra(Gandha Paka), time duration to cook sneha preparation, shef life with examples Phala grita and</p>	1	10	5	4

	<p>Ksheerabala Bala Taila, Concept of Avartana, Research updates on snehakalpana, market survey</p> <p><b>Sandhana Kalpana</b> Introduction, significance of sandhana kalpana, classification, difference between Madhya and Shukta Kalpana, general method of preparation, essential ingredients, anukta Mana, sandhana vidhi, observations, Burnig candle test, Lime water Test, important factors in Asava Arishta Preparation like sandhanan patra selection, place for fermentaion, importance of room temperature, sandhana kala, adding of honey, bhasma, prakshepaka dravya, difference between Asava &amp; Arishta, shelf life and alcohol % with examples Draksharista and Usheerasava, Research updates on Sandhana Kalpana, market survey</p> <p><b>Pathya Kalpana</b> Definition , significance of Pathya, types, general, method of preparation Manda, Peya, Yavagu, Vilepi, Anna or Odana Kalpana, Krashara, Yusha, Takra, Khada, Kambalika, Raga, Shadava, Related Research updates, Market survey of Dietary Supplements</p>				
8	<p><b>8.Rasa Dravya Parichaya- I</b> <b>Synonyms, minerological identification, sources, types, grahya and agrahyata, doshas, shodhana, marana and other processing techniques, Probable Physico-chemical Changes, importance of temperature while processing , yoga, Research updates of the following</b></p> <p><b>Must to know Drugs</b> Parada (mercury) Abhraka (Biotite Mica) Makshika (Chalco-pyrite) Shilajatu(Asphaltum Punjabianum) Gandhaka (Sulfur) Gairika(Red Ochre) Kankshi (Alum) Haratala (Orpiment) Manahshila (Realgar) Kampillaka(Mallotus Philippinensis) Navasadara (Ammonium chloride) Hingula (Red Cinnabar) Swarna (Gold) Rajata (Silver) Tamra (Copper) Loha (Iron) Mandur (rust iron) Vanga (Tin) Naga (Lead) Yashada (Zinc) Mukta (Pearl), Pravala (Coral)</p>	2	10	12	4

	<p>Vajra (Diamond)  Kaparda (Cowries)  Shukti (Oyster Shell)  Shankh (Conch Shell)  Godanti (Gypsum)  Samudraphena (Cattle Fish bone)  Kukkutanda twak (Hen's EggShell)  Tankana kshara (Borax)</p>				
9	<p><b>9.Rasa Dravya Parichaya II</b>  <b>Synonyms, mineralogical identification, sources, types, grahya and agrahyata, shodhana, marana and other processing techniques with probable chemical reactions, the importance of temperature, yoga, research updates of the following: Desirable to know drugs:</b>  Sasyaka (Peacock ore)  Kaseesa (Green Vitriol),  Gauri pashana (Arsenic oxide);  Trinakanta,  Akika(Agate),  Sudha (Lime stone ),  Khatika  Ajashthi;  Jaharmohara (Serpentine)  Dugdhapashana (Talc)</p>	2	5	7	6
10	<p><b>10.Rasadravya Parichaya III</b>  <b>Synonyms, Minerological Identification, sources, types, Grahya, Agrahyata, Shodhana, Marana, Probable Chemical Changes, Properties,dose, Ashuddha/Apakwa Bhasma Sevanajanya Vydhi and their shantyupaya, yoga, Research updates</b>  <b>Nice to know drugs:</b>  Vaikrantha,  Vimala (Iron Pyrite),  Chapala  Rasaka  Anjana  Kankustha  Agnijara  Giri Sindura (Red oxide of Hg)  Mriddara shringa (Litharge)  Kamsya (Bronze)  Pittala (Brass)  Vartaloha.  Manikya (Ruby)  Tarkshya (Emerald)  Pushparaga (Topaz)  Nilam (Sapphire)  Gomeda (Zircon or Cinnamone stone)</p>	2	5	3	6



	Vaidurya (Cats eye) Mriga shringa (Stag horn) Sikata (Silica) Vyomashma (Sangeyashab - Jade) Kousheyashma (Asbestos) Badarshama (silicate of lime)				
11	<p><b>11.Kalpana Nirman -III (Method of Preparation of different dosage forms)</b></p> <p><b>Sharkara Kalpana</b></p> <ul style="list-style-type: none"> <li>◆ General method of preparation, difference between sharkara kalpana and syrup, importance of temperature, precautions, confirmatory tests, packing, preservation, shelf life with Example of Tulasi Arka Sharkara</li> </ul> <p><b>Gudapaka</b></p> <ul style="list-style-type: none"> <li>◆ General Method of Preparation, importance of temperature, precautions, confirmatory tests, packing, preservation, shelf life with Example of ManibhadraGuda, Guda Pippali</li> </ul> <p><b>Lavana Kalpana</b></p> <ul style="list-style-type: none"> <li>◆ General Method of Preparation, importance of temperature, precautions, confirmatory tests, packing, preservation, shelf life with Example of Narikela Lavana</li> </ul> <p><b>Kshara Kalpana</b></p> <ul style="list-style-type: none"> <li>◆ General Method of Preparation, importance of temperature, precautions, confirmatory tests, packing, preservation, shelf life with Example of Kadali Kshara, chinch Kshara</li> </ul> <p><b>Ayskriti Kalpana</b></p> <ul style="list-style-type: none"> <li>◆ General Method of Preparation, importance of temperature, precautions, confirmatory tests, packing, preservation, shelf life with Example Ayaskriti</li> </ul> <p><b>Lepa Kalpana</b></p> <ul style="list-style-type: none"> <li>◆ General Method of Preparation, importance of temperature, precautions, confirmatory tests, packing, preservation, shelf life with Example of</li> </ul>	2	10	8	6

	Avalgunjadi Lepa, Keshavardhaka Lepa.				
12	<b>12.Chaturvidha Rasayana</b> <b>Introduction, definition, importance, types, Procedure, necessary equipment, Shelf life with following example</b> <b>Kharaliya Rasayana:</b> Shwasakuthara rasa and Vatavidwansana rasa <b>Parpati Rasayana:</b> Loha parpati and sudha parpati <b>Kupipakwa Rasayana:</b> Rasasidhura and Rasa karpura <b>Pottali Rasayana:</b> Tamragarbha pottali and Loha garbha pottali	2	10	4	4
13	<b>13.Current and emerging trend in Ayurvedic pharmaceuticals</b> <b>Cosmetics-Formulation, Regulatory Provisions</b> Brief Introduction to Cosmetics-Formulation, Regulatory Provisions, Plant Layout and other factory requirements, process used in the manufacture of Cosmetics, Most commonly used cosmetic Raw materials , Control of microbial contamination in the manufacture of cosmetics and Quality Control of cosmetics, Skin Sensitization Sensitivity Testing, In vitro-Tests for Skin Irritation, Quality Control of Raw materials, Intermediates and Finished Products, Stability of Cosmetics <b>Introduction to Dosage forms</b> Introduction, Classification of Dosage forms(Solid dosage forms, Liquid dosage forms and Semisolid dosage forms), Need of dosage forms.	3	5	3	4
14	<b>14.GMP(Schedule T) &amp; Regulatory aspects of Ayurvedic drugs</b> <b>Brief overview of following</b> <ul style="list-style-type: none"> <li>◆ <b>Drug and Cosmetics Act 1940 and Rules 1945</b> import, manufacture, sale distribution of drugs and cosmetics standards of quality, misbranded, adulterated, spurious drugs and cosmetics as amended from time to time.  <b>New Acts related to Drugs and Devices.</b></li> <li>◆ <b>Good Manufacturing Practices (GMP) of ASU</b> Drugs in accordance to Schedule- T  <b>Food Safety and Standards Authority of India (FSSAI) and FDA Approval Drugs.</b></li> </ul>	3	5	2	4
<b>Total Marks</b>			<b>100</b>	<b>75 hr</b>	<b>57 hr</b>

**Paper 2 Ayurvediya Aushadhi Prayoga Vigyana**

Sr. No	A2 List of Topics	B2 Term	C2 Marks	D2 Lecture hours	E2 Non-Lecture hours
15	<b>1.Aushadhi Prayoga Vigyana</b> Introduction, Ethymology, Scope of Aushadhi Prayoga vigyanaPrashastha beshaja Lakshana	1	5	1	2
16	<b>2.Single drug (Herbal &amp; Mineral)</b> <b>Single drug its variety of formulations and their different indications• Chemical/phytochemical composition</b> <ul style="list-style-type: none"> <li>• Pharmacodynamics and pharmacokinetics as per formulation</li> <li>• Therapeutic properties</li> <li>• Awasthanusara Uses(as applicable)</li> <li>• Matra</li> <li>• Anupana</li> <li>• Pathyapathya</li> <li>• Sevana Kala</li> <li>• Kala maryada (duration of medication as applicable)</li> <li>• Side effects of medication (as applicable)</li> <li>• Research updates and clinical evidences for each of the following formulations</li> </ul> <b>Guduchi</b> Guduchi Swarasa (Sha.Sam.Ma. Kh. Chp1/7 page 138) Guduchyadi Churna (B.R. Pleehayakrut Rogdhikara) Guduchi Kwatha (B.R. Jwaradhikara) Guduchi Hima (B.R. Chardi Rogadhikara) Guduchi Ghana- Samshamani Vati (AFI Part II Page 183) Guduchi Satva (AFI-Part I, Page 205) Amrutadi Guggulu (AFI-Part III, Page 107) Amritarishta (AFI Part I page 6) <b>Amalaki</b> Amalaki Swarasa (Sha.Sam.Ma.Kha.) Amalakyadi Churna (Sha.Sam.M.Kha. Churna kalpana) Triphala Rasayana (Cha.Chi. Rasayana Adhyaya) Chyavanaprasha (AFI Part I page 37) Dhatri Lauha (AFI Part I Page 284) Amalakyadi Gutika (Sha.Sam.Ma.Kha. Vati Kalpana) Phalatrikadi Kwatha (Sha.Sam.Ma.Kha.Kwatha Kalpana) Triphala Ghrita (Sha.Sam.Ma.Kha. Ghrita Kalpana) <b>Bhallataka</b> Bhallataka Modaka (B.R. Pleeha-Yakrit Rogadhikara) Bhallataka Ghrita (B.R. Gulma Rogadhikara) Bhallataka Guda (B.R. Arsha Rogadhikara) Bhallatakadi Taila (B.R. Nadivrina Rogadhikara) Bhallataka Avaleha (B.R. Arsha Rogadhikara)	1	10	8	2

	<p>Bhallatakadi Lepa (B.R. Kushta Rogadhikara)          Bhallatakadi Kwatha (B.R. Urusthabha Rogadhikara)Note:          For Bhallataka additional ashuddha, avidhi sevanajanya          vyadhi and their shantyupaya<b>Gandhaka</b>          Gandhaka churna (SY page 217)          Gandhaka Rasayana (AFI-Part II, Page 115)          Gandhaka Druti (RRR 3rd Chapter)          Gandhaka Taila (R.T. 8th Chapter)          Gandhakadya Malahara (AFI-Part II, Page 165)          Gandhakadi Lepa (RRS Shiroroga Chikitsa)          Gandhaka Vati (B.R. Agnimandya Rogadhikara)  <b>Gairika</b>          Gairika Pradeha (Cha.Chi. Visarpa Rogadhyaya          Laghusuta shekhara Rasa (AFI Part II Page 282)          Gairikadya Malahara (AFI-Part III, Page 224)          Gairikadya Gutikanjana (B.R. Netraroga)          Gairika rasakriya (Cha.Chi.26/235)          Varnakara lepa (Cha.Chi.25/117)</p>				
17	<p><b>3.Single drug(Bhasma, Shuddha &amp; Pishti)</b>  <b>• Single drug/ formulation and its mode of action in different indications</b>  <b>•Chemical/phytochemical composition</b>  <b>• Pharmacodynamics and pharmacokinetics as per formulation</b>  <b>• Therapeutic properties</b>  <b>• Awasthanusara Uses(as applicable)</b>  <b>• Matra</b>  <b>• Anupana</b>  <b>• Pathyapathya</b>  <b>• Sevana Kala</b>  <b>• Kala maryada (duration of medication as applicable)</b>  <b>• Side effects of medication(as applicable)</b>  <b>• Ashuddha apakwa, avidhi sevanajanya vyadhi and their shantyupaya,</b>  <b>• Research updates and clinical evidences for each of the following formulations:</b>          Abhraka Bhasma          Swarna Makshika Bhasma          Swarna Bhasma          Rajata Bhasma          Lauha Bhasma          Tamra Bhasma          Vanga Bhasma          Naga Bhasma          Yashada Bhasma          Kasisa Bhasma          Shuddha Shilajatu          Shuddha Gandhaka          Shuddha Gairika</p>	2	15	12	6

	<p>Shuddha Kankshi  Mukta Pishti &amp; Bhasma  Pravala Pishti &amp; Bhasma  Vajra Bhasma  Kaparda Bhasma  Shankh Bhasma  Godanti Bhasma  Shuddha Tankana  Shuddha Kankshi</p>				
18	<p><b>4.Aushadhi Kalpa -I (Compound formulations)</b>  •<b>Chemical/phytochemical composition</b>  • <b>Pharmacodynamics and pharmacokinetics as per formulation</b>  • <b>Therapeutic properties and its mode of action in different indications,</b>  • <b>Awasthanusara Uses(as applicable)</b>  • <b>Matra</b>  • <b>Anupana</b>  • <b>Pathyapathya</b>  • <b>Sevana Kala</b>  • <b>Kala maryada (duration of medication as applicable)</b>  • <b>Side effects of medication(as applicable)</b>  • <b>Ashuddha apakwa processed , avidhi sevanajanya vyadhi and their shantyupaya,</b>  • <b>Research updates and clinical evidences for each of the following formulations:</b>  <b>Kharaliya Rasayana</b>  • Arogyavardhini Gutika : A.F.I. - I, Rasayoga, 20:4, R.R.S. Visarpa Chi. 20/106  • Kumara Kalyana Rasa : A.F.I. - I, Rasayoga, 20:9, B.R. Balaroga / 163  • Garbhapala Rasa : A.F.I. - II, Rasayoga, 16:14,R.T.Sa. Part - I, 140  Chandraprabha Vati : A.F.I. - I, Vati Gutika, 12:10,Sha.Sa.M.7/40  • Pravala Panchamrita Rasa : A.F.I. - II, Rasayoga, 16:37,B.R. Gulma / 139  • Anandbhairava Rasa : A.F.I. - I, Rasayoga, 20:3,R.Sa.Sa.Jwara 2/103  • Yogendra Rasa : A.F.I. - I, Rasayoga, 20:31,B.R. Vatavyadhi / 506  • Laxmivilas Rasa : A.F.I. - I, Rasayoga, 20:39, B.R. Rasayana / 55  • Vasantakusumakara Rasa : A.F.I. - I, Rasayoga,20:42,R.Sa.Sa.Rasayana Vajikarana / 80  • Vasantamalti Rasa : A.F.I. - I, Rasayoga, 20:41, Si.Bhai.Ma.Ma.Jwara / 60  • Brihat Vata Chintamani Rasa : A.F.I. - I, Rasayoga, 20:26,</p>	2	15	16	4

	<p>B.R., Vatavyadhi/502</p> <ul style="list-style-type: none"> <li>• Shankha Vati : A.F.I. - I, Vati Gutika, 12:32, B.R. Agnimandya / 182</li> <li>• Shwaskuthara Rasa : A.F.I. - I, Rasayoga, 20:49, Yo.Ra., Swasa / Page 373</li> <li>• Kamadudha Rasa : A.F.I. - II, Rasayoga, 16:9, R.Ta.Sa. Kharaliya Rasayana / 80</li> <li>• Sutashekhar Rasa : A.F.I. - II, Rasayoga, 16:63, Yo.Ra. Amlapita / Page 125</li> <li>• Navayasa Loha : A.F.I. - II, Lauha, 17:2, Cha.Sa.Chi.16/70</li> <li>• Ichchhabhedhi Rasa : A.F.I. - I, Rasayoga, 20:5, B.Ra. Udararoga / 84</li> <li>• Krimikuthara Rasa : A.F.I. - II, Rasayoga, 16:12, R.Ta.Sa. Kharaliya Rasayana / P. 103</li> </ul> <p><b>Parpati Rasayana</b></p> <ul style="list-style-type: none"> <li>• Panchamruta Parpati : A.F.I. - I, Parpati, 16:1, B.R. Grahani / 461</li> <li>• Bola Parpati : A.F.I. - I, Parpati, 16:2, Yo.R., Pradara / P 842</li> </ul> <p><b>Kupipakwa Rasayana</b></p> <ul style="list-style-type: none"> <li>• Swarna Vanga : A.F.I. - I, Kupipakwa, 15:9, Rasamruta 3/95</li> <li>• Makaradhwaja : A.F.I. - I, Kupipakwa, 15: 2, B. R. Vajikarana 2/ 237</li> <li>• Sameerpannaga Rasa : A.F.I. - I, Kupipakwa, 15:8, A.A.G.S. Part - 4 Page 88</li> </ul> <p><b>Pottali Rasayana</b></p> <ul style="list-style-type: none"> <li>• Hemagarbha Pottali : A.F.I. - II, Rasayoga, 16:66, Rasamruta Rasavigyaniya 9/218</li> </ul>				
19	<p><b>5.Aushadhi Kalpa-II (Compound Drugs/Formulations)</b></p> <ul style="list-style-type: none"> <li>• <b>Chemical/phytochemical composition</b></li> <li>• <b>Pharmacodynamics and pharmacokinetics as per formulation</b></li> <li>• <b>Therapeutic properties and its mode of action in different indications,</b></li> <li>• <b>Awasthanusara Uses(as applicable)</b></li> <li>• <b>Matra</b></li> <li>• <b>Anupana</b></li> <li>• <b>Pathyapathya</b></li> <li>• <b>Sevana Kala</b></li> <li>• <b>Kala maryada (duration of medication as applicable)</b></li> <li>• <b>Side effects of medication(as applicable)</b></li> <li>• <b>Improperly processed , avidhi sevanajanya vyadhi and their shantyupaya,</b></li> <li>• <b>Research updates and clinical evidences for each of the following formulations:</b></li> </ul> <p>Dashamoola Kwatha (AFI Part I Page 55) Mahamanjistadi Kwatha (AFI Part I page 59)</p>	3	15	14	2

	<p>Pushyanuga Churna (AFI-Part I, Page 113)  Sudarshana Churna (AFI Part I Page 116)  Lavana Bhaskara Churna (AFI-Part I, Page 114)  Bilvadi Gutika (AFI Part I Page 188)  Chitrakadi Gutika (AFI-Part I, Page 186)  Sanjivani Vati (B.R. Jwaradhikara)  Vyoshadi Vati (AFI Part III Page 253)  Bala Chaturbhadra Rasa (B.R. Balarogadhikara)  Simhanada Guggulu (AFI-Part I, Page 71)  Yogaraja Guggulu (AFI-Part I, Page 69)  Chyavanaprashavaleha (AFI Part I page 37)  Dadimavaleha (Y.R. Jwaratisaradhyaya)  Panchagavya Ghrita (AFI Part I Page 90)  Brahmi Ghrita (AFI Part I Page 93)  Narayana Taila (AFI Part I Page 138)  Neelibhringadi Taila (AFI Part I Page 139)  Panchaguna Taila (AFI-Part II, Page 145)  Aravindasava (AFI Part I page 7)  Ashokarishta (AFI Part I page 8)  Kumaryasava (AFI Part I page 10)  Kutajarishta (AFI Part I page 10)  Gandhakadya Malahara (AFI-Part II, Page 165)  Lepa Gutu (AFI Part III page 232)</p>				
20	<p><b>6.Dosage Forms &amp; Cosmetic Products</b>  Definition of dosage form,-Cosmetics  Advantages and disadvantages of currently available dosage forms and cosmetics. Route of their administration. Research updates on modification of classical Ayurvedic dosage forms and relevant case studies.</p>	3	5	5	2
21	<p><b>7.Nutraceuticals</b>  <b>Introduction</b>  <b>Types, non Indian nutraceuticals and their uses</b>  <b>Ayurvedic Perspective of Nutraceuticals with special reference to dietic preparation, rasayana with one examples for each category , mode of action, nutritional value calculation, research updates and case studies on below mentioned category</b>  <b>General Health :</b> Kushmanda avaleha  <b>Pediatric Health:</b> Preenana Modaka(Kashyapa)  <b>Geriatric Health:</b> Chavanaprasha avaleha  <b>Reproductive Health:</b> Phala Grita  <b>Women's health:</b> Soubhagya shuntipaka, Shatavari grita  <b>Cardio-protective:</b> Arjuna Ksheerapaka &amp; Rasona ksheera paka  <b>Sports endeavor:</b> Kharjuradi mantha  <b>Mental health:</b> Brahma Rasayana</p>	3	5	6	1
22	<p><b>8.Anupana Prayoga for Aushadhi Kalpa</b></p>	3	5	4	1

	<p><b>Properties of Anupana</b>  <b>Factors to be considered for selection of Anupana</b>  •Dosha  •Aushadha  •Roga/ Rogi  •Ahara  <b>Purpose of Anupana</b>  <b>Contraindications of Anupana</b>  <b>Eka Kalpa Vydi anusara aneka Anupana for following yogas</b>  <b>1.Kaishore Guggulu:</b> Sarangadhar Samhita , Madhyam khanda- 7/72-81, P: 136<b>2. Yogaraj, Guggulu:</b> Sarangadhar Samhita Madhyam khanda- 7/56-69, P:135<b>3. Narayana Churna:</b> Sarangadhar Samhita of Pandit Sarangadharacharya, , Madhyam khanda- 7/83-91, P:123-124<b>4.Rasa Sindoor:</b> RasaTarangini Hindi commentary of Sri Sadananda Sarma,Chaukhambha Surbharti, Murcchana vigyaniya Taranga, 6/203-234, P: 125-127<b>5. Rasa Parpati:</b> Rasa Tarangini of Sri Sadananda Sarma,Chaukhambha Surbharti Prakashan, Murcchana vigyaniya Taranga, 6/144-153, P: 116-117<b>6.Kankayan Vati :</b> Sarangadhar Samhita Surbharti Prakashan, Madhyam khanda, 7/50-55, P: 134-135)</p>				
23	<p><b>9.Aushadhi Prayoga Marga</b>  <b>Introduction</b>  <b>Types in ayurveda</b>  <b>Advantages and disadvantages of each aushadhi prayoga marga and probable mode of action after administration of following dosage forms in below mentioned routes</b>  1. Mukha (Oral Cavity): Vati, Gutika, Churna, Asava, Arishta,Kashaya, Avaleha, Khanda, Sneha (Ghrita/Taila),  2. Nasa(Nasal Route)- Dosage form used - Churna, taila, swarasa, arka  3. Karna (Through Ear)- Taila, Ghrita  4. Akshi (Through Eyes)- - Ghrita, Taila,  5. Twak (Through Skin)- Lepa, Alepa, Pralepa, Malahara, upanaha,pradeha, abhyanga, udvartana  • Shirodhara - Takra  • Abhyanga- Sahacharadi Taila  • Ashti Bhagna- Murivenna Taila  • Vrana- Jatyadi Taila  • Smashru – Shankha Bhasma  • Kesha Ghanata- Bringaraja Taila  • Akala Palita – Hasthi Danta Masi  • Indralupta – Icchabhedi Rasa  • Lomashatana – Lomashatana Lepa  6. Guda ( Anal Route)- Dosage forms - Vartis, taila, ghrita, kalka, churna, kashaya  7. Mutra marga (Through urethra)- Uttara Basti with</p>	3	10	5	1



	Dosage forms- Taila, ghrita 8. Yoni marga (Through vagina)- Yoni Dharana, Yoni Dhavana, Yoni Pichu, Yoni Dhoopana				
24	<b>10.Rational prescription along with safe dispensing of Ayurvedic formulations.</b> Rational prescription along with safe dispensing of Ayurvedic formulations as per NABH guideline	3	5	1	4
25	<b>11.Traditional &amp; Local health Practices</b> Introduction to Traditional & Local health Practices and Government initiatives to preserve it. Brief introduction to TKDL	3	5	2	4
26	<b>12.Pharmacovigilance for Ayurveda drugs</b> Pharmacovigilance and Adverse Drug Reactions (ADR) Pharmacovigilance Programme of Ayurveda, Siddha, Unani and Homeopathy (ASU & H) Drugs Central Sector Scheme and Centres of Pharmacovigilance of ASU & H Drugs	3	5	1	4
<b>Total Marks</b>			<b>100</b>	<b>75 hr</b>	<b>33 hr</b>

**Table 3: Learning objectives (Theory) of Course**

<b>Paper 1 Ayurvediya Aushadhi Nirmana Vigyana</b>									
<b>A3</b> Course outcome	<b>B3</b> Learning Objective (At the end of the session, the students should be able to)	<b>C3</b> Doma in/sub	<b>D3</b> Must to know / desirable to know / Nice to know	<b>E3</b> Level Does/ Show s how/ Know s how/ Know	<b>F3</b> T-L meth od	<b>G3</b> Assessment  (Refer abbreviations)	<b>H3</b> Form ative/ summ ative	<b>I3</b> Term	<b>J3</b> Integr ation
<b>Topic 1.Chronological development of Ayurvediya Aushadhi Nirmana</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1	Explain historical evolution of Ayurvediya aushadhi nirman and Rasashastra.	CK	MK	K	L&G D	TT-Theory	F&S	I	
CO1	Describe about contribution of Nagarjuna Acharya to Rasashastra	CK	MK	K	L_V C	TT-Theory	F&S	I	
CO1	Enlist important classical texts of Rasashastra and describe their unique features in short.	CK	DK	K	L&PP T	TT-Theory	F&S	I	
CO1	Describe structure of Pharmacy and enlist formulations prepared in pharmacy, after visiting the unit of teaching pharmacy of own campus	CC	MK	KH	L&G D	CL-PR	F	I	
CO1	Describe Recent development in Ayurvedic Pharmaceuticals viz, new dosage forms, pharmaceutical modification techniques.	CK	DK	K	L&PP T	TT-Theory	F&S	I	
CO1	Define Rasa and Rasayana and describe difference between Rasa and Rasayana	CK	DK	K	L&PP T	T- MEQs	F	I	

CO1	Justify design of ancient Rasashala	AFT-VAL	NK	KH	SDL	PRN	F	I	
<b>Topic 2 2.Paribhasha ( Terminology) (Lecture :8 hours, Non lecture: 4 hours)</b>									
CO1	Explain the term Paribhasha and its importance in Ayurvediya Aushadhi Nirmana.	CK	MK	K	L	T-CRQs	F	I	
CO1	Discribe the terms Aushadha, Bheshaja, Kalpana, Kashaya, Kashaya yoni, Samskara- based on their word derivations	CC	MK	K	L	T- EW	F&S	I	
CO1	Enlist sequentially - names of all drugs classified in the varga(group). Recite shlokas of Maharasa, Uprasa , Sadharana Rasa Varga from Rasaratnasamuchchaya.	CC	MK	K	EDU, SDL, GBL, REC	P-REC,P-ID,PUZ,O-QZ	F&S	I	
CO1	Enlist and discuss Sandigdha, Krutrima, Pratinidhi and Anupalabdha dravya.	CK	DK	K	L&PP T,SD L,GB L	P-ID,CL-PR	F	I	
CO1,CO2	Discribe the definition of the term Shodhana. Explain with examples different techniques used for the procedures of Shodhana.	CAP	MK	KH	L&G D,L_ VC,P T	T- MEQs,P-E XAM,O-QZ,O-GAME	F&S	I	
CO1	Explain the term Marana and describe its types with examples	CK	MK	K	L&PP T,LS	T-OBT	F&S	I	
CO1	Enlist all relevent prakriya paribhasha of Amrutikarana, Lohitakarana,Sattvapatana, druti and discuss with examples	CK	DK	K	DIS,L S	PRN	F	I	
CO1,CO2	Recite sequentially names of Parada Ashta samskara. Explain the terms Jarana Murchchhana and cite types with examples. Compare Jarana and Murchchhana.	CC	MK	KH	L_ VC ,PrBL	T-EMIT,T- ME Qs,PRN,M-CHT	F&S	I	

CO1	Identify names of Parada Bandhas	CK	NK	K	LS	T-OBT	F	I	
CO1,CO2,CO5	Describe Grahyagrahya parameters used for selection of Rasadravyas.	CK	MK	SH	L&PP T,PrB L	T- EW	F&S	I	
CO1,CO2,CO5,CO6	Illustrate all Bhasma pariksha as per classical description.	CC	MK	KH	L_VC ,IBL, DA,D	T- MEQs,P- EXAM,CHK	S	III	
CO1,CO2,CO5	Define the word Siddhilakshani.Recite examples of classical siddhilakshani. Interpret its rationality	CE	MK	KH	L&PP T,SD L,RE C,D_ L	T- MEQs,P- EXAM	F&S	I	
CO1	Recognise and discuss Dhanvantari Bhaga and Rudra bhaga	CC	NK	K	RLE	C-INT	F	I	
CO1	Explain importance of Mana-paribhasha and classical types of Mana. Recall Charts of Mana .	CK	DK	KH	L&PP T,PS M	T-CRQs,P- SUR	F	I	
CO1,CO2	Categorize parameters of Drug Standardization and develop a checklist for assessment of quality of rasadravyas	CE	DK	KH	BS,IB L,TP W,SD L	CL- PR,WP,CHK	F&S	I	
CO2	Explain Value of selection of genuine raw material	AFT- VAL	MK	KH	DIS	DEB	F	II	
CO2,CO3	Explain importance of ethical practices for drug processing( Shodhan, Marana )	AFT- VAL	MK	K	PrBL	P-POS	F	II	
CO2,CO3	Discuss and justify importance of Bhasma Pariksha	AFT- RES	MK	KH	BS	T- EW	F&S	III	

CO2,CO3	Explain value of keen and accurate application of weights and measures in Ayurvediya Aushadhi nirmana	AFT-VAL	DK	K	L&GD	PRN	F	II	
<b>Topic 3 3.Adharbhuta Siddhanta (Application of fundamental principles )</b> (Lecture :4 hours, Non lecture: 2 hours)									
CO1,CO2	Elaborate fundamental principles of Ayurvediya Aushadhi Nirmana alongwith their classical references and discuss their application with classical examples of various kalpas.	CC	MK	KH	L&PP T,BS	T- EW,M- POS	F&S	I	
CO1,CO2	Explain Dravya Samgraha vidhi. Explain types of Bhumi desha and types of drugs to be collected from particular place & places from where Dravya should not be collected.	CC	MK	KH	L&PP T,DIS ,BS	T- EW	F&S	I	H-DG
CO1,CO2	Describe time of Dravya collection and explain rationality behind it.	CC	MK	KH	L&PP T,BS	T- EW	F&S	I	H-DG
CO1,CO2	Enlist parts of Sthavara & Jangama Dravyas used for Ayurvediya Aushadhi nirmana.	CC	MK	KH	L&G D,BS	T- EW	F&S	I	H-DG
CO1,CO2	Define Samskara. Discuss role of Samskara in Ayurvediya Aushadhi Nirmana alongwith various examples.	CC	MK	KH	L&PP T,BS	T- EW	F&S	I	H-Sa mhita
CO1,CO2	Discribe Ardra - Shushka Dravya & Anukta – Visheshokta Dravya collection principles.	CC	MK	KH	L&PP T,DIS	T- EW	F&S	I	H-DG
CO1,CO2	Describe importance of kalpa sevan matra. Explain factors considered for deciding dosage of any drug ( Ayurvedic as well as modern medicine principles). Describe Posology	CC	MK	KH	L&PP T,BS	T- EW	F&S	I	
CO1,CO2	Explain Saveeryata Avadhi(Shelf life) of Ayurvedic dosage forms.	CK	DK	K	L&PP T,DIS	T- MEQs,P- VIVA	F&S	I	
CO1,CO2	Discuss Yogika Dravya Sidhdhanta(Drug combination)	CC	MK	KH	L&PP T,BS	T- EW	F&S	I	
CO1	Explain importance of Kala (Time) Samskara in Ayurvediya	CK	MK	K	L&PP	TT-Theory	F&S	I	

	Aushadhi Nirmana. Elaborate Aushadhi sevana kala mentioned in Sharangdhara samhita. Discribe chrono- Therapeutics.				T				
CO1	Justify Aushadhi kalpa namakarana siddhanta with examples	CC	DK	KH	IBL	CL-PR	F	I	
<b>Topic 4 4.Yantropakaranani- I (Equipments and machineries)</b> (Lecture :6 hours, Non lecture: 4 hours)									
CO1,CO5	Choose and record contemporary machines used in Ayurvedic drug preparation.	CC	DK	K	L&PP T,DIS	T- EW	F&S	I	
CO1,CO5	Discuss the pharmaceutical use of Distillation apparatus, Ball Mill, Pulveriser, End Runner, Edge Runner, Tablet compression machine, Capsule filling machine, Pouch filling machine, Liquid filling machine in Ayurvediya Aushadhi Nirmana	CC	DK	K	L&PP T,DIS	T- EW	F	I	
CO1,CO5	Describe the principles behind construction and working of the classical Yantras used for Ayurvediya Aushadhi nirmana.	CAP	MK	KH	L&PP T,DIS	T- MEQs,P- VIVA	F&S	I	
CO1,CO5	Enlist categorical information about the following Yantras in the charts- Ulukhal Yantra, Patan Yantra, Jarana Yantra, Patala Yantra and Swedana Yantra.	CK	DK	K	L&PP T,DIS	T- EW	F	I	

CO1,CO5	Interpret the mechanism and effect of Yantras / machines on the Physical and Chemical properties of the drug material.	CC	DK	KH	DIS,I BL	M-POS	F	I	
CO1	Enlist Ayurvediya aushadhi kalpana and equipments/yantras/ machines used for preparation of each kalpana.	CK	DK	K	L&PP T	T- EW	F	I	
<b>Topic 5 5.Yantropakaranani -II (Equipments, fuel and Heating Devices)</b> (Lecture :5 hours, Non lecture: 4 hours)									
CO1,CO5	Describe the term Yantra and enlist yantras described in classics useful for aushadhi nirmana.	CK	DK	K	L&PP T	TT-Theory	F	I	
CO1,CO5	Define the term Puta and recite its classical explanation.	CK	MK	K	L_VC ,RLE	T- EW,M- POS	F&S	I	
CO1,CO5	Produce categorical information( Size of Pit, Number of cowdunkcakes, use etc.) about following Putas viz. Mahaputa, Gajaputa, Varahputa, Kukkutaputa, Kapotputa, Lavakputa, Kumbhaputa, Bhandaputa, Valukaputa and Bhudharputa.	CK	MK	K	L&PP T,DIS ,TPW	T- EW,M- POS,COM	F&S	I	
CO1,CO5	Recognise the principles behind construction and working of the classical Putas.	CC	MK	KH	L&PP T,DIS ,IBL	T- EW,M- POS	F&S	I	
CO1,CO5	Identify and enlist contemporary devices used in the preparation	CC	DK	K	L&PP	T- MEQs,QZ	F&S	I	

	of Bhasma.				T,DIS ,IBL	,M-POS			
CO1,CO5	Review the temperature pattern of various Putas by referring research articles.	CC	DK	K	TPW, SDL	QZ ,M-POS	F&S	I	
CO1,CO5	Compile names and significance of temperature measuring devices with reference to Puta.	CK	DK	K	DIS, ML	CL-PR,M- POS	F	I	
CO1,CO5	Enlist the specific Puta used for a particular Bhasma Nirmana.	CC	DK	KH	L&PP T	CL-PR,M- POS	F	I	
CO1,CO5	Enlist various devices used for heating during Ayurvediya Aushadhi nirmana.	CK	DK	K	L,DIS ,RLE, FV	T- EW,P-SUR	F&S	I	
CO1,CO5	Enlist constituents needed for Samanya Musha Nirmana.	CK	DK	K	L&PP T,IBL	T- MEQs	F&S	I	
CO1,CO5	Define the term Musha and describe uses of various types of Musha.	CK	DK	D	L_ VC ,D-M	T-OBT	F&S	I	
CO1,CO5	Enlist and discuss the material used for Sandhi Bandhan ( while using Sharava and Kachakupi)	CK	NK	K	DIS,R LE	T-OBT	F	I	
CO1,CO5	Identify and record the types of Crucibles .	CK	NK	K	L&PP T	M-POS	F	I	



CO1,CO5	Interpret the effect of heat transformation in the material subjected to heating through Musha.	CAP	DK	KH	L&PP T,DIS ,D-M	PRN,CL-PR	F	I	
CO1,CO5	Recall Pakaj Utpatti Siddhant and interpret it for Agni Sannikarsha Sanskara.	CC	DK	KH	L&PP T,DIS	T- EW,CR- RED	F&S	I	
CO1,CO5	Explain the Pharmaceutical use of the Hot plate, heating mantle, induction stove, hot air oven, muffle furnace (horizontal and vertical type)	CC	NK	KH	DIS,S DL	P-SUR,M- POS	F	I	
CO1	Describe types of Koskthi and their uses	CK	DK	K	L	COM	F	I	
CO1,CO5	Describe the Current trends in heat transfer device e.g. steam jacketed heating device, programmed muffle furnace, programmed furnace for Parpati / Pottali preparation.	CC	DK	K	L&PP T,IBL ,SDL	M-POS,COM	F	I	
CO1,CO5	Assess and interpret the effect of fuel in quantum of heat given (time and temperature)	CC	DK	KH	DIS,P rBL	M-POS,CR- RED	F	I	
CO1,CO5	Enlist various fuels used for heating for estimation of their heat value.	CK	NK	K	IBL,S DL	M-POS	F	I	
CO2,CO3	Analyse and appraise use of proper heating device and fuels used for Ayurvediya Aushadhi Nirmana.	AFT- SET	DK	KH	BS	DEB	F	II	
<b>Topic 6 6.Kalpana Nirmana I (Primary &amp; Secondary dosage forms) (Lecture :6 hours, Non lecture: 4 hours)</b>									
CO1,CO2	1. Explain Kashaya kalpana  2. Enlist the dosage form come under Panchavidha Kashaya	CC	MK	KH	L	T- EW,P- VIVA	F&S	II	

	Kalpana and their Upakalpana  3. Justify Primary , secondary and tertiary dosage form under Panchavidha kashaya Kalpana and their Upakalpana								
CO1	Define with synonyms and classify different varieties of the dosage form in Ayurvediya Aushadhi nirmana	CK	MK	K	L	T- EW,P- VIVA	F&S	II	
CO1	Describe methods of preparation of the dosage form along with the principles of extraction, concentration and dilution etc.	CC	MK	KH	L&PP T	T- EW,P- VIVA	F&S	II	
CO1,CO2	Explain in details about Standard Operating Procedure (SOP) of each kalpana.	CC	MK	KH	L&PP T,DIS	T- EW,P- VIVA	F&S	II	
CO1,CO3	Enlist details of the applications/administration ( samanya Matra, Anupana or sahapana, indications and contraindications) of the dosage form with various examples	CC	MK	K	L&PP T	T- EW,P- VIVA	F&S	II	
CO1,CO6	Assess and discuss modern day development and market trend of the dosage form	CC	DK	K	L&G D,IBL ,LS	T- MEQs,P- SUR	F&S	II	
CO1	Determine the advantages and disadvantages of the dosage form	CC	DK	K	L	T- EW,P- VIVA	F&S	II	
CO2	Describe method of preparation of dosage form along with the principle involved	CK	MK	K	L&PP T,DIS	T- EW,P- VIVA	F&S	II	
CO1	Describe meaning of the term Upakalpana. Enlist panchavidha kashaya kalpana and their respective Upakalpana	CK	DK	K	L	T- MEQs,P- VIVA	F&S	II	
CO1	Explain various kalpas belonging to Various dosage forms	CK	MK	K	L_VC	P-EXAM	S	II	

	-Ingredients, proportion, matra, sevan vidhi if any, therapeutic uses				,PT				
CO2	Critically evaluate rationality behind different proportion of water used in various formulations	AFT-VAL	DK	KH	BS	P-VIVA	F&S	III	
<b>Topic 7 7.Kalpana Nirmana-II (Method of Preparation of different dosage forms&amp; Dietary Supplements) )</b> (Lecture :5 hours, Non lecture: 4 hours)									
CO1,CO5	Explain the basic principles involved , processing techniques,quality control parameters used/ involved in the preparation of Avaleha, Kalpana with examples ,instruments used in small and Large scale production,Research updates	CAP	MK	K	L&PP T,TP W,BL	T- EW,T-OBT	F&S	II	
CO1,CO5	Explain the basic principles involved , processing techniques,quality control parameters used/ involved in the preparation of Sneha Kalpana, Kalpana with examples ,instruments used in small and Large scale production,Concept of Avartana, Research updates on Snehakalpana, Market survey	CK	MK	K	L_VC ,TUT	T- EW,P-VIVA	F&S	II	
CO1,CO4	Describe the Significance of sandhana kalpana, classification, Difference between Madya and Shukta Kalpana, general method of preparation, essential ingredients, Anukta Mana, Sandhana Vidhi, observations, Burnig candle test, Lime water Test, difference between Asava and Arishta, essential knowlege of sale and clinical practice , Research updates	CAP	MK	K	L_VC ,PrBL	T- EW,T-OBT	F&S	II	
CO1,CO3,CO5	Explain Definition , significance of Pathya, types, general, method of preparation Manda, Peya, Yavagu, Vilepi, Anna or Odana Kalpana, Krushara, Yusha, Takra, Khada, Kambalika, Raga, Shadava, Related Research updates, Market survey of Dietary Supplements and Nutraceuticals	CAP	MK	KH	L_VC ,RLE	T- EW,P-VIV A,P-EXAM	F&S	II	
<b>Topic 8 8.Rasa Dravya Parichaya- I</b> (Lecture :12 hours, Non lecture: 4 hours)									
CO1		CC	MK	K	L&PP	T- MEQs,P-	S	I	

	Enlist synonyms of Rasadravya and explain significance of that				T,D_ L	VIVA			
CO1,CO2,CO 6	Explain classical & Mineralogical identification and Sources of Rasadravyas	CC	MK	SH	L&PP T,PT	T- EW,P- EXAM	F&S	I	
CO1,CO2	Discriminate types, Grahya-Agrahyata and Dosha of Rasadravya	CC	MK	KH	L&PP T,PT	P-VIVA,TT- Theory	F&S	I	
CO1,CO2	Explain Shodhan and Marana and other processing techniques of the Rasa- Dravya.	CC	MK	KH	L_VC ,IBL, D	T- EW,P- VIVA,INT	F&S	I	
CO1,CO2,CO 6	Discuss probable physical, chemical changes occurring during process & after Shodhana and Marana of Parada, Haratala, Tamra and Shankha.	CC	MK	KH	L&PP T,BS, SDL	T- EW,P-VIV A,P-EXAM	F&S	I	
CO6		CC	DK	KH	DIS,B	P-VIVA	F&S	I	

	Explain research updates about Shilajatu,Naga,Mukta and Kapardika.?				S				
CO1,CO2,CO6	Discuss probable physical, chemical changes occurring after Bhavana, Puta & whole process of Bhasma nirmana from Rasadravyas	CC	MK	KH	DIS,B S	T-OBT	F&S	I	
CO1,CO4	Enlist Kalpas prepared from these Rasdravyas and therapeutic importance of that Rasadravya	CK	DK	K	IBL,S DL	PRN	F	II	
CO2,CO3	Develop checklist for identification of genuine rasadravyas	AFT- CHR	MK	K	IBL	P-PS	F&S	III	
<b>Topic 9 9.Rasa Dravya Parichaya II</b> (Lecture :7 hours, Non lecture: 6 hours)									
CO1	Enlist the important synonyms of Rasadravyas	CC	DK	KH	L&PP T,DIS	P-VIVA	F&S	II	
CO1,CO6	Explain classical & Minerological identification and their Sources.	CK	DK	K	L&PP T,D_ L	P-VIVA	F&S	II	

CO1	Elaborate types, Grahya-Agrahyata and Dosha of Rasadravyas	CK	DK	K	L&PP T	P-VIVA	F	II	
CO1,CO2	Explain Shodhana, Marana & and other processing techniques with probable chemical reactions.	CC	MK	KH	L&PP T,DIS ,LS	T- EW,P- VIVA	F&S	II	
CO1,CO2	Explain Shodhana, Marana & and other processing techniques with probable chemical reactions.	CE	DK	K	L&G D,PT	P-VIVA	F&S	I	
CO6	Explain research updates of Kasisa,Gauripashana and Akika.	CC	DK	KH	DIS, ML	PRN	F	I	
CO1,CO5	Enlist names of rasadravyas and important kalpas prepared from respective dravya. Describe therapeutic importance of that Rasadravya.	CK	DK	K	DIS,S DL	CL-PR,M- CHT	F	II	
<b>Topic 10 10.Rasadravya Parichaya III</b> (Lecture :3 hours, Non lecture: 6 hours)									
CO1	Enlist Synonyms and sources.	CK	NK	K	PrBL, TPW, PER	T-OBT,M- CHT	F&S	II	

CO1,CO6	Determine types, Grahya-Agrahya, properties & classical as well as Mineralogical Identification of Rasadravyas	CC	NK	K	L&PP T,DIS ,SDL	P-VIVA,CHK	F&S	II	
CO1,CO2	Explain Shodhana, Marana and Probable Chemical Changes.	CC	DK	K	L&PP T,IBL	PRN	F&S	II	
CO6	Explain research update of Badarashma.	CK	NK	K	DIS,L S	P-VIVA	F	II	
CO1,CO5	Enlist Rasadravyas from this group and describe important kalpas with their therapeutic utility	CK	DK	K	TPW	PRN	F	II	
<b>Topic 11 11.Kalpna Nirman -III (Method of Preparation of different dosage forms) (Lecture :8 hours, Non lecture: 6 hours)</b>									
CO1,CO2,CO 3	Describe sharkara kalpana along with preparation method of Syrup.Explain therapeutic importance of prepared sharkara kalpana along with its shelf life.	CC	NK	K	L&PP T,SD L	P-VIVA	F&S	II	
CO1,CO2,CO 3	Describe Gudapaka preparation method with its confirmatory tests and precautionsExplain therapeutic importance of prepared Gudapaka along with its shelf life.	CC	NK	K	L&PP T	P-VIVA	F&S	II	
CO1,CO2,CO 3	Describe Lavana kalpana preparation method with its confirmatory tests and precautionsExplain therapeutic	CC	DK	K	L&PP T	T-CRQs,P- VIVA	F&S	II	

	importance of prepared Lavana kalpana along with its shelf life and packaging techniques.								
CO1,CO2,CO3	Describe Kshara kalpana preparation method with its confirmatory tests and precautions Explain therapeutic importance of prepared Kshara kalpana and Ksharasutra integration with Shalya tantra department along with its shelf life and packaging techniques.	CAP	MK	KH	L&PP T	P-VIVA,TT- Theory	F&S	II	V- SHL
CO1,CO2,CO3	Describe Ayaskriti kalpana preparation method with its confirmatory tests and precautions Explain therapeutic importance of prepared Ayaskriti kalpana along with its shelf life and packaging techniques.	CC	NK	KH	L&PP T	P-VIVA	S	II	
CO1,CO2,CO3	Describe Lepa kalpana preparation method with its confirmatory tests and precautions Explain therapeutic importance of prepared Lepa kalpana, integration with Kayachikitsa and Panchakarma department along with its shelf life and packaging techniques.	CC	MK	K	L&PP T	T- EW,P- VIVA	F&S	II	V-KC ,V-PC
<b>Topic 12 12.Chaturvidha Rasayana</b> (Lecture :4 hours, Non lecture: 4 hours)									
CO1,CO2	Describe importance and unouque features of Chaturvidha Rasayana - Kharaliya Rasayana, Parpati Rasayana, Kupipakwa Rasayana & Pottali Rasayana.	CC	MK	KH	L&PP T,IBL	T- EW,P- VIVA	F&S	II	
CO1,CO2	Explain definition, types and method of preparation of Chaturvidha Rasayana.	CAP	MK	D	L&PP T,PT	T- EW	F&S	II	



CO1,CO2	Determine role of Yantra, Agni & Kala for pharmaceutical process of chaturvidha rasayana	CAN	DK	KH	PT	T- EW,P-VIVA	F&S	II	
CO6	Explain shelf-life of Chaturvidha Rasayana.	CAN	DK	SH	L,DIS	P-VIVA	F&S	II	
CO5	Describe chemical changes occurring during the preparation of chaturvidha rasayana and its impact on Pharmacological action of Chaturvidha Rasayana	CAN	DK	KH	L&G D,BS, SDL	CR-RED,CR-W	F	II	
CO5	Explain law of Definite proportion and proportion of Mercury and sulphur needed for preparation of sulphide of Mercury. in Chaturvidha rasayana	CAP	DK	KH	BS,IB L	CL-PR	F	II	
<b>Topic 13 13.Current and emerging trend in Ayurvedic pharmaceuticals</b> (Lecture :3 hours, Non lecture: 4 hours)									
CO1,CO5,CO6	<b>Discuss the classification of different dosage forms.</b>	CK	DK	K	L&PP T,DIS	P-VIVA,M-POS	F&S	III	
CO1,CO5,CO6	Explain the need of different dosage forms.	CK	DK	K	L&PP T,DIS ,SDL	P-VIVA,M-POS	F&S	III	
CO1,CO5,CO6	Enlist categorical information about the cosmetics used in daily	CK	DK	K	L_VC	PRN,M-POS	F	III	

6	routine. Appreciate Ayurvedic cosmetic products.				,DIS, FV				
CO1,CO5	Appreciate Ayurvedic cosmetic products.	AFT- VAL	DK	KH	BS,Pr BL	PRN,P-SUR	F	III	
CO1,CO5,CO 6	Choose and record the contemporary machineries used in the manufacture of cosmetics.	CK	NK	K	L_VC ,DIS, SDL	M-POS	F	III	
CO1,CO5,CO 6	Enlist Quality Control parameters of cosmetics preparations.	CK	DK	K	L&PP T,DIS	P-VIVA,M- POS	F&S	III	
<b>Topic 14 14.GMP(Schedule T) &amp; Regulatory aspects of Ayurvedic drugs</b> (Lecture :2 hours, Non lecture: 4 hours)									
CO5	Explain the legal and regulatory aspects of manufacturing, and sale of Ayurvedic drugs.	CC	MK	K	L&PP T,IBL	CL-PR	F&S	III	
CO5	Describe acts and rules mentioned in Drug & Cosmetic Act 1940 & Rule 1945 and their relevance to Ayurvedic, Siddha, Unani (ASU) drugs.	CC	MK	K	L&G D,BS	QZ	F&S	III	H-DG
CO5	Discuss the guidelines of Food Safety and Standards Authority of India (FSSAI) and FDA.	CK	DK	K	L&G D,SD L	CL-PR	F	III	
CO3,CO5	Determine the principles and practice of establishment of Ayurvedic pharmacy.	CK	DK	K	L&G D,TP W	P-EN,CL-PR	F	III	
CO5	Discuss the NABL guidelines for testing laboratory (Chemical).	CK	NK	K	L&PP T,D_	CL-PR,CHK	F&S	III	

					L				
CO1,CO5	Explain long forms of these - (FSSAI) and (FDA),(CCRAS),(DCGI), (CDSCO)	CK	DK	K	L	T-EMI	S	III	
CO4	Discuss ethical aspect of large scale drug preparation in Ayurvedic Pharmacies	AFT-VAL	DK	K	DIS	CL-PR	F	III	

### Paper 2 Ayurvediya Aushadhi Prayoga Vigyana

A3 Course outcome	B3 Learning Objective (At the end of the session, the students should be able to)	C3 Doma in/sub	D3 Must to know / desirable to know / Nice to know	E3 Level Does/ Shows how/ Knows how/ Knows	F3 T-L method	G3 Assessment	H3 Formative/ summative	I3 Term	J3 Integration
<b>Topic 1 1.Aushadhi Prayoga Vigyana</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO1	Define Aushadhi Prayoga Vigyana and its scope and enlist prashasta bhesaja laxana	CK	MK	K	L	TT-Theory	F&S	I	
<b>Topic 2 2.Single drug (Herbal &amp; Mineral)</b> (Lecture :8 hours, Non lecture: 2 hours)									
CO1,CO2,CO4,CO5,CO6	Describe different dosage forms prepared out of a single herb or mineral	CK	MK	KH	L_VC	P-VIVA,COM,TT-Theory	F&S	I	
CO1,CO2,CO4,CO5,CO6	Appreciate how the therapeutic efficacy varies depending on the dosage form	AFT-VAL	MK	K	L&PPT	T- EW,DEB	F&S	I	

CO1,CO2,CO4,CO5,CO6	Describe therapeutic efficacy of different formulations of Vishadravya (Bhallataka), with its toxic effects and remedy.	CK	NK	K	L&G D	P-VIVA	F	I	
CO1,CO5	Describe therapeutic efficacy of different formulations of Guduchi, Gairika, Gandhaka	CC	MK	K	L&G D,PE R	P-VIVA,TT- Theory	F&S	III	
CO3,CO4	Aappraise multiple factors considered for preparation of various dosage forms from a single drug and creat list of more such examples.	AFT- CHR	DK	KH	BS,IB L	COM	F	III	
<b>Topic 3 3.Single drug(Bhasma, Shuddha &amp; Pishti)</b> (Lecture :12 hours, Non lecture: 6 hours)									
CO2,CO6	Explain chemical form/composition, Pharmacodynamics and pharmacokinetics of Abhraka, Loha and Godanti Bhasma.	CC	DK	KH	L&PP T,DIS ,IBL	P-VIVA	S	III	
CO1,CO2	Explain therapeutic properties, dosage, Anupana, Pathyapathya, duration of treatment, Sevana Kala, shelf life, important Yogas of each Bhasma.	CC	MK	KH	L&PP T,TP W	T- EW,P- VIVA	F&S	III	
CO1,CO2	Describe Apakwa Ashuddha Avidhi Bhasma Sevanajanya Vyadhi and their Shanti-upaya.	CK	DK	KH	DIS,B S	P-VIVA,TT- Theory	F	III	
CO1,CO2	Describe in detail Amayika Prayoga (Therapeutic uses) of each Bhasma/Pishti with given references.	CAP	MK	SH	L&G D,W	T- EW,P- VIVA	F&S	III	

CO2,CO6	Explain research updates and clinical evidences of Swarna Bhasma, Makshika Bhasma and Shankha Bhasma.	CE	DK	K	PrBL, SDL	PRN	F&S	III	
<b>Topic 4 4.Aushadhi Kalpa -I (Compound formulations)</b> (Lecture :16 hours, Non lecture: 4 hours)									
CO1,CO2	Describe reference, ingredients, therapeutic properties, dosage and all administration details alongwith Anupana of each formulation.	CK	MK	KH	L&PP T,BS, SDL	T- EW,P- VIVA	F&S	III	
CO1,CO2	Explain Pathya Apathya, Sevana Avadhi (duration of treatment) and shelf-life of each formulation.	CC	MK	KH	L&PP T,DIS ,BS	T- EW	F&S	III	
CO1,CO2	Interpret probable mode of action of each formulation as per Ayurveda.	CC	DK	KH	L&G D,BS	T- EW,P- VIVA	F&S	III	
CO2,CO3,CO 6	Explain research updates and clinical evidences of Arogyavardhini Gutika and Gandhaka Rasayana	CE	DK	K	PrBL	P-VIVA	F&S	III	

CO3,CO4	Critically analyse compound drugs for their therapeutic actions mentioned in the classics.	AFT-VAL	DK	KH	IBL	PRN	F	III	
<b>Topic 5 5.Aushadhi Kalpa-II (Compound Drugs/Formulations) (Lecture :14 hours, Non lecture: 2 hours)</b>									
CO1,CO2,CO3,CO4	Describe Ingredients, therapeutic importance, dose, anupana, pathya-pathya, duration of treatment, sevana kala, shelf life, research updates and clinical evidences of Dashamoola Kwatha, Pushyanuga Churna, Sanjivani Vati, Chitrakadi Gutika, Simhanada Guggulu, Yogaraja Guggulu, Chyavanaprashavaleha, Gandhakadya Malahara, Ashokarishta, Kutajarishta, Panchagavya Ghrita, Bilvadi Gutika.	CAP	MK	KH	L&PP T	T- EW,P- VIVA	F&S	III	
CO1,CO2,CO3,CO4	Describe Ingredients, indications, dose, anupana, pathyapathya, duration of treatment, sevana kala, shelf life, and clinical evidences of Mahamanjistadi kwatha, Sudarshana Churna, Vyoshadi Vati, Bala Chaturbhadra Rasa, Lavana Bhaskara Churna, Narayana Taila,, Neeliringadi Taila Aravindasava, Kumaryasava.	CAP	NK	KH	L&PP T,DIS	P-VIVA	S	III	
CO1,CO2,CO4,CO5	Describe Ingredients, indications, dose, anupana, pathyapathya, duration of treatment, sevana kala, shelf life, and clinical evidences of Panchaguna Taila, Dadimavaleha, Bramhi Ghrita	CK	DK	K	L&PP T	P-VIVA,TT- Theory	S	III	
CO1,CO2,CO3	Undersand & Recite following classical kalpas.Describe Amayika prayoga of each formulation.Understand probable mode of action as per AyurvedaSearch and Record relevant reaserch articles.Create charts describing details of these drugs.Review market avaibility & poplularities of these drugs among practicing vaidyas & near by population.	CAP	MK	KH	L&PP T,DIS ,BS,I BL,P BL	P-EXAM,CO M,TT-Theory	F&S	III	V-KC ,V-SH ,V-PC ,V-SH L,V-S P,V- BL

CO3,CO4	Explain ethical aspect of administration of compound drugs mainly regarding duration of the treatment given.	AFT-VAL	DK	K	PBL	CL-PR	F	III	
CO1,CO2,CO4,CO6	Describe ingredients, with its dose, therapeutic importance, anupana and pathya-apathya along with its clinical evidences and Research updates	CK	MK	KH	L&PP T	T- EW,P- VIVA	F&S	III	
CO1,CO2,CO4,CO6	Enlist the formulations with its dose, anupana and indications	CK	NK	K	L	T-EMI	S	III	
<b>Topic 6 6.Dosage Forms &amp; Cosmetic Products</b> (Lecture :5 hours, Non lecture: 2 hours)									
CO2,CO3,CO7	Define the term- Dosage forms.	CK	MK	K	L&PP T	TT-Theory	F&S	III	
CO2,CO3,CO7	Discuss the need of different dosage forms.	CK	MK	K	L&PP T	TT-Theory	F&S	III	
CO2,CO3,CO7	Explain the classification of different dosage forms.	CK	DK	K	L&PP T	TT-Theory	F&S	III	
CO2,CO3,CO7	Enlist the solid / liquid / semisolid dosage forms.	CK	MK	K	L&PP T	T-EMI	F&S	III	
CO2,CO3,CO7	Discuss the routes of administration of different dosage forms.	CK	MK	K	L&PP T	T- EW	F&S	III	
CO2,CO3,CO7	Describe the advantages and disadvantages of currently available dosage forms.	CK	MK	K	L&PP T	TT-Theory	F&S	III	
CO2,CO3,CO7	Discuss the research updates about modification of classical Ayurvedic dosage forms.	CK	DK	K	L&PP T	CL-PR	F	III	
CO2,CO3,CO7	Discuss the relevant case studies of different dosage forms.	CK	NK	K	L&PP T	P-SUR	F	III	

CO2,CO3,CO7	Define the term Cosmetics.	CK	DK	K	L	TT-Theory	F&S	III	
CO2,CO3,CO7	Explain the classification of cosmetics based on their application on the specific body parts.	CK	DK	K	L&PP T	CL-PR	F&S	III	
CO2,CO3,CO7	Differentiate between the ancient cosmetics and modern day cosmetics.	CK	DK	K	L&PP T	TT-Theory	F&S	II	
CO5	compare and appraise herbal cosmetics vs synthetic products	AFT- VAL	DK	KH	PBL	PRN	F	III	
<b>Topic 7 7.Nutraceuticals</b> (Lecture :6 hours, Non lecture: 1 hours)									
CO1	Describe importance of combination of aahara and aushadha	CK	MK	K	L&PP T	T- EW	F&S	III	H-SW
CO2,CO6	Explain Nutraceuticals with its types	CK	MK	K	L&PP T	TT-Theory	F&S	III	H-SW
CO2,CO6	Corelate rasayana and nutraceutical with examples	CAN	DK	KH	DIS,P rBL	T-OBT	F	III	H-SW
CO2	Describe with examples mode of action of Ayurvedic nutraceuticals	CAP	MK	KH	SDL, LS	PRN	F	III	H-Sa mhita, H-SW
CO2,CO6,CO7	Enlist at least two dietary preparations from Ayurvedic classics which can serve as rasayana/ nutraceutical in-1) General Health2) Pediatric Health3) Geriatric Health4) Women( Garbhini/ Sutika) Health5) Cardio-protection6) Chronic illness-recovery stage	CAP	MK	K	DIS,B S,SY	CL-PR	F	III	H-SW
CO1,CO2,CO6,CO7	Describe potential of Ayurvedic diet and Rasayana in sports endeavor	CAP	DK	KH	BS,Pr BL,PS	DEB	F	III	H-SW



					M				
CO7	Explain research updates about nutraceuticals	CK	NK	K	SDL, PL	M-POS	F	III	
CO2	Enlist atleast two examples of Aushadhi siddha aahara with its indications for each category-->(Aharadravya belonging to following category and kalpa prepared from that aahara dravya and other aushadhi ingredients)1) Jala varga2) Dugdha varga3) Ikshu varga4) Suka-dhanya varga5) Shimbi Dhanya Varga6) Shaka Varga7) Phala Varga8) Lavana Varga9) Spices	CC	DK	K	L&G D,PrB L	CL-PR	F	III	H-Sa mhita, H-SW
CO3,CO4	creat list of unique features of Ayurvedic neutraceuticals and appraise their current need	AFT- VAL	DK	KH	DIS	PRN	F	III	
<b>Topic 8 8.Anupana Prayoga for Aushadhi Kalpa</b> (Lecture :4 hours, Non lecture: 1 hours)									
CO1	Define and classify Anupana and Sahapana	CK	MK	K	L	T- EW	F&S	III	
CO1,CO2	Expalin different factors to be considered for selection of Anupana as per Disease and Patients	CC	MK	KH	L	T- EW	F&S	III	
CO1,CO2	Enlist different anupana for a single drug based on the condtion of patient and disease. Elaborate with the help of examples of kalpas.	CC	MK	KH	L	T- EW	S	III	
CO4	Describe value of proper selection of Anupanas with examples	AFT- VAL	DK	K	SDL	M-CHT	F	III	
<b>Topic 9 9.Aushadhi Prayoga Marga</b> (Lecture :5 hours, Non lecture: 1 hours)									
CO2,CO4	Discuss the various types of Aushadhi Prayog Marga (route of drug administration).	CK	MK	K	L&PP T	T- EW	F&S	II	
CO2,CO4	Describe the advantages and disadvantages of each Aushadhi Prayog Marga.	CK	DK	K	L&PP T,BS	P-SUR,PM,TT- Theory	F&S	II	

CO2,CO4	Enlist the dosage forms used in the specific Aushadhi Prayog Marga.	CK	DK	K	L&P T	T-EMI	F&S	II	
CO2	Discuss the nature of drug (s) administered in various routes of drug administration.	CAP	NK	KH	L&G D	CL-PR	F	II	
CO4,CO5	Appraise administration of drugs through various routes mentioned in Ayurvedic treatment	AFT- VAL	MK	K	L&G D	T- EW	F&S	III	
<b>Topic 10 10.Rational prescription along with safe dispensing of Ayurvedic formulations.</b> (Lecture :1 hours, Non lecture: 4 hours)									
CO2,CO4	Describe and write demo ideal prescription.	CAP	MK	SH	L&G D,CB L	CR-W,CHK	F&S	III	V-KC ,V-SP ,V-BL
CO1,CO3,CO 4	Explain the safe dispensing and efficacious use of Ayurvedic drugs.	CAP	MK	KH	L&G D,BS, TPW	T-CS,PM	F&S	III	V-KC ,V-BL
CO2,CO4	Explain the importance of rational prescribing of drugs and the concept of essential drugs.	CK	DK	K	L&G D,IBL	QZ ,CHK	F	III	V-KC
CO2,CO4,CO 5	Describe the standard protocol for safe dispensing of Ayurvedic drugs.	CK	DK	KH	L&G D	T-OBT	F	III	
CO2,CO4	Demonstrate and educate home remedies to small group of population.	CAP	DK	SH	PrBL, TPW	TR	F	III	H-SW
CO5	explain ethical aspects related to prescription writing	AFT- RES	MK	KH	TPW	INT	F	III	
<b>Topic 11 11.Traditional &amp; Local health Practices</b> (Lecture :2 hours, Non lecture: 4 hours)									
CO1	Identify Local Health Traditions and Healing Knowledge,	CC	DK	K	DIS,P rBL	P-SUR,INT	F	III	

CO1,CO5	Recognise the possible potential of product development and research based on Traditional knowledge	CK	DK	KH	IBL	INT	F	III	
CO1,CO4	Identify the factors responsible for grant of patent and erroneous grant of patent on indian traditional knowledge.?	CK	DK	K	BS	INT	F&S	III	
CO5	Appraise traditional knowlege of Ayurvedic medicines	AFT-VAL	DK	K	TPW	CR-W	F	III	
<b>Topic 12 12.Pharmacovigilance for Ayurveda drugs</b> (Lecture :1 hours, Non lecture: 4 hours)									
CO2,CO4,CO5	Describe the term Pharmacovigilance and explain importance of Pharmacovigilance for Ayurvedic drugs.	CK	DK	K	L&PP T,IBL	M-POS,C- INT,RK	F	III	V-KC ,V-BL ,H-D ,G,H- AT
CO4,CO5	Explain the status and central sector scheme of Pharmacovigilance for Ayurveda, Siddha, Unani, and Homeopathy (ASU & H) drugs.	CK	MK	K	L&PP T,DIS	INT,TT- Theory	F	III	V-KC ,H-D ,G,H- AT
CO4,CO5	Define Adverse Drug Reactions (ADR) and its types.	CE	DK	K	L&G D,IBL	QZ ,TT-Theor y,VV-Viva	S	III	V-KC ,V-BL ,H-D ,G,H- AT
CO2,CO4,CO5	Identify and monitor ADRs.	AFT-VAL	DK	KH	L&G D,BS, IBL	PRN,RK	F	III	V-KC ,V-BL ,H-D ,G,H- AT

CO2,CO4	Discuss and make critical comments on the safe and efficacious use of Ayurvedic drugs.	CAP	DK	KH	L&G D,PrB L,TU T	QZ ,CL- PR,INT	F	III	V-KC ,H-D G,H- AT
CO4,CO5	Debate on ADR of ASU drugs	AFT- RES	DK	K	DIS	DEB	F	III	

**List of Practicals** (Term and Hours)

<b>PRACTICALS (Marks-100)</b>			
<b>S.No</b>	<b>List of Topics</b>	<b>Term</b>	<b>Hours</b>
1	1.Paribhasha concept based Practicals	1	20
2	2.Panchavidha Kashaya Kalpana & their Upakalpana Practicals	1	24
3	3.Rasa Dravya Aushadhi Nirmana Practicals	1	20
4	4.Bheshaja Kalpana Practicals -I	2	24
5	5.Bheshaja Kalpana Practicals -II	2	22
6	6.Dosage Forms & Self-care Products Practicals	2	22
7	7.Field Visit/ Study Tour	3	24
8	8.Hospital IPD Practical	3	10
9	9. Drug Dispensing Practical	3	6
10	10.Quality Control Practicals	2	38

**Table 4: Learning objectives (Practical)**

<b>A4</b> Course outcome	<b>B4</b> Learning Objective (At the end of the session, the students should be able to)	<b>C4</b> Domain/sub	<b>D4</b> Must to know / desirable to know / Nice to know	<b>E4</b> Level Does/ Shows how/ Knows how/ Knows	<b>F4</b> T-L method	<b>G4</b> Assessment  (Refer abbreviations)	<b>H4</b> Formative/ summative	<b>I4</b> Term	<b>K4</b> Integration
<b>Topic 1 1.Paribhasha concept based Practicals</b>									
CO1	Identify the drugs and recite classical name, English name and chemical composition and varga( class) Recite Maharasa , uparasa, Sadharana rasa shlokas from Rasaratna samuchchaya.	PSY-SET	MK	KH	GBL, REC	P-VIVA,P-ID	F&S	I	
CO1,CO2	Demonstrate the correct procedure / SOP and assess the changes observed after the procedure.Discuss the relevant samskara and its role in that procedure.Interpret the Physical, Chemical and Biological alterations.	PSY-MEC	MK	D	GBL, PT	P-PRF,CHK,O SPE	S	I	
CO1,CO2	Observe and describe the pharmaceutical preparation of Gandhaka druti. Explain the term alotropism.Recite melting, boiling and evaporating temperature of Gandhaka.	PSY-MEC	DK	KH	DIS,D _L	P-VIVA	S	II	
CO1,CO2	Observe the procedure of Vanga Jarana. Explain the difference between Jarana and Jaranaa. Discuss chemical process of oxidation and reduction. Recall the information about melting points of all the metals.	CAP	DK	KH	PT,D	P-VIVA	S	III	
CO1,CO2	Demonstrate preparation of Kajjali. Recite its classical shloka. Prepare a checklist of parameters for its siddhilakshana. Interpret	PSY-MEC	MK	D	PBL, TPW,	P-REC,P- EXAM,P-PS	F&S	I	

	law of definite proportion to explain and calculate amount of free sulfur in the prepared amount of kajjali. Calculate the expected weight of rasasindura from the given amount of kajjali.				D_L				
CO1,CO2	Identify relevant Bhasmapariksha and demonstrate samanya and vishesha Bhasma pariksha. Interpret physical/ chemical laws relevant to classical bhasma pariksha.	PSY-MEC	MK	D	DIS,G BL,L RI,D A,D_ L	P-VIVA,CHK	F&S	I	
CO1	Identify various weights and recite essential measures from conversion chart of AFI. Recognise weighing machines and their weighing capacity.	CAP	DK	KH	BS,Pr BL,T PW,P L	PRN,P-SUR	F	I	
CO3,CO4	Identify and value SOP of each procedure of the practical conducted.	AFT-VAL	MK	KH	D_L	P-EXAM	S	II	
CO2	Appraise ancient indications mentioned in classics for confirmation of end point of the pharmaceutical process( Siddhi lakshana)	AFT-RES	MK	K	PrBL	P-VIVA	S	III	
<b>Topic 2 2.Panchavidha Kashaya Kalpana &amp; their Upakalpana Practicals</b>									
CO1,CO2	Recall, Identify and authenticate the raw materials required as per the dosage form/ formulations	PSY-SET	MK	KH	DIS,D	P-VIVA	F&S	II	
CO1,CO2	Demonstrate the method of preparation to get the desired dosage form following SOP	PSY-MEC	MK	SH	DIS,P T	P-VIVA,P-EXAM	F&S	II	
CO1,CO2,CO5	Assess and explain different parameters to achieve desired characters/ end points ( siddhi lakshana) as per classical and contemporary parameters	PSY-MEC	MK	KH	DIS,D	P-VIVA,P-EXAM	F&S	II	
CO1,CO2	Describe ethical responsibility expected during Pharmaceutical	AFT-	MK	K	SDL	P-PRF	F&S	III	

	preparation of Ayurvedic Formulations	REC							
<b>Topic 3 3.Rasa Dravya Aushadhi Nirmana Practicals</b>									
CO1,CO2,CO3	Explain reference Shloka of kalpas & write with interpretation -list of ingredients, their proportion, principles of yoga - yoga samyojana dravya	CC	MK	KH	L	P-VIVA,P-EXAM	F&S	I	
CO1,CO2,CO3	Identify raw Dravya ,used part with classical Mana and interpret in metric system....	CAP	MK	D	DIS,B S	P-EXAM	F&S	I	
CO2,CO3	Identify, Utilize & know mechanism of Yantra used for drug preparation	CAP	MK	KH	DIS,B S	VV-Viva	F&S	I	
CO2,CO3	Observe & Record various parameters responsible for good manufacturing which are done during process of phamaceutical preparation	CE	MK	SH	DIS,B S,PT	P-EXAM	F	I	
CO2	Demonstrate Sidhdhi Lakshna	CAP	MK	SH	D	P-VIVA	S	III	
CO2,CO3	Assess finished product as per classics.	CE	MK	SH	DIS,P T	P-VIVA,P-EXAM	S	I	
CO1,CO2,CO	Appraise peculiarities of chaturvidha rasayana preparation	AFT-	DK	KH	PER	M-POS	F	III	



4		VAL							
<b>Topic 4 4.Bheshaja Kalpana Practicals -I</b>									
CO1,CO3	Demonstrate Arka preparation method, along with its packaging technique and therapeutic importance.	PSY-SET	MK	SH	DIS,D-M	P-VIVA,P-EXAM	F&S	II	
CO1,CO3	Demonstrate preparation of Vati along with drying techniques	PSY-MEC	MK	KH	DIS,D	P-VIVA,P-EXAM	F&S	II	
CO1,CO3	Identify the genuine sample of Guggulu and demonstrate preparation of different types of Guggulu along with drying techniques	PSY-SET	MK	K	DIS,P T	P-VIVA,P-EXAM	F&S	II	
CO1,CO3	Identify the useful part of the raw material and demonstrate Sattva preparation method.	PSY-SET	MK	K	DIS,D	P-VIVA,P-EXAM	F	II	
CO1,CO3	Demonstrate preparation of Varti along with drying and packaging techniques.	PSY-SET	MK	KH	PT	P-VIVA,P-EXAM	F	II	
CO1,CO3	Demonstrate Lavana preparation methods, along with its packaging techniques.	PSY-SET	DK	SH	PT	P-VIVA,P-EXAM	F	II	
CO1,CO3	Identify the internal and external applications of different kshara kalpana along with importance of ksharasutra through surgical aspects.	PSY-ADT	MK	K	PT	P-VIVA,P-EXAM	F	II	V-SHL
CO1,CO3	Demonstrate and Explain preparation methods of Masi kalpana for its internal or external application in clinical practice.	PSY-ADT	DK	K	DIS,P T	P-VIVA,P-EXAM	F	II	
CO1,CO3	Demonstrate preparation and application aspects of Upanaha kalpana .	PSY-MEC	DK	K	DIS,P T	P-EXAM	F&S	II	V-KC
CO1,CO3	Demonstrate preparations of Sikta taila along with identify the genuine sample of Sikta.Perform and Describe Malahara kalpana preparation method with its confirmatory tests of end point. .	PSY-SET	DK	K	DIS,P T	P-VIVA,P-EXAM	F&S	II	

CO2,CO3	Demonstrate preparation of different types of Malahara with its applied aspect.	PSY-SET	NK	K	PT	P-SUR	F	II	V-KC
CO2,CO3	Demonstrate preparation of different types of Lepa and preparation of Shatadhouta ghrita .	PSY-SET	NK	KH	DIS,P T	PRN	F	II	V-KC ,V-PC
CO2,CO3	Perform and Describe Lepa kalpana preparation method with its confirmatory tests and precautions Explain therapeutic importance of prepared Lepa kalpana, integration with Kayachikitsa and Panchakarma department along with its shelf life and packaging techniques.	PSY-MEC	DK	SH	L&G D	P-VIVA,P- EXAM	F&S	II	V-KC
CO2,CO3	Observe demonstration of formulation of Danta manjana	CAP	NK	KH	L&G D	PRN	F	II	
<b>Topic 5 5.Bheshaja Kalpana Practicals -II</b>									
CO1,CO2	Demonstrae the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlisting the results, packing and storage of Ghrita Murchana and Taila Murchana	PSY-MEC	MK	D	PT,D	P-REC,P- EXAM,OSPE	F&S	II	
CO1,CO2	Demonstrae the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlisting the results, packing and storage of Jatyadi Gritha/ Triphala Gritha/ Ksheera Shatphala Gritha/Phala Gritha,	PSY-MEC	MK	D	PT,D	P- EXAM,OSPE	F&S	II	
CO1,CO2	Demonstrae the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlisting the results, packing and storage Ksheera Bala Taila/Kasisadi Taila/ Panchaguna Taila/ Arka Taila/Kutajasuryapaki taila	PSY-MEC	MK	SH	D	P- EXAM,OSPE	F&S	II	

CO1,CO2	Demonstrae the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlisting the results, packing and storage Bhallataka Taila Patana/ Jayapala Taila Patana/Vishvamisra Kalpa Sneha	PSY- MEC	DK	KH	D	P-VIVA,P- EXAM,OSPE	F	II	
CO2	Demonstrae the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlisting the results, packing and storage of Vasavaleha/ Chavana Prasha Avaleha/ Kushmanda Avaleha	PSY- MEC	MK	KH	D	P-VIVA,P- REC,P-EXAM	F&S	II	
CO2	Demonstrae the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlisting the results, packing and storage of Nimbu Sharkara	PSY- MEC	NK	SH	D	P- EXAM,OSPE	F	II	
CO2	Demonstrae the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlisting the results, packing and storage of Daruharidra Rasakriya	PSY- MEC	NK	SH	D	PRN	F	II	
CO2	Demonstrae the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlisting the results, packing and storage of Haridra Khanda/ Narikela Khanada	PSY- MEC	MK	D	D	P-VIVA,P- EXAM,OSPE	F&S	II	
CO1	Demonstrae the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the	PSY- MEC	MK	KH	D	T- EW,P- VIVA	F&S	II	

	Physical Changes, Siddhi lakshana, enlisting the results, packing and storage of Kumaryasava/Drakshasava								
CO1,CO2	Demonstrate the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlisting the results, packing and storage of Kutajarista/Ashokarishta/Takrarishta	PSY- MEC	MK	KH	D	P-VIVA	F&S	II	
CO2	. Demonstrate the SoP involved in the drug selection, measuring the appropriate quantity of ingredients, preparation, observe the Physical Changes, Siddhi lakshana, enlist the results, packing techniques and storage of unique formulations for e.g.Kanji/ Madushukta	CC	DK	KH	D	P-VIVA,COM	F&S	II	
<b>Topic 6 6.Dosage Forms &amp; Self-care Products Practicals</b>									
CO1,CO2,CO 6	Observe instruments used to prepare solid dosage form, liquid dosage form and Semisolid Dosage Form with one example for each , their method of preparation, ingredients used with their quantity and Quality control Parameters.	AFT- RES	DK	KH	W,PT, D	P-VIVA,CHK	F&S	III	
CO1,CO2,CO 6	Observe instruments used to prepare with one example for each , their method of preparation, ingredients used with their quantity and Quality control Parameters.of following self care products Hair care: Shampoo Body care :Soap, Perfume Face care : Face Pack/Talcum Powder Lip Care : Lip Balm, Lipstick Oral care: Tooth Paste/ Mouth Wash Foot Care: Foot Cream Hand Disinfectant : Hand Sanitizer Skin Care: Moisturizer, Sunscreen Lotion following self care products	PSY- ADT	DK	KH	L_VC ,PT,D	P-VIVA,P- EXAM,CHK	F&S	III	
<b>Topic 7 7.Field Visit/ Study Tour</b>									
CO1,CO3,CO 4,CO5,CO6	Field Visit - Record the storage condition of the raw / in-process	CK	DK	K	DIS,F V	M-POS,COM	F	III	

	/ finished goods prepared in the approved sections.								
CO1,CO3,CO4,CO5,CO6	Determine the role of various Yantras / machineries used in the approved sections of the Pharmacy	CK	DK	KH	DIS,ROLE	INT	F	III	
CO1,CO3,CO4,CO5,CO6	Differentiate between the ancient and contemporary methods of drug preparation.	CC	DK	K	DIS,FV	PRN	F	III	
CO1,CO3,CO4,CO5,CO6	Enlist the documents required in Batch Manufacturing of Ayurvedic medicines.	CK	NK	K	DIS	P-SUR	F	III	
CO1,CO3,CO4,CO5,CO6	Identify the role of Quality Control instruments and equipments in ensuring a quality Ayurvedic product.	CK	DK	K	L&PPT,DIS	DEB	F	III	
CO1,CO3,CO4,CO5,CO6	Appreciate the importance of Good Manufacturing Practices and Good Packaging Practices required in Ayurvedic Drug manufacturing.	AFT-VAL	DK	K	DIS	PRN,DEB	F	III	
CO1,CO3,CO4,CO5,CO6	Prepare own products as per prevalent FDA guidelines.	PSY-GUD	DK	D	L_VC,DIS	P-EXAM	F	III	
<b>Topic 8 8.Hospital IPD Practical</b>									
CO1,CO2,CO3,CO4	Review & Observe the case Sheets.	CC	NK	KH	DIS	P-SUR	F	III	V-KC, V-SH, V-PC, V-SH, L, V-S

									P,V- BL
CO1,CO2	Discuss for formulation prescription manner.	CC	DK	KH	L&G D	T-CS	F&S	III	V-KC
CO1,CO2,CO 3	Demonstrate & Explain prescription method.	CAP	DK	SH	CD	P-PS	F&S	III	V-KC
CO1,CO2,CO 4	Measure dose of prescribed drug.	CAP	MK	KH	PrBL	SP	F	III	
CO1,CO2,CO 3	Enlist Time, Duration, Pathya, Apathya while prescribing drugs.	CAP	DK	KH	L&G D	P-PRF	F	III	
CO4,CO5	value details and methodical writting of case records of hospital IPD patients	AFT- VAL	MK	KH	RLE	P-CASE	F	III	
<b>Topic 9 9. Drug Dispensing Practical</b>									
CO1,CO3	Assess the arrangement of Ayurvedic drugs according to nature and type in dispensing room or pharmacy.	CAP	NK	D	RLE	P-PRF	F	III	V-KC ,V-PC ,V-BL
CO1,CO3,CO 4	Assess practice of prescription processing and labelling of the drugs.	CE	DK	KH	PrBL	INT	F	III	
CO3,CO4	Determine and identify the cause of common errors occurred	CC	DK	KH	RLE	CL-PR	F	III	

	during dispensing of Ayurvedic drugs.								
CO2,CO4	Explain use of correct drug supply to the right patients, in the required dosage, quantities and clear drug information.	CAP	DK	SH	L&G D	PRN	F	III	V-KC ,V-BL
<b>Topic 10 10.Quality Control Practicals</b>									
CO2	Develop analytical skills for understanding Identity, Purity and Strength of raw materials and finished products as per the standard guideines of the Ayurvedic Pharmacopoeia of India.	CK	MK	KH	L&G D,BS, W,PT, D_L	P-VIVA	F	II	
CO2,CO5	Identify the geological description of minerals: physical parameters.	CK	DK	K	L_VC ,W,D _L,FV	P-ID	F&S	II	
CO2	Describe ayurvedic perspectives of quality control parameters applying for solid, semisolid and liquid dosage forms.	CAP	MK	SH	L&G D,TU T,DA	P-VIVA,Log book	F&S	II	
CO2,CO5	Demonstrate the calibration techniques used for Weighing Balance (chemical and physical), pH Meter, Hot Air Oven and Electric Muffle Furnace to ensure the accuracy of the instrument what it is intended to measure.	CC	DK	KH	D_L	P-VIVA,PRN	F	II	
CO2		CAP	MK	SH	PT,D	P-EXAM,Log	F	II	

	Demonstrate bulk density, loss on drying, total ash, pH and water soluble extractives of Churna.				A	book			
CO2	Perform the analytical tests of tablets/ vati/ gutika for hardness, uniformity of weight and friability.	AFT-CHR	MK	SH	PT,D A	P-EXAM,Log book	F&S	II	
CO2	Estimate specific gravity, alcohol content and total solids of Asava & Arishta.	AFT-CHR	MK	SH	PT	P-EXAM,P- PRF	F	II	
CO2,CO5	Determine iodine value, acid value and saponification value of oils / ghee.	CAP	MK	KH	D_L	P-VIVA	F&S	II	
CO2,CO3	Calculate the dose of various dosage forms and their dispensing methods.	CE	MK	SH	L&G D,PrB L,BL, RLE, D_L	P-SUR,P- CASE	F&S	II	
CO4,CO5	Appraise quality control procedures done for Ayurvedic formulations	AFT-VAL	DK	K	DIS	CL-PR	F	III	



**Table 4a: List of Practical**

S.No	Name of practical	Term	Activity	Practical hrs
1	1.Paribhasha concept basedPracticals	1	<p><b>A) Dravya Paribhasha-</b> Identification of drugs and their respective class (varga)</p> <p><b>B) Prakriya Paribhasha-</b></p> <p><b>1.Swedana:</b> Godanti Shodhana (A.F.I.-1,18:4 (Rasatarangini 11/238) Shankha Shodhana (A.F.I.-1,18:18(Rasatarangini 12/12/2) Kapardika shodhana (Rasatarangini 12/89) Guggulu Shodhana (Rasendra Sara Sangraha 1/386, Pg. 117</p> <p><b>2. Mardana:</b>Parada Samanya Shodhana (Ayurveda Prakasha 1/165)</p> <p><b>3. Dhalana :</b> Gandhaka Shodhana (A.F.I. 2 Parishishta - 2,9 Shodhana( Rasamrita 2, 3) Vanga Shodhana (A.F.I.-1,18:15 (Sharangadhara M.11/2) Yashada shodhana (Rasatarangini 19/99)</p> <p><b>4. Nirvapa:</b> Abhraka Shodhana (A.F.I.-1,18:1 (Rasatarangini 10/20) Tamra Shodhana (A.F.I.-1,18:5 (Ayurveda Prakasha 3/118)</p> <p><b>5. Nirjaleekarana :</b> Tankana Shodhana (A.F.I. 2 Parishishta -2,15 Shodhana ( Ayurveda Prakasha 2/244) Kankshi shodhana (A.F.I.-2, 14:3 (Ayurveda Prakasha 2 /258)</p> <p><b>6. Bhavana:</b> Hingula Shodhana (A.F.I. 2 Parishishta - 2 Shodhana ( Rasamruta 1/54)</p> <p><b>7. Bharjana:</b> Gairika Shodhana (A.F.I. 2 Parishishta - 2,11 Shodhana ( Rasaratna Samuchchaya 3/49) Hingu Shodhana (Bhavprakash Nighantu, Haritakyadi Varga, 1/101, Pg. 42)</p> <p><b>8. Nimajjana/Sthapana:</b> Vatsanabha shodhana (A.F.I. 2 Parishishta - 2,25 Shodhana ( Rasamrita parishishta 8:145)</p> <p>9. Jarana : Vanga Jaran (Ayurved Prakash 3/159) Vanga Bhasma (A.F.I.-1,18:15 (Rasamruta 3/94)</p> <p><b>10. Murchana:</b> Mugdha Rasa (Rasatarangini 6/9) Kajjali (A.F.I.- 1 Parishishta-1, Paribhasha 21 (Rasatarangini 2/27)</p> <p><b>11. Druti-</b> Gandhaka Druti(Rasa Ratna Samuchchaya 3/29)</p> <p><b>C) Pramanikarana Paribhasha-</b></p>	20

			<p><b>1) Bhasma Samanya Pareeksha</b> - Abhraka Bhasma (Ayurved Prakash 2/104) Shankha Bhasma (Rasaratnasamucchaya 8/26-30)</p> <p><b>2) Bhasma Vishesha Pareeksha:</b> Tamra Bhasma (Dadhi/ Nimbu Pariksha)- (Bhaishajya Kalpana Vigyan, Vd. Siddhinandan Mishra, Pg. 78)</p> <p><b>D) Namburi Phased Spot Test (NPST)</b></p>	
2	2.Panchavidha Kashaya Kalpana & their Upakalpana Practicals	1	<p><b>1.Swarasa Kalpana:</b>Tulasi swarasa (Sharangdhar Samhita Madhyam Khanda 1/2),Ardraka Swarasa (Sharangdhar Samhita Madhyam Khanda 1/2), Vasaputapaka Swarasa (Sharangdhar Samhita Madhyam Khanda 1/22-23 &amp; 34)</p> <p><b>2. Kalka Kalpana:</b> Nimba kalka (Sharangdhar Samhita Madhyam Khanda 5/1),Rasona Kalka (Sharangdhar Samhita Madhyam Khanda 5/1)</p> <p><b>3. Kwatha Kalpana:</b> Punarnavashtaka kwatha (Sharangdhar Samhita Madhyam Khanda 2/1-2, 78-79), Rasna Saptaka Kwatha (Sharangdhar Samhita Madhyam Khanda 2/1-2, 88-89)</p> <p><b>4. Hima Kalpana:</b>Dhanyaka Hima (Sharangdhar Samhita Madhyam Khanda 4/1, 7-8),Sarivadi Hima</p> <p><b>5. Phanta Kalpana:</b>Panchakola phanta (Sharangdhar Samhita Madhyam Khanda 3/1-2),Yashtimadhu phanta (AFI 1 Parishishta – 1,2/5 Paribhasha)</p> <p><b>6. Churna Kalpana:</b>Sitopaladi churna (AFI Part 1, Vol. 1 A, Pg. 348), Hingwastaka Churna (AFI Part 1, Vol. 1 A, Pg. 353)</p> <p><b>7. Pramathya:</b>Mustadi Pramathya (Sharangdhar Samhita Madhyam Khanda 2/ 152-153)</p> <p><b>8. Paneeya Kalpana:</b> Shadanga Paneeya (Sharangdhar Samhita Madhyam Khanda 2/ 159-160)</p> <p><b>9. Mantha Kalpana:</b> Kharjuradi Mantha (Sharangdhar Samhita Madhyam Khanda 3/9-10)</p> <p><b>10. Panaka Kalpana:</b> Chinchā Panaka (Bhaishajya Ratnavali Arochaka 18/34-35), Chandana Panaka</p> <p><b>11. Ksheerapaka Kalpana:</b> (Sharangdhar</p>	24

			<p>Samhita Madhyam Khanda 2/175-176), Arjuna Ksheera Paka - Chakradatta, Lashuna Ksheerapaka - Charaka Chikitsasthana 5/95</p> <p><b>12. Udaka Kalpana :</b> Tandulodaka (Sharangdhar Samhita Madhyam Khanda 1/28)</p> <p>Note: In each category if more than 1 practical are there any one or all may be performed.</p>	
3	3.Rasa Dravya Aushadhi Nirmana Practicals	1	<p><b>1. Marana :</b> Vanga Bhasma (A.F.I. - I, Bhasma, 18:15, Rasatarangini Taranga) / Sankha Bhasma:A.F.I. - I, Bhasma, 18:18, Rasatarangini taranga 12/2)</p> <p><b>2. Kharaliyarasayana :</b> Ananda Bhairava Rasa(A.F.I. - I, Rasayoga, 20:3, Rasendrasarasangraha Jwaradhikara 2/103-105) /, Tribhuvana Keerti rasa(A.F.I. - I, Rasayoga, 20:20, rasamrita 9/80-81)</p> <p><b>3. Parpati :</b> Rasa Parpati(A.F.I. - I, Parpati, 16:3, Bhaishajyaratnavali grahanirogadhikara 414-416&amp;436-440), Sweta Parpati(A.F.I. - II, Parpati, 12:2, siddhyogsangraha ashmarimutrakruchhaadhikara)</p> <p><b>4. Kupipakwarasayana</b> : Rasasindhura(A.F.I. - I, Kupipakwa Rasayana, 15:6, rasatarangini taranga 6/162-176)</p> <p><b>5.Pottalirasayana :</b> Rasagarbhapottali (Rasayogsagar dwitiyabhaga pottali rahasya page 582)</p> <p><b>6. Rasa :</b> Laghusutsekhararasa (Rasatantrasara avum siddhaprayogsangraha part-1, kharaliya rasayana page 274)</p> <p><b>7. Loha:</b> Navayasa loha(A.F.I. - II, lauha, 17:2, Charaka samhita chi.16/70-71)/, Saptamrita loha(A.F.I. - I, lauha, 21:11, Bhaishajyaratnavali shoolrogadhikara 83-84)</p>	20
4	4.Bheshaja Kalpana Practicals -I	2	<p><b>1. Arka Kalpana:</b> Yavani Arka (API, Part 2, Vol. 3, Pg. 24) Gulab Arka (API, Part 2, Vol. 3, Pg. 4) Misreya Arka (AFI, Part 1, Vol. 1 A, Pg. 106)</p>	24

**2. Vati Kalpana:**

Agni Tundi Vati (AFI, Part 1, Vol. 1 A, Pg. 497)

Chitrakadi Vati (API, Part 2, Vol. 3, Pg. 107)

Lavangadi Vati (API, Part 2, Vol. 3, Pg. 116)

**3. Guggulu Kalpana:**

Triphala Guggulu (API, Part 2, Vol. 2, Pg. 134)

Kaishor Guggulu (API, Part 2, Vol. 1, Pg. 94)

**4. Satva Kalpana:**

Amruta Satva (AFI, Part 1, Vol. 1 A, Pg. 560)

Ardraka Satwa

**5. Varti Kalpana:**

Phala Varti - (Bhaishajya Ratnavali 31/10)

Chandrodaya Varti (AFI, Part 1, Vol. 1 A, Pg. 553)

**6. Lavana Kalpana:**

Arka Lavana (API, Part 2, Vol. 1, Pg. 103)

Narikela Lavana (AFI, Part 1, Vol. 1 A, Pg. 473)

**7. Kshara Kalpana:**

Apamarga Kshara (AFI, Part 1, Vol. 1 A, Pg. 466)

Kshara Sutra Preparation (AFI Part 3, Pg 213)

**8. Masi Kalpana:**

Triphala Masi (Rasendra Sara Sangraha Upadamsha Chikitsa)

Mayura Piccha Masi (Yogratnakar , Chhardiroga, Pg. 453)

**9. Upanaha:**

Atasi Upanaha

**10. Manjana:**

Dashanasamskara churna (Bhaishajya Ratnavali Mukharog, 61/97-98)

**11. Malahara Kalpana:**

Siktha Taila (Rasatarangini 4/59)

Sarjarasa Malahara (Rasatantrasar & Siddha Prayog Sangrah Part 1, Pg. 849)

Gandhaka Malahara (Rastarangini 8/63-85)

**12. Lepa Kalpana:**

Dashanga Lepa (AFI, Part 1, Vol. 1 A, Pg.

			487) Shatadhouta Ghrita (Sushrut Samhita Uttartantra 39/283)	
5	5.BheshajaKalpana Practicals -II	2	<p><b>1. Sneha Kalpana:</b> Ghrita Murchana (Bhaishajya Ratnavali, Jwaradhikar, 1285), Taila Murchana (Bhaishajya Ratnavali, Jwaradhikar, 1286-1287)</p> <p><b>2. Ghrita Kalpana:</b> Triphala Ghrita (API, Part 2, Vol. 1, Pg. 90), Amruta Ghrita (Bhaishajya Ratnavali Vatarakta 27/126)</p> <p><b>3. Taila Kalpana:</b> Ksheera Bala Taila (API, Part 2, Vol. 1, Pg. 124), Arka Taila (Sharangdhar Samhita Madhyam Khanda 9/148)</p> <p><b>4. Taila Patana:</b> Bhallataka Taila Patana (Sushrut Samhita Chikitsa Sthana 1/92)</p> <p><b>5. Avaleha Kalpana:</b> Vasavaleha (API, Part 2, Vol. 1, Pg. 32), Kushmanda Avaleha (AFI, Part 1, Vol. 1 A, Pg. 35)</p> <p><b>6. Sharkara Kalpana:</b> Nimbu Sharkara (Rasatantrasara &amp; Siddhaprayog Sangraha I / Paka Avaleha)</p> <p><b>7. Ghana:</b> Kutaja Ghana (AFI Part 2, Pg 175), Guduchi Ghana (Ayurved Prakash 3)</p> <p><b>8. Khanda Kalpana:</b> Haridra Khanda (Bhaishajya Ratnavali Udarda, Shitapitta), Narikela Khanda (AFI, Part 1, Vol. 1 A, Pg. 41)</p> <p><b>9. Asava :</b> Lohasava (Sharangdhar Samhita, Madhyam Khanda 10/ 34-38), Drakshasava (AFI Part 2, 1:1)</p> <p><b>10. Arishta:</b> Arjunarishta (Bhaishajya Ratnavali Hridrog). Takrarishta (Charak Samhita Chikitsa 15 / 120)</p> <p><b>11. Shukta Kalpana:</b> Kanji (Sharangdhar Samhita, Madhyam Khanda 10/ 12), Madushukta (Bhaishajya Ratnavali Karnaroga 62 /23-24)</p>	22
6	6.Dosage Forms & Self-care Products Practical	2	<p><b>1. Solid dosage forms:</b></p> <ul style="list-style-type: none"> <li>◆ Granules/ Lozenges (Pharmaceutics by R.M. Mehta)</li> </ul>	22

**2. Liquid Dosage forms:**

- ◆ Syrup/Suspension/Emulsion/Liniment (Pharmaceutics by R.M. Mehta)

**3. Semisolid Dosage:**

- ◆ Cream/Gel/Ointment/Pain Balm (Pharmaceutics by R.M. Mehta)

**4. Hair Care:**

- ◆ Shampoo (A Handbook of Cosmetics by B M Mithal & R N Saha 8th chapter)

**5. Body Care:**

- ◆ Soap/Perfume (Pharmaceutics by R.M. Mehta)

**6. Face Care:**

- ◆ Face pack / Talcum Powder (A Handbook of Cosmetics by B M Mithal & R N Saha 3rd chapter)

**7. Lip Care:**

- ◆ Lip Balm, Lipstick (A Handbook of Cosmetics by B M Mithal & R N Saha 4th chapter)

**8. Oral Care:**

- ◆ Tooth Paste/ Mouth Wash (A Handbook of Cosmetics by B M Mithal & R N Saha 19th & 20th chapter)

**9. Foot Care:**

			<ul style="list-style-type: none"> <li>◆ Foot Cream (A Handbook of Cosmetics by B M Mithal &amp; R N Saha 5th chapter)</li> </ul> <p><b>10. Hand Disinfectant:</b></p> <ul style="list-style-type: none"> <li>◆ Hand Sanitizer ((Pharmaceutics by R.M. Mehta)</li> </ul> <p><b>11. Skin Care:</b></p> <ul style="list-style-type: none"> <li>◆ Moisturizer/Sunscreen Lotion (A Handbook of Cosmetics by B M Mithal &amp; R N Saha 6th chapter)</li> </ul> <p><b>Note: In each category if more than 1 practical are there any one or all may be performed.</b></p>	
7	7.Field Visit/ Study Tour	3	<p>GMP Certified Pharmacy Visit X  2 Pharmacy (1 classical formulations and 1 Proprietary formulations/Having both Manufacturing facility)  NABL Accredited drug Testing Laboratory/Research and Development Unit  Combined out campus/ Field visit may be planned wherever feasible</p>	24
8	8.Hospital IPD Practical	3	<p>Hospital IPD Practical: Formulation prescription, method administration, dose, time, duration, Pathya, Apathya advised - Minimum 10 case sheet record of different dosage forms prescribed for particular case/ disease</p>	10
9	9. DrugDispensing Practical	3	<p>Drug Dispensing practical for method of Dispensing different dosage forms, their packing for OPD and IPD patients</p>	6
10	10.Quality Control Practicals	2	<ul style="list-style-type: none"> <li>◆ <b>1 Minerals &amp; Metals</b>  Mineral Identification <ul style="list-style-type: none"> <li>• Physical form – Crystal and</li> </ul> </li> </ul>	38

Amorphous

- Hardness on Moh's scale
- Brittleness test
- Fracture and Cleavage
- Streak Test
- Luster

## **2 Plant Material**

- Estimation of Foreign matter
- Specific Gravity
- Refractive Index

## **3. Prepared Dosage forms**

### A. Solid Dosage Forms

Rasaushadhi

- Bhasma and Pishti Pariksha
- Determination of Moisture content

### **4. Kashtoushadhi**

a. Churna

- Particle Size
- Bulk Density
- Determination of Ash Value – Total Water Soluble/Acid Insoluble ash

b. Tablets

- Uniformity in Weight and Size
- Tablet Hardness

### B. Semisolid Dosage forms

- Moisture Content
- Microbial Load

### C. Liquid Dosage Forms

- PH Value
- Refractive Index
- Specific Gravity
- Saponification Value
- Iodine Value
- Acid Value
- Viscosity

#### **Note :**

- All Practical should be performed in Accordance of Methods published in protocol for testing of ASU Medicines and



			Laboratory Guide for Analysis of Ayurveda & Siddha formulations published by Dept of AYUSH, GOI • Minimum 5 Analytical Practicals are to be written in Practical Record or In Journal	
<b>Total Hr</b>				<b>210</b>

### Activity

CO	Topic name	Activity Details	Hours
CO1,CO2	Paper I -1. Chronological development of Ayurvediya Aushadhi Nirmana	<p><b>Objective</b> - To orient the students regarding chronological development of Rasashastra &amp; Bhaishajya Kalpana</p> <p>After completing this activity, students will be able to:</p> <ul style="list-style-type: none"> <li>• Describe the history of Rasashastra &amp; Bhaishajya Kalpana.</li> <li>• Identify the different types of metal-based medicines.</li> <li>• Explain the benefits of metal-based medicines.</li> <li>• Discuss the safety of metal-based medicines.</li> </ul> <p><b>Methodology</b></p> <p>1) All students are to be assigned to collect and compile information on chronological</p>	1

		<p>development of Rasashastra &amp; Bhaishajya Kalpana from different books, including Indians are the first, who introduced metal based medicines.</p> <p>2) Ask to Submit the assignment for signature</p>	
CO1,CO2	Paper I - 2. a) Paribhasha(Terminology)	<p><b>Rasadravya</b></p> <p><b>Objective</b> - To encourage the students to remember rasadravyas and their classification through games</p> <p><b>Activity</b></p> <p><b>Group I</b> -In one big tray all Rasa - Dravyas are to be kept together.</p> <p>Timer to be started.</p> <p>In a stipulated time, student has to collect drugs belonging to the particular class (rasadravya varga) allotted to him /her and create a heap in order This can be given in a group.</p> <p><b>Group 2.-</b>Word puzzle</p> <p>Various word puzzles can be created for making the students to remember names of rasadravyas along with their class.</p>	1
CO1,CO3	Paper I -2. b)Paribhasha	<p><b>Mana Paribhasha Objective</b> -</p> <p>After completing this activity, students will be able to:</p>	2

		<ul style="list-style-type: none"> <li>• weigh dry &amp; wet drugs</li> <li>• Understand the % of weight loss after drying different variety of the wet drugs</li> <li>• Enjoy (game based) learning about rasadravyas and their classification.</li> </ul> <p><b>Methodology-</b></p> <p>whole batch need to be divided into various groups. (4-5 students in each group).</p> <p>Each group need to make a chart/ task as per the instructions written on the paper they pick up.</p> <p>1) Collect seeds mentioned in the classical mana paribhasha and prepare chart describing details of mana</p> <p>2) Measure by weight the given drug. (Guduchi Bharad, Amalaki Bharad, Haritaki Churna, Nimbapatra churna, whole maricha all will be kept having same weight) Now observe how much volume these drugs have.</p> <p>3) Collect fresh Guduchi.500gm or any fresh drugs leaf, bark, flower etc. Keep on observing the reduction in the weight of the sample till it dries completely. Record weight every day. Discussion about observation will be done.</p> <p>Do this same for Vasa, Shatavari, Amalaki also. Compare and assess the results. Every year drugs need to be changed</p>	
CO1,CO2	Paper I -2. c)Paribhasha Terminology	<b>Shodhana</b>	1

**Objective** - To enhance ability of the students to recall their knowledge about rasadravyas and their procedures

**At the end of Activity, the students should be able to**

Recall the different shodhana methods that are used for rasadravyas.

- Identify the different yantras that are used for shodhana.
- Understand the different procedures that are used for shodhana.
- Correctly answer questions about shodhana methods, yantras, and procedures.
- Explain the different steps involved in the shodhana process.
- Discuss the benefits of shodhana for rasadravyas.

**Activity-**

Rapid Fire quiz online

Questions will be framed based on the knowledge of Yantra, Dravya, Method used for that drug etc and rapid fire round will be carried out. This can be done online

Questions for example-

- 1) Vanga Shodhan is done by which method?
- 2) Which yantra is used for Shankha Shodhan?

		3) LashunaSvarasa bhavana is used for shodhana of which drug?	
CO1,CO2	<b>Paper I- 3.Adharabhuta Siddhanta (Fundamental Principles)</b>	<p><b>Objective :</b> To understand the concept with the help of classical shloka &amp; application of fundamental principles of Ayurvediya aushadhi nirmana.</p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>◆ Identify the different fundamental principles of Ayurvediya Aushadhi Nirmana.</li> <li>◆ Illustrate how these principles are applied in the preparation of Ayurvedic formulations.</li> <li>◆ Interpret classical shlokas related to the application of fundamental principles using Panchavayavavakya.</li> <li>◆ Demonstrate the skill of interpreting classical shlokas using Panchavayavavakya.</li> <li>◆ Students are to be divided into 5 groups</li> <li>◆ Each group need to be given 2 Shlokas from particular classical text book</li> </ul> <p><b>Method of Activity:</b></p> <ol style="list-style-type: none"> <li>1. The students are divided into groups &amp; each group need to be allotted 1 to 2 shlokas from classics related to application of fundamental principles.</li> <li>2. To develop skill of interpretation of shloka by applying Panchavayava vakya i.e Pratignya,</li> </ol>	2

Hetu, Udaharana, Upanaya and nigamana

3. They will understand application of basic fundamentals.

4. Every year different sets of shlokas are to be given. Repetition of shlokas is not acceptable

**Discussion:**

After completion of task, discussion need to be held with teacher and students.

Teacher in charge will finally conclude the discussion on application of fundamental principles and understanding the shloka by applying Panchavayavakya.

**Optional Activity** Activity - 1 Title : Search references from classical text

Group : Students should be divided in to 10 groups.

Reference Text : 1.Chakradatta 2.Yogaratnakara  
3.Bhavaprakasha 4.Sarangadhara

1GP : DravyaSamgraha method

2 GP : Collection Time

3 Gp :Collection Part

4 GP : Examples of Samskara

5 GP :Collection Nakshatra

6 GP :Pranija dravya partcollection

7 GP :Duplication Yoga

8 GP : Namakarana on Mana/Number of Dravya

9 GP : Saveeryata Avadhi

10 GP : Anupana in classical Yoga

CO1,CO5	<p><b>Paper I</b>  <b>-4.Yantropakaranani - I</b>  <b>(Equipments and machineries )</b></p>	<p><b>Objectives:-</b></p> <p>After completing this activity, students will be able to:</p> <ul style="list-style-type: none"> <li>• Identify the different yantras that are used in the preparation of Ayurvedic formulations.</li> <li>• interpret the different procedures of drug preparation that use yantras.</li> <li>• Collect information on different yantras from classical text books.</li> <li>• Present their findings in a clear and concise way.</li> </ul> <p><b>Activity</b></p> <ul style="list-style-type: none"> <li>◆ Students need to be divided into 4 groups (15 to 25 students in each group)</li> <li>◆ Each group need to be given one reference book</li> <li>◆ They have to collect information on different yantras explained /used for different procedures of drug preparation from that book.</li> <li>◆ Books like Ananda kanda, Rasa Tarangini, Rasa Ratna Samuchyaya, Rasendra Sara Sangraha, Parada Samhita etc can be given</li> <li>◆ Every year digfferent books are to be given.</li> <li>◆ Each Group has to present/ Submit assignment on total no of Yantras mentioned, their different uses, Structure/ Picture etc</li> </ul> <p><b>Discussion:</b> In charge teacher will comment on particular group performance and study matter</p>	4
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		collected.	
CO1,CO5	<b>Paper I</b> <b>-5.Yantropakaranani - II</b> <b>(Equipments and machineries )</b>	<p><b>Objective:-</b></p> <p>After completing this activity, students will be able to:</p> <ul style="list-style-type: none"> <li>• Prepare a video/ppt demonstration on Musha, Koshthi and Puta.</li> <li>• Model the preparation of Musha, Koshti and Puta.</li> <li>• Collect literature on Musha, Koshti and Puta from classical text books as per different authors.</li> <li>• Identify modern/presently available Yantras based on the classical concept of Musha, Koshti and Puta.</li> </ul> <p><b>Activity</b></p> <p><b>Students are to be divided into 4 groups</b></p> <p><b>Group I-</b> is allotted to prepare video/ppt demonstration</p> <p><b>Group II-</b>Model preparation of Musha, Koshthi and Puta</p> <p><b>Group III-</b> Literature collection from classical text books as per different authors on Musha, Koshthi and Puta</p> <p><b>Group IV -</b> Modern / Presently available Yantras based on the classical concept of our yantra, Musha, Koshthi and Puta</p> <p><b>Note:</b> Every year different yantras/ instruments need to be given</p>	4



		<p><b>Discussion and Conclusion:</b> Each group has to present their activity followed by teacher's remark</p>	
CO1,CO2	<p><b>Paper I- 6. Kalpana Nirmana I(Primary &amp; Secondary dosage forms)</b></p>	<p><b>Objective:-</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify the different dosage forms that are commonly used in Ayurveda.</li> <li>• Appraise the different methods that are used to prepare these dosage forms.</li> <li>• Document the different activities that are performed at home and in communities/societies related to the preparation of these dosage forms.</li> <li>• Prepare two dosage forms in the laboratory from their observation of home preparations.</li> </ul> <p><b>Methodology:</b></p> <p>1. Every student will document different activities performed at home and in societies/communities related to the preparation of different dosage forms which come under Panchavidha kashaya kalpana , Upakalpana and their household applications.( for example-fruit juices belong to svarasa kalpana, chutney to kalka etc.)</p> <p>Discussion:</p> <p>1.The students will be assessed based on their documentation</p> <p>2. A group containing 10 number of students will be asked to collect the raw materials and prepare</p>	4

		<p>minimum two numbers of dosage forms in the laboratory from their observation of home preparations.</p> <p>3. Finally an interactive session will be held to discuss the learning experiences and to clear doubts</p>	
CO5	Paper I- 7 & 11. Kalpana Nirmana II &III (Method of preparation of different dosage forms & dietary supplements)	<p><b>objective: -</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify the different dosage forms that are commonly used in Ayurveda.</li> <li>• Appraise the different methods that are used to prepare these dosage forms.</li> <li>• Document the different activities researches related to the preparation of these dosage forms.</li> </ul> <p><b>Methodology: -</b></p> <p>1. Students need to be divided into 4 different groups.</p> <p>2. <b>Group 1</b> - Directed to collect information on different varieties of proprietary Ayurvedic and contemporary solid dosage forms available in the market through e-resources (e.g. tablets, capsules, lozenges etc)</p> <p>3. <b>Group 2</b>- Directed to collect information on different varieties of proprietary Ayurvedic and contemporary Liquid dosage forms available in the market through e-resources (e.g. Oils, syrups, suspensions etc)</p> <p>4. <b>Group 3</b> - Directed to collect information on</p>	10

		<p>different varieties of proprietary Ayurvedic and contemporary semisolid dosage forms available in the market through e-resources (e.g. ointments, gels, jellies etc)</p> <p><b>5.Group 4</b> - Directed to collect research articles published on modification of classical Ayurvedic dosage forms through e-resources on solid, liquid and semisolid dosage forms.</p> <p>Discussion: -Finally Students have to present the collected information in the form of power point presentation and submit the assignment.</p> <p>In charge teacher has to conclude by stressing upon scope for research and development in modification of classical dosage forms.</p> <p>The mentioned activity is an example.</p> <p><b>Note:</b> Every year different formulations/ dosage forms/ activity need to be given.</p>	
CO1,CO2,CO3	<p><b>Paper I- 8.Rasa Dravya Parichaya - I MK</b></p>	<p><b>Objecives:-</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Justify the importance of identifying genuine Rasa Dravyas.</li> <li>• Learn to interpret classical and mineralogical criteria for identifying Rasa Dravyas.</li> <li>• Communicate findings effectively</li> </ul> <p><b>Method of Activity:</b></p> <ol style="list-style-type: none"> <li>1. Students are to be divided into 4 to 5 groups</li> <li>2. Each group is to be given 5 Rasadravyas (from</li> </ol>	4

		<p>must to know dravya list).</p> <p>3. Students will be instructed to collect raw samples/ Pictures / Photos of assigned Rasa Dravya</p> <p>4. Students have to interpret classical as well as mineralogical criteria for identifying that Rasa Dravya.</p> <p>5. Encourage them to develop the skill of identification of various Rasa Dravyas and to understand its necessity.</p> <p><b>Discussion &amp; Conclusion</b></p> <p>Each Group has to share the presentation.</p> <p>Finally, teacher has to give concluding remarks.</p> <p><b>Note:</b> The mentioned activity is an example.</p> <p>Every year different sets of drugs/ activity need to be given.</p>	
CO1,CO2,CO3	<p><b>Paper I-9.Rasa Dravya Parichaya II - DK</b></p>	<p><b>Objectives :-</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Document the different rasa dravyas that are considered to be desirable to know.</li> <li>• Gather information about each rasa dravya, such as its Sanskrit name, English name, synonyms, botanical name, physical appearance, taste, and medicinal properties.</li> <li>• Present the findings in a clear and concise way.</li> </ul>	6

		<ul style="list-style-type: none"> <li>• Debate and justify that their drug is more superior than other drugs in the same group.</li> </ul> <p><b>Method of Activity:</b></p> <ol style="list-style-type: none"> <li>1. Students are to be divided into 4 groups</li> <li>2. The students will be instructed to refer and collect photos, general information, medicinal uses from classical text books and e resources.</li> <li>3. Each group is to be given 2 drugs.</li> <li>4. The mentioned activity is an example. Every year different rasadravya / activity need to be given.</li> </ol> <p><b>Discussion:</b></p> <p>After the completion of compilation of desirable to know Rasa Dravya, each group will present short review of their work in front of the class and they have to debate and justify that their drug is more superior than other drugs in the same group. Finally, teacher have to give concluding remark on debate.</p>	
CO3	Paper I- 10.Rasa Dravya Parichaya - III NK	<p><b>Objectives :-</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Document the different rasa dravyas that are considered to be desirable to know.</li> <li>• Gather information about each rasa dravya, such as its Sanskrit name, English name, synonyms, botanical name, physical appearance,</li> </ul>	6

taste, and medicinal properties.

- Present the findings in a clear and concise way.
- Debate and justify that their drug is more superior than other drugs in the same group. To compile, understand and document basic information about certain Rasa Darvyas. (this activity is for nice to know dravyas)

**Methodology:**

1. Students are to be divided into 4 groups
2. The students will be instructed to refer and collect photos, general information, medicinal uses of given dravyas from classical text books and e resources.
3. Each group is to be given 4 drugs.
4. The mentioned activity is an example. Every year different drugs/ activity need to be given.

**Discussion:**

After the completion of compilation of nice to know Rasa Dravya, each group will present short review of their findings, in front of class and they have to debate and justify that their drugs are more superior than other drugs. Finally, teacher have to give concluding remark on debate.

Note: Every year different drugs are to be given.

CO1,CO2,CO3,CO5	<b>Paper I - 12.Chaturvidha Rasayana -MK</b>	<p><b>Objectives:-</b></p> <ul style="list-style-type: none"> <li>• Collect information on different Chaturvidha Rasa formulations.</li> <li>• Identify the different manufacturing companies that produce Chaturvidha Rasa formulations.</li> <li>• appraise the different classical references that are used to manufacture Chaturvidha Rasa formulations.</li> <li>• Compare the MRP (prices) of different Chaturvidha Rasa formulations.</li> <li>• Identify the indications for different Chaturvidha Rasa formulations.</li> <li>• Analyze the different Chaturvidha Rasa formulations and develop critical thinking skills.</li> <li>• Communicate their findings effectively to the class.</li> </ul> <p><b>Method of Activity: (Survey)</b></p> <p><b>Students are to be divided into 5 groups</b></p> <p><b>1. Group 1-</b> Need to be assigned to collect information on Swarna Bhasma manufacturing companies, classical references they follow to manufacture it, MRP (prices) and indications</p> <p><b>2. Group 2-</b> Need to be assigned to collect varieties of parpati containing suvarna bhasma as one ingredient in it, their manufacturing companies, classical references they follow to manufacture it, MRP (prices) and indications</p> <p><b>3. Group 3-</b> Need to be assigned to collect varieties of kupipakwa rasayanas containing suvarna bhasma as one ingredient in it,</p>	4
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		<p>manufacturing companies, classical references they follow to manufacture it, MRP (prices) and indications</p> <p><b>4. Group 4</b> - Need to be assigned to collect varieties of pottali rasayanas containing suvarna bhasma as one ingredient in it, manufacturing companies, classical references they follow to manufacture it, MRP (prices) and indications</p> <p><b>5. Group 5</b> - Need to be assigned to collect varieties of kharaliya rasayanas containing suvarna bhasma as one ingredient in it, manufacturing companies, classical references they follow to manufacture it, MRP (prices) and indications</p> <p><b>6.</b> The mentioned activity is an example. Every year different formulations/ activity need to be given.</p> <p><b>Discussion:</b> All groups have to present their assignment and finally in charge teacher has to give conclusion of importance of swarnakalpa. rationality behind following different references and probable variation in their cost.</p>	
CO1	Paper I- 13.Current and Emerging Trends in Ayurvedic pharmaceuticals	<p><b>Objectives: -</b></p> <ul style="list-style-type: none"> <li>• Identify the current and emerging trends in Ayurvedic Pharmaceuticals.</li> <li>• Analyze the potential impact of these trends on the future of Ayurvedic Pharmaceuticals.</li> <li>• Review and record the commonly used modified dosage forms of Ayurvedic</li> </ul>	4



		<p>formulations.</p> <ul style="list-style-type: none"> <li>• Evaluate the potential of these modified dosage forms to improve the efficacy and safety of Ayurvedic formulations.</li> </ul> <p><b>Method of Activity</b></p> <p>Students need to be divided into 3 groups</p> <p><b>Group 1.</b> List the current and emerging trends in Ayurvedic Pharmaceuticals viz. cosmetics, Nutraceuticals, Herbaceuticals</p> <p><b>Group 2.</b> Review and record the commonly used modified dosage forms of Ayurvedic formulations</p> <p><b>Group 3.</b> Generate a folder on computer about relevant research articles on modified Ayurvedic dosage forms</p> <p><b>Discussion :</b> All the above groups will present their assignment with their team and Exchange of Knowledge will take place followed by conclusion by faculty in charge</p>	
CO4	Paper I - 14. GMP & Drug and Cosmetic act 1940 and rules 1945	<p><b>Objective:</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify misleading advertisements under the Drug &amp; Magic Remedies objectionable advertisements Act, 1954.</li> <li>• Analyze misleading advertisements and identify the specific provisions of the Act that are being violated.</li> </ul>	4

		<ul style="list-style-type: none"> <li>• Communicate their findings in a clear and concise way.</li> </ul> <p><b>Methodology: -</b></p> <p><b>Students are to be divided into 5 students in each group</b></p> <p>1. Each group need to report two misleading advertisements under Drug &amp; Magic Remedies - objectionable advertisements Act, 1954 advertising through TV channels, print media or electronic media etc.</p> <p>2. The students will ask to submit details of objectionable advertisements in the prescribed format.</p> <p><b>Discussion: -</b></p> <p>After the submission of reports, the students will be asked to present and an interaction will be held between students and the concerned teacher (s) to understand the act &amp; rules of objectionable advertisements as a learning experience.</p>	
CO1	Paper II -1. Aushadhi Prayoga Vigyana	<p><b>Objective:</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Understand the concept of Prashasta Bheshaja lakshana.</li> <li>• Identify the different aspects of Prashasta Bheshaja lakshana, such as bahu kalpam, bahugunam, and sampannam.</li> </ul>	2

		<ul style="list-style-type: none"> <li>• Gather information about a given drug/formulation and justify whether it is a Prashasta Bhesaja.</li> <li>• Communicate their findings in a clear and concise way.</li> </ul> <p><b>Method of Activity</b></p> <p>Students will be divided in Groups consisting of 10 Students in each group</p> <p>each group will be given one drug/Formulation</p> <p>They have to search information about Prashasta bhesaja on following aspects-</p> <ol style="list-style-type: none"> <li>1.Bahu Kalpam</li> <li>2.Bahugunam</li> <li>3.Sampannam</li> </ol> <p>justify that the drug which they are allotted drug/formulation</p> <p>Each team will present their Justification followed by conclusion by designated faculty.</p>	
CO1,CO3	<b>Paper II- 2.Single drug (Herbal &amp; Mineral)</b>	<p><b>Objective:</b></p> <p><b>After completing this activity, students will be able to demonstrate their knowledge of herbal and mineral drugs by:</b></p> <ul style="list-style-type: none"> <li>• Identifying and differentiating between</li> </ul>	2

different types of herbal and mineral drugs, with at least 5 examples of each.

- Understanding the different formulations of herbal and mineral drugs, with at least 3 examples of each formulation.
- Learning about the different indications for herbal and mineral drugs, with at least 3 examples of each indication.
- Learning about the different anupanas that can be used with herbal and mineral drugs, with at least 3 examples of each anupana.
- Understanding the importance of pathyaapatya, sevana kala, and saveeryatavadhi in the administration of herbal and mineral drugs.
- Communicating their findings in a clear and concise way, including a presentation to the class that is clear, concise, and answers questions about the drugs.

#### **Method of Activity**

1. Students need to be divided into groups as per convenience
2. Each group need to be assigned with one herbal or one mineral drug or from both categories
3. Advised to collect information on assigned single drug/drugs variety of formulations, different indications when given in different form, with different anupana, Pathyaapatya, sevana kala, saveeryatavadhi and research updates and clinical evidences for each of the formulations
4. Every year different drugs are to be allotted to avoid repetition.

CO1,CO2,CO3	<p><b>Paper II -3.Single Drug (Bhasma, Shuudha &amp; Pishti)- Mk</b></p>	<p><b>Objective</b></p> <p><b>After completing this activity, students will be able to demonstrate their knowledge of market research by:</b></p> <ul style="list-style-type: none"> <li>• Conducting a market survey of one or two bhasmas in a particular city.</li> <li>• Collecting and documenting information about the market demand for the bhasma, such as the price, the dosage, and the frequency of use.</li> <li>• Analyzing the data collected to determine the market trends for the bhasma.</li> <li>• Communicating their findings in a clear and concise way, including a presentation to the class.</li> </ul> <p><b>Method of Activity:</b></p> <ol style="list-style-type: none"> <li>1.The students instructed to visit Ayurvedic drug store and collect information as given in the format.</li> <li>2.Students need to be divided into 4 to 5 groups. Each group need to be given 1 to 2 drugs. (Every year different drugs are to be allotted to avoid repetition.)</li> <li>3.Each group has to visit one to two Ayurvedic drug stores. Number of stores can be increased based on number of drug stores in the city or around the city.( based on information of online survey )</li> </ol> <p>After collecting information students have to submit survey forms to department</p>	6
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CO1,CO2	Paper II- 4. Aushadhi Kalpa-I(Compound Formulations)	<p><b>Horizontal Integration Activity with Department of Agada Tantra Objective</b></p> <p><b>After completing this activity,</b></p> <ul style="list-style-type: none"> <li>• Students will be able to demonstrate their knowledge of the preparation and uses of agadas by:</li> <li>• Preparing five different agadas under the guidance of Rasashastra &amp; Bk Dept faculty..</li> <li>• Presenting their findings on the ingredients, method of preparation, uses, dosage, anupana, and mode of action of the agadas.</li> <li>• Communicating the utility of the agadas in different conditions, research updates with case studies, and dosage, anupana, and duration of agada kalpa prayoga.</li> </ul> <p><b>Method of Activity</b></p> <p><b>Students will be divided into 5 groups</b></p> <p>Each group will get hands on training to prepare one peculiar agada (mentioned in following list) and faculty from Agada Tantra department will give information about its utility in different Visha Laxana/or Stages of visha dushta.All details about agada kalpa prayoga viz.Dosage, Anupana, Duration will be discussed -2hrs</p> <p>Team 1: Bilavdi Agada</p> <p>Team 2: Dooshivishari Agada</p> <p>Team 3: Dashanga Agada</p> <p>Team 4: Murvadi Agada</p> <p>Team 5: Pancha Shireesha Agada</p> <p>Presentation will be done by all Teams on</p>	4
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		<p>Ingredients, Method of Preparation, Video/ Photos of ingredients, preparation, uses, dosage, Anupana</p> <p>Every year different topics are to be selected for integrated activity. Repetition should be avoided.</p> <p>Discussion will be done on mode of action, utility of above prepared Agadas in different conditions, Research updates with Case studies by Agada Tantra Faculty</p>	
CO3	<p><b>Paper II - 5. Aushadhi Kalpa - II(Compound drugs/ formulations)</b></p>	<p><b>Objective</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify the different types of research updates and clinical evidences that are available for the formulations listed in the syllabus Aushadhi Kalpa - II(Compound drugs/ formulations).</li> <li>• Collect and compile research updates and clinical evidences for the formulations assigned to them.</li> <li>• Review the research updates and clinical evidences to determine their relevance and significance.</li> <li>• Communicate their findings in a clear and concise way.</li> </ul> <p><b>Methodology of Activity :</b></p> <ol style="list-style-type: none"> <li>1.Students are to be divided into 5 to 6 groups</li> <li>2.Each group is to be assigned 2 to 3 formulations in the syllabus.</li> </ol>	2

		<p>3. Groups are instructed to collect Research updates and clinical evidences for formulations assigned to them</p> <p>4. Every year different formulations are to be allotted to avoid repetition.</p> <p><b>Submission of Assignment:</b></p> <p>After the completion of compilation groups have to submit the assignment for correction.</p>	
CO4	Paper II - 6 Dosage forms & cosmetic products Paper II- 7. Nutraceuticals	<p><b>objective</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify the different types of cosmetic and nutraceutical products.</li> <li>• Understand the legal and regulatory requirements for these products.</li> <li>• Research the market for these products.</li> <li>• Analyze the quality control tests that are recommended for these products.</li> <li>• Prepare a report/assignment on the selected products.</li> <li>• Communicate their findings in a clear and concise way.</li> <li>• Answer questions about their findings.</li> <li>• Communicate the significance of various guidelines used for testing of food products and cosmetics in brief.</li> </ul>	3



**Methodology: -**

1. Students are to be divided into 5-6 groups
2. Each group need to be given one to two cosmetic or nutraceutical products for eg. Lipstick, lip balm, Energy drink, Nutritional supplement for children, working women, pregnant women etc.
3. The students will be asked to prepare a report/assignment on number of companies selling such products. Information should be compiled about their major ingredients, preservatives, price, market value, quality control tests recommended etc.
4. For that Nutritional Product, the students will be asked to go through the quality parameters and nutritional values displayed on packages of food products as per the guidelines of Food Safety and Standards Authority of India (FSSAI).
5. Every year different products are to be allotted to avoid repetition

**Discussion: -** After the submission of reports, a discussion will be held among the students and the teacher(s) to understand the significance of various guidelines used for testing of food products and cosmetics in brief.

**Optional Activity****Objectives-**

**after completion of the course students should be able to prepare dosage forms and self care products in the syllabus.**

**Short term course/ Module**

		<p>Online/offline mode in collaboration with Pharmacy college</p> <p>Dosage Forms &amp; Self-care Products</p> <p>Assessment through MCQ's</p> <p>Duration of the course may be 22hrs including online assessment</p>	
CO1,CO3,CO6	<p>Paper II- 8 Anupana Prayoga for Aushadhi Kalpa</p> <p>Paper II- 9. Aushadhi Prayoga Marga</p>	<p><b>Objective</b></p> <p><b>After the completion of this activity</b></p> <ul style="list-style-type: none"> <li>• Students should be able to explain/present the probable pharmacokinetic and pharmacodynamic principles of assigned Ayurvedic drugs &amp; Anupana in different condition or indication</li> </ul> <p><b>Method of Activity: -</b></p> <ol style="list-style-type: none"> <li>1. Students will be divided into 5 to 6 groups</li> <li>2. Each group need to be allotted formulations/ single drug/Bhasma/Pishti etc</li> <li>3. Students are asked to explain the therapeutic importance of five formulations with respect to different Anupana, Aushadhiprayoga marga and their utility in different disorders with the probable pharmacokinetic and pharmacodynamic principles involved in the use of assigned Ayurvedic drugs.</li> <li>4. students have to submit assignment / sharing ppt presentation in the activity group</li> </ol> <p><b>Discussion: -</b></p> <p>After the completion of this task, students should be able to explain/present the probable pharmacokinetic and pharmacodynamic principles of assigned Ayurvedic drugs. In charge teacher has to conclude on collection of compiled matter and drugs action.</p>	2

CO3	Paper II 10. Rational prescription along with safe dispensing of Ayurvedic formulations.	<p><b>Objective</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify the different components of a prescription.</li> <li>• Analyse the prescriptions to determine whether they are rational.</li> <li>• Discuss the significance of ideal prescription and rationality of use of drugs in Ayurveda.</li> </ul> <p><b>Methodology: -</b></p> <ol style="list-style-type: none"> <li>1. Students are to be divided into 4 to 5 groups</li> <li>2. Each group is advised to collect 4 to 5 prescriptions from different departments of the hospital.</li> <li>3. The students are asked to visit hospital to go through the randomly selected five prescriptions for promoting them to know the ideal prescription and rational use of drugs.</li> <li>4. The students will be asked to present their review of this activity during the non-lecture hours.</li> <li>5. Strictly instructions should be given to maintain confidentiality about patient's name and consultant's name.</li> </ol> <p><b>Discussion: -</b></p> <p>After the completion of the task, an interaction will be held among the students and the concerned teacher (s) to understand the</p>	4

		significance of ideal prescription and rationality of use of drugs in Ayurvedic practices.	
CO1,CO5	Paper II 11. Traditional and local health practices	<p><b>Objective</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify different types of traditional healers in their local area/region.</li> <li>• Interview traditional healers to understand their practices.</li> <li>• Document the practices of traditional healers in a way that is respectful and preserves their knowledge.</li> <li>• Communicate the findings of their research to others.</li> </ul> <p><b>Methodology :</b></p> <p>1. To understand the practices of traditional healers/ Folklore healers- the students are instructed to visit and meet some of the folk healers / traditional healers who have been practicing since ages in their local area/region. During their holiday/vacation students can complete this survey in and around the institute or near their residential place.</p> <p>2. The students may act as a bridge between Ayurveda and traditional/local healers by making them understand the beneficial effect of technology and how this can help the healers to expand their treatment to a larger mass. Because many a times it has been observed that the healers are reluctant or they don't entertain the students who come to meet them for fear of exploitation or theft of their knowledge.</p>	4

		<p>3. By doing this practice, the healers will develop confidence on students which helps in collecting /documenting practices, through which a new horizon may open in the field of medicinal research.</p> <p><b>Discussion:</b> After the completion of the visit, an interaction need to be held among the concerned teachers and students to discuss the learning experiences, and try to find out difficulties so that in future those things can be managed or avoided to make things easier.</p>	
CO4	Paper II 12. Pharmacovigilance for Ayurveda drugs	<p><b>Objective</b></p> <p><b>After completing this activity, students will be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify the different types of adverse drug reactions (ADRs).</li> <li>• Describe the detection criteria for ADRs.</li> <li>• Explain the assessment techniques for ADRs.</li> <li>• Discuss the prevention criteria for ADRs.</li> <li>• Able to fill out an ADR reporting format</li> </ul> <p><b>Methodology: -</b></p> <p>The students will be asked to visit hospital or go through the previously reported cases to discuss for detection criteria, assessment techniques, understanding and prevention criteria of ADRs.</p> <p>Every student is assigned to fill up the ADR reporting format by allotting imaginary situation/ real case</p>	4

		<p><b>Discussion: -</b></p> <p>After the visit, an interaction will be held among the concerned teacher(s) and the students to discuss the learning experiences, and the importance of ADRs, their assessment and reporting techniques.</p>	
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# Hours indicated are included in calculations of Table 3 and 4 !

**Table 5- Teaching learning method**

Sr No	Teaching learning methods in the course	No of Activities
1	Lecture	15
2	Lecture with Power point presentation	82
3	Lecture & Group Discussion	25
4	Lecture with Video clips	14
5	Discussions	46
6	Brainstorming	29
7	Inquiry-Based Learning	25
8	PBL	1
9	CBL	1
10	Project-Based Learning	15
11	Team project work	12
12	Blended Learning	1
13	Edutainment	1
14	Mobile learning	2
15	Self-directed learning	23
16	Problem solving method	2
17	Workshops	1
18	Game-Based Learning	2
19	Demo on Model	2
20	Library Session	7

21	Peer learning	1
22	Real life experience	5
23	Recitation	2
24	Symposium	1
25	Tutorial	2
26	Presentations	2
27	Practical	7
28	Drug analysis	1
29	Demonstration	2
30	Demonstration Lab	4
31	Field visit	2

These are overall teaching learning methods listed in Table 3 and 4. Teachers can select the best possible method amongst the given methods as per objective, available time etc.

**Table 6: Assessment Summary: Assessment is subdivided in A to H points**

#### 6 A-Number of Papers and Marks Distribution

Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand Total
			Practical	Viva	Elective	IA	Sub Total	
AyUG-RB	2	200	100	70	-	30	200	400

#### 6 B - Scheme of Assessment (formative and Summative)

PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
	First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
Second	3 PA & First TT	3 PA & Second TT	3 PA & UE <sup>**</sup>

PA: Periodical Assessment; TT: Term Test; UE: University Examinations.

\*\* University Examination shall be on entire syllabus

## 6 C - Calculation Method for Internal assessment Marks

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A 2	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 30 Marks (D/15*30)	Term Test (Marks converted to 30)	Sub Total _/60 Marks	Term Assessment (.../30)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert to 30 marks.							

## 6 D - Evaluation Methods for Periodical Assessment

S. No	Evaluation Methods
1	Activities Indicated in Table 3 - Column G3 as per Indicated I, II or III term in column I3

### Evaluation Methods in MSE

1. Practical / Clinical Performance
2. Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
3. Open Book Test (Problem Based)
4. Summary Writing (Research Papers/ Samhitas)
5. Class Presentations; Work Book Maintenance
6. Problem Based Assignment
7. Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)
8. Extra-curricular Activities, (Social Work, Public Awareness, Surveillance Activities, Sports or Other Activities which may be decided by the department).
9. Small Project etc.



## 6 E Question Paper Pattern

### II PROFESSIONAL BAMS EXAMINATIONS AyUG- RB

#### PAPER-1

Time: 3 Hours Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

		<b>Number of Questions</b>	<b>Marks per question</b>	<b>Total Marks</b>
Q 1	MULTIPLE CHOICE QUESTIONS (MCQ)	20	1	20
Q 2	SHORT ANSWER QUESTIONS (SAQ)	8	5	40
Q 3	LONG ANSWER QUESTIONS (LAQ)	4	10	40
				100

**Similar for Paper II (If applicable).**

## 6 F Distribution of theory examination

<b>Paper 1 Ayurvediya Aushadhi Nirmana Vigyana</b>						
<b>Sr. No</b>	<b>A List of Topics</b>	<b>B Term</b>	<b>C Marks</b>	<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
1	<b>1.Chronological development of Ayurvediya Aushadhi Nirmana</b>	1	05	No	Yes	No
2	<b>2.Paribhasha ( Terminology)</b>	1	10	Yes	Yes	No
3	<b>3.Adharbhuta Siddhanta (Application of fundamental principles )</b>	1	05	Yes	Yes	No
4	<b>4.Yantropakaranani- I (Equipments and machineries)</b>	1	05	Yes	Yes	No
5	<b>5.Yantropakaranani -II (Equipments, fuel and Heating Devices)</b>	1	05	Yes	Yes	No
6	<b>6.Kalpana Nirmana I (Primary &amp; Secondary dosage forms)</b>	1	10	Yes	Yes	Yes
7	<b>7.Kalpana Nirmana-II (Method of Preparation of different dosage forms&amp; Dietary Supplements) )</b>	1	10	Yes	Yes	Yes
8	<b>8.Rasa Dravya Parichaya- I</b>	2	10	Yes	Yes	Yes
9	<b>9.Rasa Dravya Parichaya II</b>	2	5	Yes	Yes	No
10	<b>10.Rasadravaya Parichaya III</b>	2	5	Yes	No	No
11	<b>11.Kalpana Nirman -III (Method of Preparation of different dosage forms)</b>	2	10	Yes	Yes	Yes
12	<b>12.Chaturvidha Rasayana</b>	2	10	Yes	Yes	Yes
13	<b>13.Current and emerging trend in Ayurvedic pharmaceuticals</b>	3	5	No	Yes	No

14	<b>14.GMP(Schedule T) &amp; Regulatory aspects of Ayurvedic drugs</b>	3	5	Yes	Yes	No
<b>Total Marks</b>			<b>100</b>			

<b>Paper 2 Ayurvediya Aushadhi Prayoga Vigyana</b>						
<b>Sr. No</b>	<b>A List of Topics</b>	<b>B Term</b>	<b>C Marks</b>	<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
15	<b>1.Aushadhi Prayoga Vigyana</b>	1	5	Yes	Yes	No
16	<b>2.Single drug (Herbal &amp; Mineral)</b>	1	10	Yes	Yes	Yes
17	<b>3.Single drug(Bhasma, Shuddha &amp; Pishti)</b>	2	15	Yes	Yes	Yes
18	<b>4.Aushadhi Kalpa -I (Compound formulations)</b>	2	15	Yes	Yes	Yes
19	<b>5.Aushadhi Kalpa-II (Compound Drugs/Formulations)</b>	3	15	Yes	Yes	Yes
20	<b>6.Dosage Forms &amp; Cosmetic Products</b>	3	5	Yes	Yes	No
21	<b>7.Nutraceuticals</b>	3	5	Yes	Yes	No
22	<b>8.Anupana Prayoga for Aushadhi Kalpa</b>	3	5	Yes	Yes	No
23	<b>9.Aushadhi Prayoga Marga</b>	3	10	Yes	Yes	Yes
24	<b>10.Rational prescription along with safe dispensing of Ayurvedic formulations.</b>	3	5	No	Yes	No
25	<b>11.Traditional &amp; Local health Practices</b>	3	5	No	Yes	No
26	<b>12.Pharmacovigilance for Ayurveda drugs</b>	3	5	Yes	Yes	No
<b>Total Marks</b>			<b>100</b>			

6 G Blue print of paper I & II (if applicable)

Paper No:1		
Question No	Type of Question	Question Paper Format
Q1	<p><b>Multiple choice Questions</b>  <b>20 Questions</b>  <b>1 mark each</b>  <b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b>  <b>Desirable to know - 3 MCQ</b>  <b>Nice to know part - 2 MCQ</b></p>	<ol style="list-style-type: none"> <li>1. 2.Paribhasha ( Terminology)</li> <li>2. 2.Paribhasha ( Terminology)</li> <li>3. 2.Paribhasha ( Terminology)</li> <li>4. 4.Yantropakaranani- I (Equipments and machineries)</li> <li>5. 5.Yantropakaranani -II (Equipments, fuel and Heating Devices)</li> <li>6. 6.Kalpana Nirmana I (Primary &amp; Secondary dosage forms)</li> <li>7. 6.Kalpana Nirmana I (Primary &amp; Secondary dosage forms)</li> <li>8. 6.Kalpana Nirmana I (Primary &amp; Secondary dosage forms)</li> <li>9. 7.Kalpana Nirmana-II (Method of Preparation of different dosage forms&amp; Dietary Supplements )</li> <li>10. 7.Kalpana Nirmana-II (Method of Preparation of different dosage forms&amp; Dietary Supplements )</li> <li>11. 8.Rasa Dravya Parichaya- I</li> <li>12. 8.Rasa Dravya Parichaya- I</li> <li>13. 8.Rasa Dravya Parichaya- I</li> <li>14. 8.Rasa Dravya Parichaya- I</li> <li>15. 9.Rasa Dravya Parichaya II</li> <li>16. 10.Rasadravya Parichaya III</li> <li>17. 11.Kalpana Nirman -III (Method of Preparation of different dosage forms)</li> <li>18. 12.Chaturvidha Rasayana</li> <li>19. 12.Chaturvidha Rasayana</li> <li>20. 14.GMP(Schedule T) &amp; Regulatory aspects of Ayurvedic drugs</li> </ol>
Q2	<p><b>Short answer Questions</b>  <b>Eight Questions</b>  <b>5 Marks Each</b>  <b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b>  <b>Desirable to know - 1 SAQ</b>  <b>No questions on Nice to know</b></p>	<ol style="list-style-type: none"> <li>1. 1.Chronological development of Ayurvediya Aushadhi Nirmana</li> <li>2. 3.Adharbhuta Siddhanta (Application of fundamental principles ) / 2.Paribhasha ( Terminology)</li> <li>3. 9.Rasa Dravya Parichaya II / 4.Yantropakaranani- I (Equipments and machineries) / 5.Yantropakaranani -II (Equipments, fuel and Heating Devices)</li> <li>4. 6.Kalpana Nirmana I (Primary &amp; Secondary dosage forms)</li> <li>5. 7.Kalpana Nirmana-II (Method of Preparation</li> </ol>

		<p>of different dosage forms&amp; Dietary Supplements) )</p> <p>6. 9.Rasa Dravya Parichaya II / 8.Rasa Dravya Parichaya- I</p> <p>7. 12.Chaturvidha Rasayana</p> <p>8. 14.GMP(Schedule T) &amp; Regulatory aspects of Ayurvedic drugs / 13.Current and emerging trend in Ayurvedic pharmaceuticals</p>
<b>Q3</b>	<p><b>Long answer Questions</b> <b>Four Questions</b> <b>10 marks each</b> <b>All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable to know</b></p>	<p>1. 6.Kalpana Nirmana I (Primary &amp; Secondary dosage forms)</p> <p>2. 7.Kalpana Nirmana-II (Method of Preparation of different dosage forms&amp; Dietary Supplements) )</p> <p>3. 8.Rasa Dravya Parichaya- I</p> <p>4. 11.Kalpana Nirman -III (Method of Preparation of different dosage forms) / 12.Chaturvidha Rasayana</p>
<b>Paper No:2</b>		
<b>Question No</b>	<b>Type of Question</b>	<b>Question Paper Format</b>
<b>Q1</b>	<p><b>Multiple choice Questions</b> <b>20 Questions</b> <b>1 mark each</b> <b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b> <b>Desirable to know - 3 MCQ</b> <b>Nice to know part - 2 MCQ</b></p>	<p>1. 1.Aushadhi Prayoga Vigyana</p> <p>2. 2.Single drug (Herbal &amp; Mineral)</p> <p>3. 2.Single drug (Herbal &amp; Mineral)</p> <p>4. 3.Single drug(Bhasma, Shuddha &amp; Pishti)</p> <p>5. 3.Single drug(Bhasma, Shuddha &amp; Pishti)</p> <p>6. 3.Single drug(Bhasma, Shuddha &amp; Pishti)</p> <p>7. 3.Single drug(Bhasma, Shuddha &amp; Pishti)</p> <p>8. 4.Aushadhi Kalpa -I (Compound formulations)</p> <p>9. 4.Aushadhi Kalpa -I (Compound formulations)</p> <p>10. 4.Aushadhi Kalpa -I (Compound formulations)</p> <p>11. 4.Aushadhi Kalpa -I (Compound formulations)</p> <p>12. 5.Aushadhi Kalpa-II (Compound Drugs/Formulations)</p> <p>13. 5.Aushadhi Kalpa-II (Compound Drugs/Formulations)</p> <p>14. 5.Aushadhi Kalpa-II (Compound Drugs/Formulations)</p> <p>15. 5.Aushadhi Kalpa-II (Compound Drugs/Formulations)</p> <p>16. 6.Dosage Forms &amp; Cosmetic Products</p>

		<p>17. 7.Nutraceuticals</p> <p>18. 8.Anupana Prayoga for Aushadhi Kalpa</p> <p>19. 9.Aushadhi Prayoga Marga</p> <p>20. 12.Pharmacovigilance for Ayurveda drugs</p>
Q2	<p><b>Short answer Questions</b>  <b>Eight Questions</b>  <b>5 Marks Each</b>  <b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b>  <b>Desirable to know - 1 SAQ</b>  <b>No questions on Nice to know</b></p>	<p>1. 8.Anupana Prayoga for Aushadhi Kalpa /  1.Aushadhi Prayoga Vigyana</p> <p>2. 2.Single drug (Herbal &amp; Mineral)</p> <p>3. 3.Single drug(Bhasma, Shuddha &amp; Pishti)</p> <p>4. 4.Aushadhi Kalpa -I (Compound formulations)</p> <p>5. 5.Aushadhi Kalpa-II (Compound Drugs/Formulations)</p> <p>6. 7.Nutraceuticals</p> <p>7. 9.Aushadhi Prayoga Marga</p> <p>8. 12.Pharmacovigilance for Ayurveda drugs /</p> <p>10.Rational prescription along with safe dispensing of Ayurvedic formulations. /</p> <p>6.Dosage Forms &amp; Cosmetic Products /</p> <p>11.Traditional &amp; Local health Practices</p>
Q3	<p><b>Long answer Questions</b>  <b>Four Questions</b>  <b>10 marks each</b>  <b>All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable to know</b></p>	<p>1. 2.Single drug (Herbal &amp; Mineral) / 9.Aushadhi Prayoga Marga</p> <p>2. 3.Single drug(Bhasma, Shuddha &amp; Pishti)</p> <p>3. 4.Aushadhi Kalpa -I (Compound formulations)</p> <p>4. 5.Aushadhi Kalpa-II (Compound Drugs/Formulations)</p>

## 6 H Distribution of Practical Exam

S.No	Heads	Marks
1	<p><b>1.Spotting (10 sample + 5 Instruments/ equipments)</b></p> <p><b>Identification (1 mark) answering sub question related to spotter(1 mark) 15x2=30 marks</b> <b>Choose</b> <b>spotter from below mentioned list</b></p> <ol style="list-style-type: none"><li>1. Parada (mercury),</li><li>2. Abhraka (Biotite Mica),</li><li>3. Makshika (Chalco-pyrite),</li><li>4. Shilajatu(Asphaltum Punjabianum)</li><li>5. Gandhaka (Sulfur)</li><li>6. Gairika(Red Ochre)</li><li>7. Kankshi (Alum)</li><li>8. Haratala (Orpiment)</li><li>9. Manahshila (Realgar)</li><li>10. Kampillaka(Mallotus Philippinensis)</li><li>11. Navasadara (Ammonium chloride)</li><li>12. Hingula (Red Cinnabar)</li><li>13. Tamra (Copper)</li><li>14. Loha (Iron)</li><li>15. Mandur (rust iron)</li><li>16. Vanga (Tin)</li><li>17. Naga (Lead)</li><li>18. Yashada (Zinc)</li><li>19. Pravala (Coral)</li><li>20. Kaparda (Cowries)</li><li>21. Shukti (Oyster Shell)</li><li>22. Shankh (Conch Shell)</li><li>23. Godanti (Gypsum)</li><li>24. Samudraphena (Cattle Fish bone)</li><li>25. Kukkutanda twak (Hen's EggShell),</li><li>26. Tankana kshara (Borax)</li><li>27. Sasyaka (Peacock ore)</li><li>28. Kasisa (Green Vitriol),</li><li>29. Gauri pashana (Arsenic oxide)</li><li>30. Akika(Agate),</li><li>31. Sudha (Lime stone )</li><li>32. Khatika</li><li>33. Dugdhapashana (Talc)</li> <li>34. Vimala</li><li>35. Rasaka</li><li>36. Yantra</li></ol>	30

	<p>37. Dola Yantra  38. Damaru Yantra  39. Valuka Yantra  40. Puta Yantra  41. Khalwa Yantra  42. Patana Yantra  43. Darvika Yantra  44. Ulukhala Yantra  45. Patala Yantra  46. Kupi Yantra  47. Arkapatana Yantra  48. Pithara Yantra  49. Sharava Yantra  50. Palika Yantra  51. Sthali Yantra  52. Swedana Yantra  53. Moh's scale  54. Tablet Hardness tester  55. Ph Meter  56. Muffle Furnace  57. Electronic Weighing machine  58. Pycnometer  59. Large scale manufacturing instruments &amp; equipments in the syllabus Photos /Pictures may be used for spotting</p>	
2	<p><b>2. Long Practical</b></p> <ul style="list-style-type: none"> <li>◆ Selection of Ingredients with proportion(10Marks)</li> <li>◆ Preparation following SOP (15 marks)</li> <li>◆ Demonstration of Siddhi lakshana(05Marks)</li> <li>◆ on site viva ( 10 Marks)</li> </ul> <p><b>List of Long Practicals</b></p> <ol style="list-style-type: none"> <li>1. Sitopaladi churna</li> <li>2. Hingwastaka Churn</li> <li>3. Agni Tundi Vati</li> <li>4. Chitrakadi Vati</li> <li>5. Lavangadi Vati</li> <li>6. Triphala Guggulu</li> <li>7. Kaishor Guggulu</li> <li>8. Phala Varti</li> <li>9. Chandrodaya Varti</li> </ol>	40



	<p>10. Arka Lavana  11. Narikela Lavana  12. Atasi Upanaha  13. Dashanasamskara churna  14. Gandhaka Malahara  15. Dashanga Lepa  16. Mustadi Pramathya  17. Shadanga Paneeya  18. Kharjuradi Mantha  19. Chinch Panaka  20. Chandana Panaka  21. Ghrita Murchana  22. Taila Murchana  23. Triphala Ghrita  24. Amruta Ghrita  25. Ksheera Bala Taila  26. Arka Taila  27. Vasavaleha  28. Nimbu Sharkara  29. Kutaja Ghana  30. Guduchi Ghana  31. Haridra Khanda  32. Narikela Khanda  33. Ananda Bhairava Rasa  34. Tribhuvana Keerti rasa  35. Rasa Parpati  36. Sweta Parpati  37. Laghusutsekhara rasa  38. Navayasa loha  39. Saptamrita loha</p> <p><b>Note: for preparation shuddha dravya, decoction, murchita gritha, murchita taila etc are to be provided for long practical</b></p>	
3	<p><b>3.Short Practical</b></p> <ul style="list-style-type: none"> <li>◆ Selection of Ingredients with proportion(5Marks)</li> <li>◆ Preparation following SOP (5 marks)</li> <li>◆ Demonstration of Siddhi lakshana(5Marks)</li> <li>◆ on site viva ( 5 Marks)</li> </ul> <p><b>List of Short Practicals</b></p> <p>1. Godanti Shodhana  2. Shankha Shodhana</p>	20

	<ol style="list-style-type: none"> <li>3. Kapardika shodhana</li> <li>4. Guggulu Shodhana</li> <li>5. Gandhaka Shodhana</li> <li>6. Vanga Shodhana</li> <li>7. Yashada shodhana</li> <li>8. Abhraka Shodhana</li> <li>9. Tamra Shodhana</li> <li>10. Tankana Shodhana</li> <li>11. Kankshi shodhana</li> <li>12. Hingula Shodhana</li> <li>13. Gairika Shodhana</li> <li>14. Hingu Shodhana</li> <li>15. Mugdha Rasa</li> <li>16. Tamra Bhasma (Dadhi/ Nimbu Pariksha)</li> <li>17. Triphala Masi</li> <li>18. Mayura Piccha Masi</li> <li>19. Vasaputapaka Swarasa</li> <li>20. Amruta Satva</li> <li>21. Arjuna Ksheera Paka</li> <li>22. Lashuna Ksheerapaka</li> <li>23. Punarnavashtaka kwatha</li> <li>24. Rasna Saptaka Kwatha</li> <li>25. Specific Gravity</li> <li>26. Refractive Index</li> <li>27. PH</li> </ol>	
4	<p>4. Practical Record</p> <p>Four Record books- for each record book 2.5 Marks</p>	10
5	<p><b>5. Viva-Voce</b></p> <p><b>Structure of Viva</b></p> <ol style="list-style-type: none"> <li>1. Paribhasha – (2 questions 3 marks each) - 6 Marks</li> <li>2. Shodhana, marana –( 1 question from each 5 marks each ) -10 Marks</li> <li>3. Yantropakarana –(2questions 3 marks each) - 6 Marks</li> <li>4. Chemical composition Raasadravya –(1 questions 2 marks each)-2 Marks</li> <li>5. Therapeutic application of single drugs – (2 question 3 marks each ) -6 marks</li> <li>6. Yoga - (Shloka-3 marks; ingredients-5 marks: indications -5 marks</li> </ol>	70

	<p>dose &amp; anupana-2Marks )-15Marks (Select the yoga having at least 5 ingredients)</p> <p>7. Siddhi lakshana &amp; quality control tests –(2 questions 5 marks each )-10 Marks</p> <p>8. D&amp; C act, GMP, FSSAI- 2 Marks</p> <p>9. Viva on Non Lecture hour activity book-8 Marks</p> <p>10. Communication skills -5 Marks</p>	
6	<b>6. Internal assessment</b>	30
<b>Total Marks</b>		<b>200</b>

**References Books/ Resources**

<b>S.No</b>	<b>Book</b>	<b>Resources</b>
1	1. Adyatan Rasa Shastra	R.K. Goyal Chaukhamba Surbharati Prakashan, Varanasi
2	2.Ayurvediya Aushadhi gunadharmashastra	Vol I, II, III, IV, V, Gune Gangadharashastri, Gune Bandhu Prakashan
3	3. Asava Arishta Vigyanam	Dr. Pakshdhar Jha, Chaukhambha Sanskrit Sansthan, Varanasi
4	4. Ayurvediya Rasa Shastra	(Sachitra) Chandrabhusan Jha by Chaukhamba Surbharati Prakashan Varanasi, Reprint 2012
5	5.Ayurvediya Rasa Shastra	Prof. Siddhi Nandan Mishra, Chaukhamba Orientalia, Varanasi
6	6.Ayurved Prakash	Vaidya Gulraj Mishra. Chaukhambha Bharati Academy, Varanasi
7	7.Drugs and Cosmetic Act - 1940	Vijay Malik, Eastern Book Company Delhi
8	8. Pratyaksha Aushadh Nirmanam	Acharya Vishwanath Dwivedi
9	9.Rasa Tarangini	Sadanand Sharma, Motilal Banarasidas, Varanasi
10	10.Rasa Bhaishajya Kalpana Vigyan	Vaidya Santosh Kumar Khandal, Choukhamba Publishers, New Delhi
11	11.Rasa Ratna Samuchchaya (Hindi)	Dattatreya Ananta Kulkarni, Meharchand Lachamdas Publications, New Delhi
12	12.Rasendra Sara Sangraha	Vaidya Gopal Krishna, Chaukhambha Sanskrit Series of Varanasi
13	13.Ayurvediya Paribhasha	Indradev Tripathi Chaukhamba Orientalia, Varanasi
14	14.Sharangadhara Samhita	Radhakrishna Parashar Vaidyanath Ayurved Bhavan Pvt
15	15.Bharatiya Bhaishajya Kalpana Vigyana	Gananath Vishwanath Dwivedi Krishnadas Academy, Varanasi
16	16.Ayurvedic formulary of India	Govt. of India Ministry of Health & Family welfare New Delhi
17	17.Ayurvedic Pharmacopiea of India	CCRAS Govt. of India Ministry of Health & Family welfare New Delhi
18	18.Abhinava Bhaishajya Kalpana	Siddhi Nandan Mishra, Chaukhamba Surbharati Prakashan, Varanasi
19	19.Bhaishjya Ratnawali	Prof S N Mishra Choukhamba Publishers, Varanasi
20	20.Ayurvediya Rasashastra Ka Udbhava Evam Vikas	Satyendrakumar Arya, Krishnadas Academy, 1984

21	21.Yoga Ratnakar	Shri Laxmipathi Shastri, Chaukhambha Prakashana Varanasi, Reprint 2018
22	22.A Text book of Rasashastra	Prof. Parimi Suresh Chaukhambha Prakashak, Varanasi
23	23.Siddhoushadi Sangraha	Vaidyaratna G. A. Phadke, Ayurvedacharya, Satara, N. H Kolhatkar, Maharashtra mitra Mudranalaya, Shukravara peth, Satara
24	24.Application on standardised Namburi phased spot test in identification of Bhasma and Sindura preparations of Ayurveda published	Namburi Hanumantha Rao, CCRAS., New Delhi
25	25. Evidence based safety of Ayurvedic herbo-mineral formulations	Kumar Anhimanyu published by CCRAS, New Delhi
26	26. Introduction to Ayurvedic Pharmaceutics	Dr Devendra Joshi & Dr Geeta Joshi Chaukhambha Orientalia
27	27. A Handbook of Cosmetics	B. M. Mithal & R.N. Saha Published by Delhi Vallabh Prakashana
28	28. Sahasrayoga (Sanskrit and Hindi)	Reprint by CCRAS, New Delhi
29	29. Manual on Quality Parameters for Ayurveda & Siddha drugs	CCRAS, New Delhi
30	30.Safety and Prescription Trends of Rasaushadhis	Critical appraisal of Reported Medical Practices of Ayurveda Herbomineral formulations from CCRAS experience.
31	31. General Guidelines for Drug Development of Ayurvedic Formulations	CCRAS New Delhi, Volume I 1 <sup>st</sup> Edn. 2018
32	32. General Guidelines for Safety/Toxicity Evaluation of Ayurvedic Formulations	CCRAS New Delhi, Volume II 1 <sup>st</sup> Edn. 2018
33	33.General Guidelines for Clinical Evaluation of Ayurvedic Interventions	CCRAS New Delhi, Volume III 1 <sup>st</sup> Edn. 2018
34	34. WHO internationalstandard terminologies on Ayurveda	WHO International Standard Terminology on Ayurveda, WHO 2022
35	35,Inorganic Pharmaceutical Chemistry	Gundu Rao P, Vallabha Prakashana
36	36, Organic Pharmaceutical Chemistry	Singh Harkishan; Kapoor V K, Vallabha Prakashana

37	37 Shlokavali of Rasashastra Bhaishajya Kalpana	Ninad Sathye;Shivaji Wavhal, Shantanu Prakashan Pune, 2009
38	38. Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems	Loyd V Allen : Others, 9th volume, Lippincott Williams & Willkins Wolters Kluwer Co.2011
39	39. Laboratory Guide for the Analysis of Ayurveda and Siddha Formulations	Lavekar G S,Central Council For Research in Ayurveda & Siddha,2010
40	40. Pharmaceutics I & II	Mehta R M, Vallabha Prakashana, 2014
41	41. Central Drugs Standard Control Organization Directorate General of Health Services Ministry of Health & Family Welfare Government of India	<a href="https://cdsco.gov.in/opencms/opencms/en/Home/">https://cdsco.gov.in/opencms/opencms/en/Home/</a>
42	42. FSSAI official website	<a href="https://www.fssai.gov.in/">https://www.fssai.gov.in/</a>
43	43. PHARMACOPOEIA COMMISSION FOR INDIAN MEDICINE & HOMOEOPATHY OFFICIAL WEBSITE	<a href="https://pcimh.gov.in/">https://pcimh.gov.in/</a>

## Abbreviations

### Assessment

S.No	Short form	Discription
1	T-EMI	Theory extended matching item
2	T- EW	Theory Essay writing
3	T- MEQs	Theory MEQs
4	T-CRQs	Theory CRQs
5	T-CS	Theory case study
6	T-OBT	Theory open book test
7	P-VIVA	Practical Viva
8	P-REC	Practical Recitation
9	P-EXAM	Practical exam
10	PRN	Presentation
11	P-PRF	Practical Performance
12	P-SUR	Practical Survey
13	P-EN	Practical enact
14	P-RP	Practical Role play
15	P-MOD	Practical Model
16	P-POS	Practical Poster
17	P-CASE	Practical Case taking
18	P-ID	Practical identification
19	P-PS	Practical Problem solving
20	QZ	Quiz
21	PUZ	Puzzles
22	CL-PR	Class Presentation,
23	DEB	Debate
24	WP	Word puzzle
25	O-QZ	Online quiz

26	O-GAME	Online game-based assessment
27	M-MOD	Making of Model
28	M-CHT	Making of Charts
29	M-POS	Making of Posters
30	C-INT	Conducting interview
31	INT	Interactions
32	CR-RED	Critical reading papers
33	CR-W	Creativity Writing
34	C-VC	Clinical video cases,
35	SP	Simulated patients
36	PM	Patient management problems
37	CHK	Checklists
38	OSCE	OSCE
39	OSPE	OSPE,
40	Mini-CEX	Mini-CEX
41	DOPS	DOPS
42	CWS	CWS
43	RS	Rating scales
44	RK	Record keeping
45	COM	Compilations
46	Portfolios	Portfolios
47	Log book	Log book
48	TR	Trainers report
49	SA	Self-assessment
50	PA	Peer assessment
51	360D	360-degree evaluation
52	TT-Theory	Theory
53	PP-Practical	Practical
54	VV-Viva	Viva



## Domain

S.No	Short form	Discription
1	CK	Cognitive/Knowledge
2	CC	Cognitive/Comprehension
3	CAP	Cognitive/Application
4	CAN	Cognitive/Analysis
5	CS	Cognitive/Synthesis
6	CE	Cognitive/Evaluation
7	PSY-SET	Psychomotor/Set
8	PSY-GUD	Psychomotor/Guided response
9	PSY-MEC	Psychomotor/Mechanism
10	PSY-ADT	Psychomotor Adaptation
11	PSY-ORG	Psychomotor/Origination
12	AFT-REC	Affective/ Receiving
13	AFT-RES	Affective/Responding
14	AFT-VAL	Affective/Valuing
15	AFT-SET	Affective/Organization
16	AFT-CHR	Affective/ characterization

## T L method

S.No	Short form	Discription
1	L	Lecture
2	L&PPT	Lecture with Power point presentation
3	L&GD	Lecture & Group Discussion
4	L_VC	Lecture with Video clips
5	DIS	Discussions
6	BS	Brainstorming
7	IBL	Inquiry-Based Learning
8	PBL	PBL
9	CBL	CBL
10	PrBL	Project-Based Learning
11	TBL	TBL
12	TPW	Team project work
13	FC	Flipped classroom
14	BL	Blended Learning
15	EDU	Edutainment
16	ML	Mobile learning
17	ECE	ECE
18	SIM	Simulation
19	RP	Role plays
20	SDL	Self-directed learning
21	PSM	Problem solving method
22	KL	Kinesthetic Learning
23	W	Workshops
24	GBL	Game-Based Learning
25	D-M	Demo on Model

26	LS	Library Session
27	PL	Peer learning
28	RLE	Real life experience
29	REC	Recitation
30	SY	Symposium
31	TUT	Tutorial
32	PER	Presentations
33	PT	Practical
34	XRy	X ray identification
35	CD	Case diagnosis
36	LRI	Lab report interpretation
37	DA	Drug analysis
38	D	Demonstration
39	D_BED	Demonstration bedside
40	D_L	Demonstration Lab
41	DG	Demonstration Garden
42	FV	Field visit
43	PRA	Practical
44	VIVA	Viva
45	TH	Theory

॥ आयुषे सर्वलोकानाम् ॥



**Course curriculum for Second Professional BAMS**

**(PRESCRIBED BY NCISM)**

# **Roga Nidan evam Vikriti Vigyan**

**(SUBJECT CODE : AyUG-RN)**

**(Applicable from 2021-22 batch, from the academic year 2023-24 onwards for 5 years or until further notification by NCISM, whichever is earlier)**

**BOARD OF AYURVEDA**

**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE NEW**

**DELHI-110058**

## II Professional Ayurvedacharya (BAMS)

**Subject Code : AyUG-RN**

### Summary

Total number of Teaching hours: 450			
Lecture hours(LH)-Theory		150	150(LH)
Paper I	60		
Paper II	90		
Non Lecture hours(NLH)-Theory		300	300(NLH)
Paper I & II	90		
Non Lecture hours(NLH)-Practical			
Paper I & II	210		

Examination (Papers & Mark Distribution)					
Item	Theory Component Marks	Practical Component Marks			
		Practical	Viva	Elective	IA
Paper I	100	100	70	-	30
Paper II	100				
Sub-Total	200	200			
Total marks	400				

**Important Note:-**The User Manual II BAMS is a valuable resource that provides comprehensive details about the curriculum file. It will help you understand and implement the curriculum. Please read the User Manual II before reading this curriculum file. The curriculum file has been thoroughly reviewed and verified for accuracy. However, if you find any discrepancies, please note that the contents related to the MSE should be considered authentic.

In case of difficulty and questions regarding curriculum write to [cur.imp@ncismindia.org](mailto:cur.imp@ncismindia.org)

## **PREFACE**

Roganidan Evum Vikriti Vigyan is a subject that gives emphasis on Ayurveda and contemporary Diagnostics and Pathology. It is a key subject that trains the students to apply knowledge of fundamental principles of Ayurveda to practice by understanding diseases, patient interaction, drawing diagnosis, and prognosis. This is a strong base to frame an appropriate treatment protocol.

The curriculum is framed with a vision for developing the diagnostic knowledge and skills of a student abiding by a patient-centric education. Activity-based training has been inculcated throughout the curriculum to improve the dexterity of a student in handling real-life scenarios in the journey of reaching a diagnosis. The anatomy and physiology learned in an apparently healthy individual from the first professional year is continued in the second professional year with knowledge regarding morbid reflections in the mind and body through this subject.

The sequence of knitting the points in theory and practical are carefully executed to maintain rationality and continuity in learning from a clinical perspective. The basic principles of Vikriti vigyan and their application in Roga nidana, Vyadhi vigyana and clinical diagnostics supported by contemporary diagnostics are the core areas of the curriculum. The essential areas from contemporary pathology and diagnostics are included with the objective to receive interdisciplinary integrated teaching. Some of the topics are defined for horizontal & vertical integration for better understanding.

Innovative teaching learning and assessment methods are introduced. These will develop an interest in students, making the curriculum student and patient-centric and will help to develop competencies, skills, attitudes, and communication as these are indispensable components of the learning process in Health care/ Medicine.

In addition to classroom teaching-learning, the dedicated time has been allotted to clinical activities, self-directed learning, group learning, survey to identify specific illnesses, CBL, and PBL, which are aligned with traditional and innovative formative assessments and scientific writings; ultimately expecting the improved performance of the students in summative assessments and as a successful practitioner in future by implementing Competency-Based Medical Education. The subject will be definitely helpful to the students to create a justifiable diagnosis for future treatment plans which is the basic need for successful practice.

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**Course Code and Name of Course**

<b>Course code</b>	<b>Name of Course</b>
AyUG-RN	Roga Nidan evam Vikriti Vigyan

**Table 1- Course learning outcomes and matched PO**

<b>SR1 CO No</b>	<b>A1 Course learning Outcomes (CO) AyUG-RN At the end of the course AyUG-RN, the students should be able to-</b>	<b>B1 Course learning Outcomes matched with program learning outcomes.</b>
CO1	Identify the morbidities in accordance with principles of Ayurveda pathology (vikriti vigyan siddhanta)	PO1
CO2	Describe the basic, general, and systemic pathological process thereby applying it in reaching a diagnosis	PO2,PO3
CO3	Perform appropriate clinical examination (pareeksha) utilizing Ayurveda and contemporary principles (samakalina siddhanta)	PO2,PO3,PO4
CO4	Order and interpret various diagnostic laboratory investigations and imaging	PO2,PO3
CO5	Diagnose and present the case with clinical reasoning (naidanika tarka)	PO5
CO6	Follow and advise advancements in diagnosis (vyadhi vinischaya) and prognosis (sadhya asadhyata) in clinical practice (naidanika adhyayana)	PO7
CO7	Communicate effectively with the patient (rugna), relatives (bandhujan) and other stakeholders (anya hita dhaarak)	PO8
CO8	Demonstrate ethics (sadvritta), compassion (karuna) and possess qualities of a clinician (vaidya guna)	PO6,PO9



**Table 2 : Contents of Course**

<b>Paper 1 Fundamental Principles of Vikriti Vigyan</b>					
<b>Sr. No</b>	<b>A2 List of Topics</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
1	<b>1. Roga nidana – Pathophysiology and clinical diagnosis</b>	1	43	1	0
2	<b>2. Pareeksha</b> Roga and Rogi Pareeksha	1		1	0
3	<b>3. Methods of Rogi pareeksha</b>	1		4	3
4	<b>4. Sapeksha nidana - Vyavacchedaka nidana</b> Sapeksha nidana - Vyavacchedaka nidana of Ukta/Anukta vyadhi: Methods of differential diagnosis	1		1	0
5	<b>5. Upashaya/ Anupashaya</b>	1		1	0
6	<b>6. Dosha Vikriti</b> A. Nidana (Vyadhi janaka hetu) B. Agni bheda and Vikriti C. Dosha Vriddhi, Kshaya and Dushta Karma, Ashyapakarsha, Avarana, Samsargaja, Sannipataja. D. Dosha swabhava - Nityasamshleshita (Leena) dosha and Paricchedita dosha E. Paridhavamana dosha	1		3	2
7	<b>7. Doshagati and Rogamarga</b>	1		1	0
8	<b>8. Srotodushti</b> Samanya sroto dusti nidana and lakshana	1		1	0
9	<b>9. Concept of Ama</b> A. Samanya nidana, and Samanya lakshana B. Bheda (Anna rasa. Mala sanchaya (Dhatwagni mandya janit). Dosha dushti)	1		2	0
10	<b>10. Assessment of Ama</b> Sama and nirama dosha lakshana, Pureesha lakshana	1		0	1
11	<b>11. Sthana samshraya – Poorvaroop</b>	1	49	1	0
12	<b>12. Dushya dushti</b> A. Dhatu and mala vriddhi kshaya lakshana B. Specific Sroto dusti lakshana in relation to Dosha, Upadhatu, Mala, Indriya, Avayava, and Mana dushti lakshana	1		9	9
13	<b>13. Samprapti</b> A. Samprapti bheda B. Vyadhi janma and Vyadhi janya	1		1	0

14	<b>14. Rupa</b> Pratyatma/ Samanya/ Vishishta Rupa	1		1	0
15	<b>15. Vyadhinamakarana</b>	1		1	1
16	<b>16. Vyadhi</b> A. Definition, B. Classification – Dwividha/ Trividha/ Chaturvidha/ Saptavidha (Adibala/ Sahaja - Genetic, Janmabala/ Garbhaja - Congenital, Dosha bala/ Jataja - Acquired, Sanghatabala/ Peedaja - Traumatic, Daivabala/ Prabhavaja - Iatrogenic, Kalabala/ Kalaja – Environmental and Geriatric, Swabhava balapravrutta), etc.	1		4	0
17	<b>17. Ashtanindita (Endocrine disorders)</b>	1		1	0
18	<b>18. Janapadodhwamsa vikara (Pandemic disorders)</b>	1		1	0
19	<b>19. Nidanarthakara Vyadhi, Vyadhisankara</b>	1		1	0
20	<b>20. Vyadhikshamatva</b> A. Vikaravighata Bhava & Abhava, SatmyaB. Ojus - Bheda – Two types and Four types C. Dosha Paka D. ImmunityE. Healing/repair	1		2	0
21	<b>21. Rogi bala Pareeksha</b>	1		2	1
22	<b>22. Dhatu Paka</b> A. Dhatu pakaB. Ojodusti lakshana C. Asatmya - Immune pathologyD. Cell Injury and Cellular adaptations E. Inflammation F. Haemodynamic disorders G. Neoplasia	1		12	1
23	<b>23. Infection and Nutritional disorders</b>	1	8	4	1
24	<b>24. Upadrava</b>	2		1	0
25	<b>25. Arishta</b>	2		1	0
26	<b>26. Vyadhi bala pareeksha</b>	2		1	0
27	<b>27. Sadhyasadhyatva – Prognosis</b>	2		1	0
28	<b>28. Digital health and Artificial intelligence in the context of Roganidana</b>	2		1	1

<b>Total Marks</b>	<b>100</b>	<b>60 hr</b>	<b>20 hr</b>
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<b>Paper 2 Vyadhi Vigyan, contemporary understanding and updates</b>					
<b>Sr. No</b>	<b>A2 List of Topics</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
29	<b>1. Agnimandya – Ajeerna, Anaha, Adhmana, Atopa</b>	2	43	1	0
30	<b>2. Chhardi</b>	2		1	0
31	<b>3. Amlapitta</b>	2		2	0
32	<b>4. Shoola</b> Parinama Shoola, Annadrava Shoola	2		1	0
33	<b>5. Atisara, and Pravahika</b>	2		3	1
34	<b>6. Grahani</b>	2		2	1
35	<b>7. Visuchika, Alasaka, Vilambika</b>	2		1	0
36	<b>8. Common GIT diseases</b> Ulcerative dyspepsia and Non-ulcerative dyspepsia, Irritable Bowel Syndrome, Inflammatory Bowel Diseases	2		1	4
37	<b>9. Mutrakrichhra</b>	2		2	1
38	<b>10. Mutraghata</b>	2		3	1
39	<b>11. Common Urinary diseases</b> Urinary Tract Infection, Prostatomegaly, Nephrotic syndrome, Nephritic syndrome, Acute Kidney Injury and Chronic Kidney Disease	2		1	6
40	<b>12. Hikka</b>	2		1	0
41	<b>13. Shwasa</b>	2		2	1
42	<b>14. Kasa</b>	2		2	0

43	<b>15. Rajayakshma &amp; Shosha</b>	2		3	0
44	<b>16. Common lung disorders</b> Pneumonia, Chronic Obstructive Pulmonary Disease, Pleural effusion, Bronchiectasis	2		1	4
45	<b>17. Jwara</b> Jwarabheda - Doshaja and Agantuja (Abhishanga jwara), Vishama Jwara, Punaravartaka Jwara, Jwara avastha - Ama, Pachyamana and Nirama Jwara	2		4	1
46	<b>18. Masurika – Romantika</b>	2		1	0
47	<b>19. Fever</b> A. General mechanism of Fever. B. Introduction to Eruptive fevers - Measles, Chicken pox, Rubella, Hand foot mouth disease, Herpes zoster C. Parasitic fevers – Filariasis, Malaria, D. Detailed description of Common infective fevers – Typhoid, Dengue, Influenza, Chikungunya, E. Common regional disorders presenting with fever	2		1	6
48	<b>20. Pandu</b>	2		2	0
49	<b>21. Raktapitta</b>	2	25	1	1
50	<b>22. Hematopoietic diseases</b> Anaemia, Nutritional anaemia, Thalassemia, Sickle cell Anaemia, Leukaemia, Thrombocytopenia	2		1	6
51	<b>23. Hridroga</b>	2		1	1
52	<b>24. Shotha</b>	2		2	0
53	<b>25. Cardiovascular disorders</b> Coronary Artery Disease (Ischemic Heart Disease, and Myocardial Infarction) and Congestive cardiac failure	2		1	5
54	<b>26. Kamala</b>	2		2	0
55	<b>27. Udara Roga</b>	2		2	1
56	<b>28. Hepatobiliary diseases</b> Liver cirrhosis, Alcoholic and Non - Alcoholic Liver Disease, Hepatitis, Jaundice and Ascites	2		1	2
57	<b>29. Kushtha - Maha Kushtha &amp; Kshudra Kushtha</b>	3		3	1

	(According to Charaka)			
58	<b>30. Sheetapitta</b>	3		1 0
59	<b>31. Shwitra</b>	3		1 0
60	<b>32. Visarpa</b>	3		2 0
61	<b>33. Skin diseases</b> Allergic disorders - Eczema, Urticaria; Squamous lesions - Psoriasis, Lichen planus; Bullous lesion – Pemphigus and Pemphigoid; Mycotic skin diseases; Leprosy; Vitiligo; Cellulitis	3		1 6
62	<b>34. Galaganda</b>	3		1 0
63	<b>35. Thyroid disorders</b> Hypothyroidism and hyperthyroidism	3		1 1
64	<b>36. Sthoulya – Karshya</b>	3	32	1 0
65	<b>37. Obesity</b>	3		1 1
66	<b>38. Prameha</b>	3		2 1
67	<b>39. Diabetes Mellitus and Pancreatitis</b>	3		1 1
68	<b>40. Vatavyadhi</b> Samanya nidana, Samanya purvarupa, Samanya lakshana	3		1 0
69	<b>41. Snayugata vata</b> Snayugata vata, Akshepaka – Apatanaka; Ardita, Pakshaghata, Kampavata, Gridhrasi, Vishwachi, Pangutwa	3		4 2
70	<b>42. Common neurologic and spine disorders</b> Common neurologic diseases: Parkinson’s disease, Stroke, Bell’s Palsy, Motor Neuron Disease, Transverse myelitis, Epilepsy (Organic). Common Spine disorders: Lumbago-Sciatica syndrome, Brachial neuralgia, Cervical and Lumbar Spondylosis	3		2 4
71	<b>43. Sandhigatavata and Asthi majja gata vata</b> Sandhigatavata, Katigraha, Manyasthambha, Vatakantaka, Avabahuka, Amsashosha	3		1 0
72	<b>44. Diseases of bone, joints, and muscles</b>	3		1 2

	Diseases of bone and Joints - Osteoarthritis, Osteoporosis. Frozen Shoulder, Calcaneal spur/ Plantar fasciitis, Tennis elbow, Carpel tunnel syndrome; Muscular diseases - Muscular Dystrophy				
73	<b>45. Amavata</b>	3	2	0	
74	<b>46. Vatarakta</b>	3	2	1	
75	<b>47. Immunological &amp; Metabolic disorders</b> Rheumatic fever, Rheumatoid arthritis, SLE, Ankylosing spondylitis, Gout	3	1	2	
76	<b>48. Klaibya &amp; Vandhyatva</b>	3	1	0	
77	<b>49. Sexual dysfunction and Infertility</b>	3	1	1	
78	<b>50. Unmada &amp; Apasmara</b>	3	3	0	
79	<b>51. Vishada</b>	3	1	0	
80	<b>52. Murchha, and Sanyasa</b>	3	1	0	
81	<b>53. Common Psychiatric diseases</b> Depression, Anxiety neurosis and Epilepsy (Non-organic)	3	1	0	
82	<b>54. Phiranga and Upadamsha</b>	3	1	0	
83	<b>55. Syphilis &amp; Gonorrhoea</b>	3	1	1	
84	<b>56. Krimiroga</b>	3	1	0	
85	<b>57. Clinical presentation of common parasitic disorders</b> Hook worm, Round worm, Thread worm, Pin worm	3	1	2	
86	<b>58. Khalitya &amp; Palitya</b>	3	1	0	
87	<b>59. Shleepada</b>	3	1	0	
88	<b>60. Tuberculosis</b>	3			
<b>Total Marks</b>			<b>100</b>	<b>90 hr</b>	<b>70 hr</b>

**Table 3: Learning objectives (Theory) of Course**

<b>Paper 1 Fundamental Principles of Vikriti Vigyan</b>									
<b>A3</b> Course outcome	<b>B3</b> Learning Objective (At the end of the session, the students should be able to)	<b>C3</b> Domain/sub	<b>D3</b> Must to know / desirable to know / Nice to know	<b>E3</b> Level Does/ Shows how/ Knows how/ Know	<b>F3</b> T-L method	<b>G3</b> Assessment (Refer abbreviations)	<b>H3</b> Formative/summative	<b>I3</b> Term	<b>J3</b> Integration
<b>Topic 1 1. Roga nidana – Pathophysiology and clinical diagnosis</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Explain the concept of Roganidana	CC	MK	KH	L&PPT	INT	F&S	I	
CO1	Explain the concept of pathophysiology and clinical diagnosis	CC	MK	KH	L&PPT	O-QZ	F&S	I	
<b>Topic 2 2. Pareeksha</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define and enlist types of pareeksha	CK	MK	K	L&PPT	INT,TT-Theory	F&S	I	
CO1	Describe importance of pareeksha	CC	MK	KH	L&PPT	DEB	F&S	I	
CO1	Explain the concept of rogi pareeksha	CC	MK	KH	L&PPT	INT	F&S	I	
CO1	Enlist rogi pareeksha	CK	MK	K	L&PPT	O-QZ,INT	F&S	I	

CO1	Describe importance of rogi pareeksha	CC	MK	KH	L&G D	DEB	F&S	I	
CO1	Explain the concept of roga pareeksha	CC	MK	KH	L&PP T	INT,TT- Theory	F&S	I	
CO1	Enlist roga pareeksha	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Describe importance of roga pareeksha	CC	MK	KH	L&G D	T-OBT,DEB	F&S	I	
CO1	Differentiate between rogi pareeksha and roga pareeksha	CC	MK	KH	L&G D	T-OBT,M- CHT	F&S	I	
<b>Topic 3 3. Methods of Rogi pareeksha</b> (Lecture :4 hours, Non lecture: 3 hours)									
CO1,CO3,CO 7,CO8	Describe Prashna Pareeksha, Chakshu indriyataha Pareeksha, Srotrendriyataha Pareeksha, Sparshanendriyataha Pareeksha, Ghranendriyataha Pareeksha, and Rasanendriyataha Pareeksha with its clinical interpretation	CC	MK	SH	L_VC	COM	F&S	I	
CO1,CO3	Describe the importance, clinical interpretation and methods of eliciting Nadi Pareeksha	CAN	MK	KH	L&G D,D_ BED	COM	F&S	I	
CO1	Describe the importance and clinical interpretation of Mutra Pareeksha	CC	MK	KH	L&G D	COM	F&S	I	
CO1	Describe the methods of performing Tailabindu Pareeksha	CC	MK	KH	L_VC	WP,COM	F&S	I	
CO1,CO3	Describe the importance & clinical interpretation of Mala Pareeksha, Jihwa Pareeksha, Shabda Pareeksha, Sparsha Pareeksha, Druk Pareeksha, Akriti Pareeksha	CAN	MK	KH	L&G D,SD L,D_ BED	COM	F&S	I	



<b>Topic 4 4. Sapeksha nidana - Vyavacchedaka nidana</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2,CO3,CO5	Describe the steps of Vyavacchedaka nidana of Ukta Vyadhi and Anukta vyadhi with suitable examples (Ayurveda and contemporary science incorporating clinical findings and investigations)	CE	MK	KH	L&G D,CB L	T-OBT,M- CHT	F&S	I	V-KC ,V-SH ,V-SH L,V- SP
CO5	Describe scope of developing screening, triage, confirmation, monitoring and prognostic tools in Ayurveda for Emerging diseases along with recent advancements	CC	DK	KH	L&PP T,IBL	INT	F&S	I	
<b>Topic 5 5. Upashaya/ Anupashaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define Upashaya and enlist synonyms of Upashaya	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Define Anupashaya and enlist synonyms of Anupashaya	CK	MK	K	L&PP T	INT,TT- Theory	F&S	I	
CO1	Enumerate and explain the eighteen types of Upashaya with relevant examples	CC	MK	KH	L&PP T	WP,INT	F&S	I	
<b>Topic 6 6. Dosha Vikriti</b> (Lecture :3 hours, Non lecture: 2 hours)									
CO1	Define Hetu	CK	MK	K	L&PP T	INT,TT- Theory	F&S	I	
CO1	Enlist and define synonyms of Hetu	CK	MK	K	L&PP T	QZ	F&S	I	
CO1	Enumerate and enlist classification of Nidana (Vyadhi janaka and Vyadhi bodhaka)	CK	MK	K	L&PP T	M-CHT	F&S	I	
CO1	Enumerate and describe types of Vyadhi Janaka Hetu	CC	MK	KH	L&PP	INT	F&S	I	

					T,RE C				
CO1,CO5	Correlate Vyadhi Janaka Hetu with contemporary examples	CE	MK	KH	CBL, PrBL	CL-PR	F&S	I	
CO1	Describe the Nidana of Agnidushti	CC	MK	KH	L&PP T,RE C	T-OBT	F&S	I	
CO1	Enumerate and explain the types and features of Agnidushti	CC	MK	KH	L&PP T	INT	F&S	I	
CO1	Correlate the Nidana of Agnidushti with contemporary examples	CE	MK	KH	L&G D	P-SUR	F&S	I	
CO3,CO8	Perform assessment of Agnidushti in patient	PSY- GUD	MK	SH	D_BE D	P-PRF	F&S	I	
CO1	Recite etiologies of Vata, Pitta and Kapha dushta karma	CK	MK	K	REC	P-REC	F&S	I	
CO1,CO5	Apply the knowledge of aetiologies of Vata, Pitta and Kapha dushta karma in correlating with contemporary etiologies	CAP	MK	KH	L&G D,PrB L,TP W	P-SUR	F&S	I	
CO1	Recite dushta karma, kshaya and vriddhi lakshana of Vata, Pitta and Kapha Dosha	CK	MK	K	REC	P-REC	F&S	I	
CO1	Explain Ashayapakarsha of Dosha with suitable examples	CC	MK	KH	L&G D	INT	F&S	I	
CO1	Define Avarana	CK	MK	K	L&PP T	QZ	F&S	I	
CO1	Enlist types of Avarana	CK	MK	K	L&PP	O-GAME	F&S	I	

					T				
CO1	Enlist the 63 combination of Dosha	CC	MK	KH	L&PP T	O-GAME	F&S	I	
CO1	Describe Samsargaja Dosha Dushti	CC	MK	KH	L&PP T	INT	F&S	I	
CO1	Describe Sama Sannipata and Vishama Sannipata dosha	CC	MK	KH	L&PP T	INT	F&S	I	
CO1	Enlist the different stages of Paridhavamana Dosha	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Explain Paridhavamana dosha with types and examples	CC	MK	KH	L&PP T	COM	F&S	I	
CO1	Explain Nityasamshleshita (Leena) dosha and Paricchedita dosha with examples	CC	MK	KH	L&PP T	INT	F&S	I	
<b>Topic 7 7. Doshagati and Rogamarga</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Enumerate and describe Doshagati and its utility in prognosis with relevant examples	CC	MK	KH	L&G D	INT	F&S	I	
CO1	Describe Urdhwa gati, Adho gati, Tiryaga gati, Vriddhi, Kshaya, Sthana, Koshta, Shakha, Sandhi asthi marma with illustrations and examples	CC	MK	KH	L&G D	COM	F&S	I	
CO1	Describe Koshta to Shakhagati of dosha and Shakha to Koshtagati of dosha with illustration	CC	MK	KH	L&G D	COM	F&S	I	
CO1	Enumerate and describe Rogamarga and its utility in prognosis with relevant examples	CC	MK	KH	L&G D	O-QZ	F&S	I	
<b>Topic 8 8. Srotodushti</b> (Lecture :1 hours, Non lecture: 0 hours)									

CO1	Define and enlist Srotas	CK	MK	K	L&PP T	O-QZ	F&S	I	
CO1	Describe the common aetiology for Sroto dushti	CC	MK	KH	L&G D	INT	F&S	I	
CO1	Explain features of Samanya Srotodushti with examples	CC	MK	KH	L&PP T	CL-PR	F&S	I	
<b>Topic 9 9. Concept of Ama</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1	Describe the different definitions of Ama	CC	MK	KH	L&PP T,RE C	P-REC,INT	F&S	I	
CO1	Enlist different types of Ama	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Correlate the different types of Ama with the current science	CE	MK	KH	BS,IB L	COM	F&S	I	
CO1	Describe samanya lakshana of Ama	CC	MK	KH	L&PP T	O-QZ	F&S	I	
CO1	Explain the concept of Ama with reference to Anna rasa, Mala sanchaya and Dosha dushti	CC	MK	KH	L&PP T	T-OBT,COM	F&S	I	
<b>Topic 10 10. Assessment of Ama</b> (Lecture :0 hours, Non lecture: 1 hours)									
CO1	Explain concept of Sama	CC	MK	KH	L&PP T	INT	F&S	I	
CO1	Describe specific features of Sama and Nirama Dosha and Pureesha	CC	MK	KH	L&PP T	O-GAME	F&S	I	
CO5	Identify specific features of Sama dosha, Sama pureesha, Nirama	PSY-	MK	SH	L,D_	P-PRF	F&S	I	

	dosha and Nirama pureesha in patient	GUD			BED				
<b>Topic 11 11. Sthana samshraya – Poorvaroopa</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define Sthansamshraya	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Define Poorvaroopa and enlist its types	CK	MK	K	L&PP T	QZ	F&S	I	
CO1	Describe the importance of Poorvaroopa	CC	MK	KH	L&G D	DEB	F&S	I	
CO1	Relate Sthanasamshraya with Poorvaroopa	CAP	MK	KH	L&G D	INT	F&S	I	
<b>Topic 12 12. Dushya dushti</b> (Lecture :9 hours, Non lecture: 9 hours)									
CO1	Enlist Dushya	CK	MK	K	L&PP T	QZ	F&S	I	
CO1	Describe specific features of Dhatu and Mala Vriddhi and Kshaya	CC	MK	KH	DIS	T-OBT	F&S	I	
CO1	Describe the specific etiologies of Pranavaha Sroto dushti and identify contemporary etiologies	CS	MK	SH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe features of Pranavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&PP T,RE C	P-REC,INT	F&S	I	
CO1	Describe Pranavaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	QZ	F&S	I	
CO1	Describe the specific etiologies of Udakavaha Sroto dushti and	CC	MK	KH	L&G	P-SUR	F&S	I	

	identify contemporary etiologies				D,PrB L				
CO1	Describe features of Udakavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&PP T	INT	F&S	I	
CO1	Describe Udakavaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	INT	F&S	I	
CO1	Describe the specific etiologies of Annavaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe features of Annavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe Annavaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	WP	F&S	I	
CO1	Describe the specific etiologies of Rasavaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE C	P-REC,INT	F&S	I	
CO1	Describe features of Rasavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&PP T,RE C	P-REC,INT	F&S	I	
CO1	Describe Rasavaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	QZ	F&S	I	
CO1	Describe the specific etiologies of Raktavaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE	P-REC,INT	F&S	I	

					C				
CO1	Describe features of Raktavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe Raktavaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	INT	F&S	I	
CO1	Describe the specific etiologies of Mamsavaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE C	P-REC,INT	F&S	I	
CO1	Describe features of Mamsavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe Mamsavaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	QZ	F&S	I	
CO1	Describe the specific etiologies of Medovaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE C	P-REC,INT	F&S	I	
CO1	Describe features of Medovaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe Medovaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	QZ	F&S	I	
CO1	Describe the specific etiologies of Asthivaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB	P-REC,P-SUR	F&S	I	

					L,RE C				
CO1	Describe features of Asthivaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe the specific etiologies of Majjavaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE C	P-REC,INT	F&S	I	
CO1	Describe features of Majjavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe the specific etiologies of Shukravaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE C	P-REC,INT	F&S	I	
CO1	Describe features of Shukravaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&PP T,RE C	P-REC,INT	F&S	I	
CO1	Describe Shukravaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	QZ	F&S	I	
CO1	Describe the specific etiologies of Mutravaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE C	P-REC,P-SUR	F&S	I	
CO1	Describe features of Mutravaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&G D,RE	P-REC,INT	F&S	I	



					C				
CO1	Describe Mutravaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	QZ	F&S	I	
CO1	Describe the specific etiologies of Pureeshavaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE C	P-REC,P-SUR	F&S	I	
CO1	Describe features of Pureeshavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe Pureeshavaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	QZ	F&S	I	
CO1	Describe the specific etiologies of Swedavaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE C	P-REC,P-SUR	F&S	I	
CO1	Describe features of Swedavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&G D,RE C	P-REC,INT	F&S	I	
CO1	Describe the specific etiologies of Artavavaha Sroto dushti and identify contemporary etiologies	CC	MK	KH	L&G D,PrB L,RE C	P-REC,P-SUR	F&S	I	
CO1	Describe features of Artavavaha Sroto Dushti in relation to Dosha Kopa	CC	MK	KH	L&PP T,RE C	P-REC,INT	F&S	I	

CO1	Describe Artavavaha Sroto Viddha Lakshana	CC	MK	KH	L&PP T	QZ	F&S	I	
CO1	Describe features of Upadhātu dushti, Mala dushti, Indriya dushti, and Manas dushti	CC	MK	KH	L&G D	INT	F&S	I	
CO1	Describe features of Avayava dusti with relevant examples	CC	MK	KH	L&PP T	INT	F&S	I	
CO5	Identify and interpret the specific Sroto Dushti in the patients	PSY- GUD	MK	SH	SDL	T-CS	F&S	I	
<b>Topic 13 13. Samprapti</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define Samprapti and enumerate synonyms	CK	MK	K	L&PP T	WP	F&S	I	
CO1	Enlist and describe types of Samprapti with examples	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Describe Vyadhi Janma and Vyadhi Janya Samprapti with examples	CC	MK	KH	L&PP T	INT	F&S	I	
<b>Topic 14 14. Rupa</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define, enlist and describe different types of Roopa	CC	MK	KH	L&PP T	INT	F&S	I	
CO1	Describe the importance of Roopa	CC	MK	KH	L&G D	DEB	F&S	I	
CO1	Define Pratyatma Lakshana with suitable examples	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Differentiate between Vyadhi and Lakshana.	CC	MK	KH	L&G D	INT	F&S	I	

<b>Topic 15 15. Vyadhinamakarana</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO1	Describe the basis of Vyadhi Namakarana with suitable examples	CK	MK	K	L	QZ	F&S	I	
CO6	Describe the importance of ICD, DSM and NAMASTE (National AYUSH Morbidity and Standardized Terminologies Electronic Portal) portal classification and terminology of diseases	CC	DK	KH	L&G D,D	INT	F&S	I	
CO6	Operate NAMASTE (National AYUSH Morbidity and Standardized Terminologies Electronic Portal) portal	PSY- GUD	DK	SH	D	P-PRF	F&S	I	
<b>Topic 16 16. Vyadhi</b> (Lecture :4 hours, Non lecture: 0 hours)									
CO1	Define & enlist synonyms of Vyadhi	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Enlist types of Vyadhi	CK	MK	K	L&PP T	INT	F&S	I	
CO1,CO2	Explain Adibala/ Sahaja and Hereditary disorders, Janmabala/ Garbhaja and Congenital disorders, Dosha bala/ Jataja and Acquired disorders, Sanghatabala/ Peedaja and Traumatic disorders, Daivabala/ Prabhavaja and Iatrogenic disorders, Kalabala/ Kalaja and Environmental and Geriatric disorders, Swabhava bhava vyadhi with suitable examples	CC	MK	KH	L&PP T	CL-PR	F&S	I	
<b>Topic 17 17. Ashtanindita (Endocrine disorders)</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Enlist and explain the Ashtanindita	CC	DK	KH	L&PP T	INT	F&S	I	
CO1	Describe the importance of Ashtanindita	CC	DK	KH	L&G D	DEB	F&S	I	
CO1,CO2	Correlate and describe the features of Hormonal/ Endocrinal	CE	DK	KH	L&G	COM	F&S	I	V-BL

	diseases (Pituitary disorders, Parathyroid disorders, Adrenal disorders etc.) with Ashtanindita				D,TP W				
<b>Topic 18 18. Janapadodhwamsa vikara (Pandemic disorders)</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe sadharana and asadharana hetu for Janapadodhwamsa Vikara and correlate with contemporary etiologies	CC	DK	KH	L&G D	DEB	F&S	I	V-KC ,H- SW
<b>Topic 19 19. Nidanarthakara Vyadhi, Vyadhisankara</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define and enlist types of Nidanarthakara Vyadhi with examples along with its concept	CC	DK	KH	L&G D	INT	F&S	I	
CO1	Explain the concept of Vyadhi Sankara with specific Nidana and relevant examples	CC	DK	KH	L&PP T	INT	F&S	I	
<b>Topic 20 20. Vyadhikshamatva</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1	Define Vyadhikshamatva	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Describe Trividha bala and relate to Balavruddhikara Bhava and Shareeravruddhikara Bhava	CC	MK	K	L&PP T	M-CHT	F&S	I	
CO1	Describe Vikara Vighata Bhava and Abhava along with its relation to Vyadhikshamatva	CC	MK	KH	DIS	INT	F&S	I	
CO1	Analyze Satmya in relation with health and disease	CAN	MK	KH	L&G D	INT	F&S	I	
CO1	Define and explain Dwividha and Chaturvidha Ojas	CK	MK	K	L&PP T	INT	F&S	I	
CO1	Describe Dosha Paka features with examples	CC	MK	KH	L&PP T	INT	F&S	I	

CO2	Describe pathophysiology of Healing with primary and secondary intention and Repair mechanism.	CC	MK	KH	L_VC	CL-PR	F&S	I	
CO1	Define Satmya and explain its types	CC	MK	KH	L&PP T	INT	F&S	I	
CO2	Define Immunity and describe classification of Immunity	CC	MK	KH	SDL	CL-PR	F&S	I	
CO2	Explain different mechanisms involved in Immunity	CC	MK	KH	SDL	CL-PR	F&S	I	
<b>Topic 21 21. Rogi bala Pareeksha</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1	Describe the importance of Rogi bala Pareeksha	CC	MK	KH	L&G D	DEB	F&S	I	
CO1,CO8	Describe the parameters of Rogi bala Pareeksha - Prakruti, Sara, Samhanana, Pramana, Satmya, Satwa, Aahara shakti, Vyayama shakti, Vaya and other factors such as Aushadha kshama dehatva, Yuvajatva, Pumjatvam, Vishayanasakta indriyajatva, Padasampad bhavatvam, and Anukoola grahatva, etc.	CC	MK	KH	L&PP T	INT	F&S	I	
<b>Topic 22 22. Dhatu Paka</b> (Lecture :12 hours, Non lecture: 1 hours)									
CO1	Describe Dhatupaka features with examples	CC	MK	KH	L&PP T	INT	F&S	I	
CO1	Describe different stages of Ojo dusti	CK	MK	K	L&PP T	INT	F&S	I	
CO2	Define Asatmya	CK	MK	K	L&PP T	O-QZ	F&S	I	
CO2	Define Hypersensitivity	CK	MK	K	L&PP T	QZ	F&S	I	
CO2	Describe four types of Hypersensitivity with suitable examples	CC	MK	KH	L_VC	CL-PR	F&S	I	

CO2	Define Autoimmunity	CK	MK	K	L&PP T	O-QZ	F&S	I	
CO2	Describe mechanism and classification of Autoimmunity with suitable examples	CC	MK	KH	L_VC	CL-PR	F&S	I	
CO2	Define Immunodeficiency.	CK	MK	K	L&PP T	CL-PR	F&S	I	
CO2	Describe classification of Immunodeficiency with suitable examples.	CC	MK	KH	L&PP T	M-CHT	F&S	I	
CO2	Define Cell Injury	CK	MK	K	L&PP T	QZ	F&S	I	
CO2	Describe causes and mechanism of Reversible and Irreversible Cell Injury with microscopic and macroscopic features.	CC	MK	KH	L_VC	CL-PR	F&S	I	
CO2	Define Cellular Adaptation	CK	MK	K	L&PP T	QZ	F&S	I	
CO2	Describe types and mechanisms of Cellular Adaptations with suitable examples.	CC	MK	KH	L_VC	CL-PR	F&S	I	
CO2	Describe and discuss types of Cell Death (including apoptosis) and the mechanism with suitable examples.	CC	MK	KH	L_VC	CL-PR	F&S	I	
CO2	Define, classify and describe mechanism of Inflammation, Septicaemia, Oedema, Shock, Haemorrhage, Thrombosis, Embolism, Ischemia and Infarction	CC	MK	KH	L_VC	CL-PR	F&S	I	
CO2	Define and describe Tumors	CC	MK	KH	L&PP T	CL-PR	F&S	I	
CO2	Describe nomenclature of Tumors	CC	MK	KH	L&PP T,SD	CL-PR	F&S	I	

					L				
CO2	Differentiate Benign and Malignant Tumours	CC	MK	KH	L&G D	M-CHT	F&S	I	
CO2	Describe mechanism of Metastasis	CC	MK	KH	L&PP T	CL-PR	F&S	I	
<b>Topic 23 23. Infection and Nutritional disorders</b> (Lecture :4 hours, Non lecture: 1 hours)									
CO2	Define and classify Viruses, Bacteria, and Fungi	CC	DK	KH	L&PP T,SD L	COM	F&S	I	
CO2	Describe components of Nutrition, and classify nutritional disorders	CC	DK	KH	PER	QZ	F&S	I	H-SW
CO2	Describe Macro nutritional disorders, Water soluble vitamins deficiency disorders and Fat soluble vitamins deficiency disorders	CC	DK	KH	PER	QZ	F&S	I	V-KC ,H- SW
CO2	Describe Protein Energy Malnutrition in adults and differentiate Kwashiorkor and Marasmus	CC	DK	KH	PER	QZ	F&S	I	V-KC ,V-BL
<b>Topic 24 24. Upadrava</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define and explain the concept and importance of Upadrava	CC	MK	KH	L&G D	DEB	F&S	II	
<b>Topic 25 25. Arishta</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define Arishta and Ristaabhasa	CK	NK	K	L&PP T	INT	F&S	II	
CO1	Enumerate and describe types of Arishta with its importance	CC	NK	KH	L&G D	DEB	F&S	II	

<b>Topic 26 26. Vyadhi bala pareeksha</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe Vikrititaha Pareeksha with its importance	CC	DK	KH	L&G D	DEB	F&S	II	
CO1	Describe the parameters to be assessed for Vyadhi bala - Exposure to Nidana, Samprapti, Poorvaroop, Roopa, Upadrava, Tulya dosha - dushyatvam, Atulya ritu, Number of dosha involved, Number of Rogamarga involved, Kala, Desha, Prakruti, Involvement of Marma and other factors	CC	DK	KH	L&G D	DEB	F&S	II	
<b>Topic 27 27. Sadhyasadhyatva – Prognosis</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Enumerate and describe the features of sadhyasadhyatva	CC	MK	KH	L&PP T	INT	F&S	II	
CO1	Analyse the components of Vyadhi from Sadhyasadhyatva	CAN	MK	KH	L&G D	INT	F&S	II	
<b>Topic 28 28. Digital health and Artificial intelligence in the context of Roganidana</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO6	Define and describe the scope of Digital health and Artificial intelligence in Ayurveda Diagnosis and Prognosis	CC	NK	KH	BL	COM	F&S	II	
CO6	Explain need of Instrumentation and Biosensors for diagnosis and prognosis in Ayurveda.	CC	NK	KH	BL	INT	F&S	II	
CO6	Justify scope of Diagnostic tool development in Ayurveda and their implementation.	CE	NK	KH	BL	INT	F&S	II	

<b>Paper 2 Vyadhi Vigyan, contemporary understanding and updates</b>									
<b>A3</b> Course	<b>B3</b> Learning Objective (At the end of the session, the students	<b>C3</b> Doma	<b>D3</b> Must to know	<b>E3</b> Level	<b>F3</b> T-L	<b>G3</b> Assessment	<b>H3</b> Form	<b>I3</b> Term	<b>J3</b> Integr



outcome	should be able to)	in/sub	/ desirable to know / Nice to know	Does/ Shows how/ Knows how/ Know	method	(Refer abbreviations)	ative/ summative		ation
<b>Topic 1 1. Agnimandya – Ajeerna, Anaha, Adhmana, Atopa</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define Anaha	CK	MK	K	L&P T	QZ	F&S	II	
CO1	Enlist types of Anaha	CK	MK	K	L&P T	QZ	F&S	II	
CO1,CO5	Describe Adhmana and Atopa	CC	MK	KH	L&P T	INT	F&S	II	
<b>Topic 2 2. Chhardi</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define Chhardi	CK	DK	K	L&P T	QZ	F&S	II	
CO1	Describe hetu and samprapti of Chhardi.	CC	DK	KH	L&G D	INT	F&S	II	
CO1	Enlist bheda of Chhardi	CK	DK	K	L&P T	QZ	F&S	II	
CO1	Describe purvaroop, samanya lakshana, vishishta lakshana, upadrava and sadhya asadhyata of Chhardi	CC	DK	KH	L&P T	INT	F&S	II	
<b>Topic 3 3. Amlapitta</b> (Lecture :2 hours, Non lecture: 0 hours)									

CO1	Define Amlapitta	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Describe hetu and samprapti of Amlapitta	CC	MK	KH	L&G D	M-CHT	F&S	II	
CO1	Enlist bheda of Amlapitta	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Describe purvaroop, samanya lakshana, vishishta lakshana, and sadhya asadhyata of Amlapitta	CC	MK	KH	L&PP T	INT	F&S	II	
<b>Topic 4 4. Shoola</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define Shoola	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Enlist Shoola bheda	CK	MK	K	L&PP T	QZ	F&S	II	
CO1,CO5	Describe and differentiate Parinama shoola and Annadrava shoola	CC	MK	KH	L&PP T	INT	F&S	II	
<b>Topic 5 5. Atisara, and Pravahika</b> (Lecture :3 hours, Non lecture: 1 hours)									
CO1	Describe pratyatma lakshana of Atisara	CC	MK	KH	L&PP T	QZ	F&S	II	
CO1	Describe hetu and samprapti of Atisara	CC	MK	KH	L&G D	INT	F&S	II	
CO1	Enlist bheda of Atisara	CK	MK	KH	L&PP T	QZ	F&S	II	
CO1	Describe purvaroop of Atisara	CC	MK	KH	L&PP T,CB	INT	F&S	II	

					L				
CO1	Enlist and describe upadrava of Atisara	CK	MK	K	L&PP T	INT	F&S	II	
CO1	Describe sadhya asadhyata of Atisara	CC	MK	KH	L&PP T	T-CS,INT	F&S	II	
CO1	Describe nivrutta Atisara lakshana or vigata Atisara lakshana	CC	MK	KH	L&PP T	INT	F&S	II	
CO1	Describe samprapti of Pravahika	CC	MK	KH	L&G D	M-CHT	F&S	II	
CO1	Enlist bheda of Pravahika	CK	MK	KH	L&PP T	QZ	F&S	II	
CO1	Describe samanya and vishishta lakshana of Pravahika	CC	MK	KH	L&PP T,CB L	T-CS	F&S	II	
CO1	Differentiate between Atisara and Pravahika	CC	MK	KH	L&G D,PB L	CL-PR	F&S	II	
CO1	Differentiate Doshaja Atisara	CC	MK	KH	L&G D,PB L	CL-PR	F&S	II	
CO1	Explain Bhayaja atisara, Shokaja atisara and Raktaja atisara lakshana	CC	MK	KH	L&G D,PB L	CL-PR	F&S	II	
<b>Topic 6 6. Grahani</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1	Describe pratyatma lakshana of Grahani	CC	MK	KH	L&PP	PUZ	F&S	II	

					T				
CO1	Describe hetu and samprapti of Grahani	CC	MK	KH	L&G D	M-CHT	F&S	II	
CO1	Enlist bheda of Grahani	CK	MK	KH	L&PP T	QZ	F&S	II	
CO1	Describe purvaroop, and samanya lakshana of Grahani	CC	MK	KH	L&PP T	T-CS,INT	F&S	II	
CO1	Explain Sangraha grahani and Ghati yantra grahani	CC	MK	KH	L&PP T,CB L	INT	F&S	II	
CO1	Explain sadhya asadhyata of Grahani	CC	MK	KH	L&PP T	T-CS,INT	F&S	II	
CO1	Differentiate Atisara and Grahani Roga	CC	MK	KH	L&G D,PB L	T-CS	F&S	II	
CO1	Differentiate Grahani dosha and Grahani roga	CC	MK	KH	L&G D,PB L	T-CS,CL-PR	F&S	II	
CO1	Differentiate Doshaja Grahani	CC	MK	KH	L&G D,PB L	CL-PR	F&S	II	
<b>Topic 7 7. Visuchika, Alasaka, Vilambika</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Define Visuchika	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Describe lakshana, upadrava, and sadhyasadhyata of Visuchika ,	CC	MK	KH	L&PP	INT	F&S	II	

	Alasaka and Vilambika				T				
<b>Topic 8 8. Common GIT diseases</b> (Lecture :1 hours, Non lecture: 4 hours)									
CO2	Describe the clinical features of Ulcerative dyspepsia and Non-ulcerative dyspepsia, Irritable Bowel Syndrome, and Inflammatory Bowel Diseases	CC	DK	KH	RP,T UT	INT	F&S	II	
CO3	Perform relevant clinical examination of Ulcerative dyspepsia and Non-ulcerative dyspepsia, Irritable Bowel Syndrome, and Inflammatory Bowel Diseases	PSY-GUD	DK	SH	L_VC	OSCE	F&S	II	
CO4	Order and interpret relevant investigations of Ulcerative dyspepsia and Non-ulcerative dyspepsia, Irritable Bowel Syndrome, and Inflammatory Bowel Diseases	CAP	DK	SH	L&G D,LRI ,D_L	T-CS	F&S	II	
<b>Topic 9 9. Mutrakrichhra</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1	Explain pratyatma lakshana of Mutrakrichhra	CC	MK	KH	L&PP T	PUZ	F&S	II	
CO1	Describe hetu and samprapti of Mutrakrichhra	CC	MK	KH	L&G D	INT	F&S	II	
CO1	Enlist bheda of Mutrakrichhra	CK	MK	KH	L&PP T	QZ	F&S	II	
CO1,CO5	Describe vishishta lakshana of Mutrakrichhra	CC	MK	KH	L&PP T,CB L	INT	F&S	II	
<b>Topic 10 10. Mutraghata</b> (Lecture :3 hours, Non lecture: 1 hours)									
CO1	Define Mutraghata	CK	MK	K	L&PP T	QZ	F&S	II	

CO1	Enlist conditions of Mutra shoshana and Mutra pratihanyate among different types of Mutraghata	CK	MK	K	L&G D	INT	F&S	II	
CO1	Describe different types of Mutraghata	CC	MK	KH	L&PP T,PB L	INT	F&S	II	
CO1	Differentiate Mutrakrichra and Mutraghata	CC	MK	KH	L&G D,PB L	T-CS	F&S	II	
<b>Topic 11 11. Common Urinary diseases</b> (Lecture :1 hours, Non lecture: 6 hours)									
CO2	Describe the clinical features of Urinary Tract Infection, Prostatomegaly, Nephrotic syndrome, Nephritic syndrome, Acute Kidney Injury and Chronic Kidney Disease	CC	DK	KH	L&G D,RP	T-CS	F&S	II	
CO3	Perform relevant clinical examination of Urinary Tract Infection, Prostatomegaly, Nephrotic syndrome, Nephritic syndrome, Acute Kidney Injury and Chronic Kidney Disease	PSY- GUD	DK	SH	L_VC	T-CS	F&S	II	
CO4	Order and interpret relevant investigations of Urinary Tract Infection, Prostatomegaly, Nephrotic syndrome, Nephritic syndrome, Acute Kidney Injury and Chronic Kidney Disease	CAP	DK	SH	L&G D,LRI	T-CS	F&S	II	
<b>Topic 12 12. Hikka</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe pratyatma lakshana, hetu, and samprapti of Hikka	CC	NK	KH	L&PP T	PUZ	F&S	II	
CO1	Describe cardinal features of Pancha Hikka	CC	NK	KH	L&PP T	INT	F&S	II	
<b>Topic 13 13. Shwasa</b> (Lecture :2 hours, Non lecture: 1 hours)									

CO1	Define Shwasa	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Describe hetu and samanya samprapti of Shwasa	CC	MK	KH	L&G D	T-CS	F&S	II	
CO1	Enlist bheda of Shwasa	CK	MK	K	L&PP T	P-VIVA,QZ	F&S	II	
CO1	Describe purvaroop, and sadhya asadhyata of Shwasa	CC	MK	KH	L&PP T	T-CS	F&S	II	
CO1	Describe vishishta lakshana of Tamaka shwasa with its avastha bheda	CC	MK	KH	L&PP T	T-CS	F&S	II	
CO1	Describe dosha predominance in Shwasa	CC	MK	KH	DIS	INT	F&S	II	
CO1	Identify cardinal features of Pancha shwasa and correlate with the current science	CAN	MK	KH	L&PP T	INT	F&S	II	
CO1	Differentiate Pancha shwasa	CC	MK	KH	PBL	CL-PR	F&S	II	

**Topic 14 14. Kasa** (Lecture :2 hours, Non lecture: 0 hours)

CO1	Define Kasa	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Describe hetu and samprapti of Kasa	CC	MK	KH	L&G D	INT	F&S	II	
CO1	Enlist bheda of Kasa	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Describe purvaroop and sadhya asadhyata of Kasa	CC	MK	KH	L&PP T	T-CS	F&S	II	
CO1	Describe the differential diagnosis of Kasa based on kapha	CC	MK	KH	L&PP	T-CS	F&S	II	

	lakshana				T				
CO1	Describe the differential diagnosis of Kshayaja kasa and Rajayakshma	CC	MK	KH	L&G D	T-CS	F&S	II	
CO1	Describe the differential diagnosis of Kshataja kasa and kshata ksheena	CC	MK	KH	L&G D	T-CS	F&S	II	
CO1	Differentiate Doshaja kasa	CC	MK	KH	DIS	INT	F&S	II	
<b>Topic 15 15. Rajayakshma &amp; Shosha</b> (Lecture :3 hours, Non lecture: 0 hours)									
CO1	Describe Rajayakshma vyadhi swabhava	CC	DK	KH	L&PP T	INT	F&S	II	
CO1	Describe hetu and samprapti of Rajayakshma	CC	DK	KH	L&G D	M-CHT	F&S	II	
CO1	Enlist bheda of Rajayakshma	CK	DK	K	L&PP T	QZ	F&S	II	
CO1	Explain tri roopa, shad roopa, ekadasha roopa, and sadhyasadhyata of Rajayakshma	CC	DK	KH	L&PP T	INT	F&S	II	
CO1	Classify and describe Ashta shosha	CC	DK	KH	L&PP T	INT	F&S	II	
<b>Topic 16 16. Common lung disorders</b> (Lecture :1 hours, Non lecture: 4 hours)									
CO2	Describe the clinical features of Pneumonia, Chronic Obstructive Pulmonary Disease, Pleural effusion, and Bronchiectasis	CC	DK	KH	L_VC ,RP,D _BED	INT	F&S	II	
CO3	Perform relevant clinical examination of Pneumonia, Chronic Obstructive Pulmonary Disease, Pleural effusion, and Bronchiectasis	PSY- GUD	DK	SH	L_VC	OSCE	F&S	II	



CO4	Order and interpret relevant investigations of Pneumonia, Chronic Obstructive Pulmonary Disease, Pleural effusion, and Bronchiectasis	CAP	DK	KH	XRy, LRI	T-CS	F&S	II	
<b>Topic 17 17. Jwara</b> (Lecture :4 hours, Non lecture: 1 hours)									
CO1	Define and enlist types of Jwara based on vidhi samprapti	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Describe nidana, samprapti, samanya poorvaroopo, vishishta poorvaroopo, pratyatma lakshana and samprapti of Doshaja jwara	CC	MK	KH	L&G D	PUZ,INT	F&S	II	
CO1	Describe Doshaja jwara along with sannipataja jwara according to Charaka	CC	MK	KH	L&G D	PUZ,INT	F&S	II	
CO1	Describe Abhishanga jwara, Vishama jwara, and Punaravartaka jwara	CC	MK	KH	L&PP T	T-CS	F&S	II	
CO1	Explain Antarvega, Bhahirvega jwara, Vata balasaka and Pralapaka jwara	CC	MK	KH	L&PP T	INT	F&S	II	
CO1	Differentiate Ama, Pachyamana and Nirama jwara lakshana	CC	MK	KH	L&G D	CL-PR	F&S	II	
CO1	Analyze Agantu and Doshaja jawara with reference to Jwara samprapti	CAN	MK	KH	DIS	INT	F&S	II	
CO1	Describe sadhyasadhyata of Jwara	CC	MK	KH	L&PP T	INT	F&S	II	
CO1	Enlist Jwara mukta lakshana	CK	MK	K	L&PP T	QZ	F&S	II	
<b>Topic 18 18. Masurika – Romantika</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Enlist nidana of Masurika	CK	NK	K	L&PP	QZ	F&S	II	

					T				
CO1	Describe samprapti of Masurika	CC	NK	KH	L&G D	INT	F&S	II	
CO1	Enlist bheda of Masurika	CC	NK	KH	L&PP T	QZ	F&S	II	
CO1	Explain the avasthika lakshana of Masurika	CC	NK	KH	L&PP T	INT	F&S	II	
CO1	Enlist features of Romantika	CK	NK	K	L&PP T	QZ	F&S	II	
<b>Topic 19 19. Fever</b> (Lecture :1 hours, Non lecture: 6 hours)									
CO2	Describe the organism, incubation period, and mode of transmission of Measles virus, Varicella-zoster virus and Herpes zoster, Coxsackie virus, Rubella virus, various Malaria parasites, Influenza virus, Dengue virus, Leptospira, Chikungunya virus, Salmonella and causative agents of other common regional disorders presenting with fever	CC	DK	KH	L_VC ,FC	WP,INT	F&S	II	
CO2	Describe the clinical features of Measles, Chicken pox and Herpes zoster, Hand foot mouth disease, Rubella, Malaria, Filariasis, Influenza, Dengue, Leptospirosis, Chikungunya, and Typhoid	CC	DK	KH	L_VC ,RP	T-CS	F&S	II	
CO2	Describe the common regional disorders presenting with fever	CC	DK	KH	L&G D	T-CS	F&S	II	
CO2	Describe the complications of Measles, Chicken pox and Herpes zoster, Hand foot mouth disease, Rubella, Malaria, Filariasis, Influenza, Dengue, Leptospirosis, Chikungunya, Typhoid, and other common regional disorders presenting with fever	CC	DK	KH	TUT	INT	F&S	II	

CO3	Perform relevant clinical examination related to Measles, Chicken pox and Herpes zoster, Hand foot mouth disease, Rubella, Malaria, Filariasis, Influenza, Dengue, Leptospirosis, Chikungunya, Typhoid, and other common regional disorders presenting with fever	PSY-GUD	DK	SH	L_VC	OSCE	F&S	II	
CO4	Order and interpret relevant investigations related to Measles, Chicken pox and Herpes zoster, Hand foot mouth disease, Rubella, Malaria, Filariasis, Influenza, Dengue, Leptospirosis, Chikungunya, Typhoid, and other common regional disorders presenting with fever	CAP	DK	SH	LRI	T-CS	F&S	II	
<b>Topic 20 20. Pandu</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1	Describe pratyatma lakshana of Pandu	CC	MK	KH	L&PP T	PUZ	F&S	II	
CO1	Describe hetu and samprapti of Pandu	CC	MK	KH	L&PP T	INT	F&S	II	
CO1	Enlist bheda of Pandu	CC	MK	KH	L&PP T	QZ	F&S	II	
CO1	Describe purvaroop of Pandu	CC	MK	KH	L&PP T	INT	F&S	II	
CO1	Enlist upadrava of Pandu	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Describe sadhya asadhyata of Pandu	CC	MK	KH	L&PP T	INT	F&S	II	
CO1	Explain Pancha pandu	CC	MK	KH	L&PP T	T-CS	F&S	II	

CO1	Differentiate Doshaja pandu	CC	MK	KH	L&G D	CL-PR	F&S	II	
<b>Topic 21 21. Raktapitta</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO1	Define Raktapitta and mention the rakta pravrutti marga	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Explain the swabhava of Raktapitta	CC	MK	KH	DIS	INT	F&S	II	
CO1	Enlist bheda of Raktapitta	CK	MK	KH	L&PP T	QZ	F&S	II	
CO1	Describe nidana, samprapti, purvaroop, vishishta lakshana of Raktapitta	CC	MK	KH	L&G D	T-CS	F&S	II	
CO1	Enlist upadrava of Raktapitta	CK	MK	KH	L&PP T	PUZ	F&S	II	
CO1	Describe sadhya asadyata of Raktapitta	CC	MK	KH	DIS	INT	F&S	II	
<b>Topic 22 22. Hematopoietic diseases</b> (Lecture :1 hours, Non lecture: 6 hours)									
CO2	Describe the clinical features of anaemia, nutritional anaemia, thalassemia, sickle cell anaemia, leukaemia, and thrombocytopenia	CC	DK	KH	L_VC ,RP	WP	F&S	II	
CO4	Order and interpret relevant investigations of anaemia, nutritional anaemia, thalassemia, sickle cell anaemia, leukaemia, and thrombocytopenia	CAP	DK	KH	L&G D,LRI	T-CS	F&S	II	
CO2	Describe the differential diagnosis of anaemia, nutritional anaemia, thalassemia, sickle cell anaemia, leukaemia, and thrombocytopenia	CC	DK	KH	L&G D,PB L	PRN	F&S	II	
<b>Topic 23 23. Hridroga</b> (Lecture :1 hours, Non lecture: 1 hours)									

CO1	Describe hetu and samprapti of Hridroga	CC	DK	KH	L&G D	QZ	F&S	II	
CO1	Enlist bheda of Hridroga	CK	DK	KH	L&PP T	PUZ	F&S	II	
CO1	Analyze samanya lakshana of Hridroga	CAN	DK	KH	DIS	T-CS	F&S	II	
CO1	Describe vishishta lakshana of Hridroga	CC	DK	KH	L&PP T	INT	F&S	II	
CO1	Enlist upadrava of Hridroga	CK	DK	KH	L&PP T	WP	F&S	II	
<b>Topic 24 24. Shotha</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1	Describe hetu of Shotha	CC	MK	KH	L&G D	O-QZ	F&S	II	
CO1	Enlist bheda of Shotha	CK	MK	KH	L&PP T	O-QZ	F&S	II	
CO1	Describe vidhi samprapti of shotha	CC	MK	KH	DIS	O-GAME	F&S	II	
CO1	Describe purvaroopta, vishishta lakshana, samprapti and sadhya asadhyata of Nija shotha	CC	MK	KH	L&G D	INT	F&S	II	
CO1	Differentiate Doshaja shotha	CC	MK	KH	L&G D	INT	F&S	II	
<b>Topic 25 25. Cardiovascular disorders</b> (Lecture :1 hours, Non lecture: 5 hours)									
CO2	Describe the clinical features of Coronary Artery Disease (Ischemic Heart Disease, and Myocardial Infarction) and Congestive cardiac failure	CC	DK	KH	L_VC ,RP	C-VC	F&S	II	V-KC

CO3	Perform relevant clinical examination of Coronary Artery Disease (Ischemic Heart Disease, and Myocardial Infarction) and Congestive cardiac failure	PSY-GUD	DK	SH	L_VC ,SIM	OSCE	F&S	I	
CO4	Order and interpret relevant investigations of Coronary Artery Disease (Ischemic Heart Disease, and Myocardial Infarction) and Congestive cardiac failure	CAP	DK	KH	L&G D,LRI	O-QZ	F&S	II	
<b>Topic 26 26. Kamala</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1	Define Kamala	CK	MK	K	L&PP T	QZ	F&S	II	
CO1	Describe hetu and samprapti of Kamala	CC	MK	KH	L&G D	INT	F&S	II	
CO1	Classify Kamala on the basis of vidhi samprapti of Kamala	CC	MK	KH	L&PP T	INT	F&S	II	
CO1	Differentiate Koshta shakhashrita and Shakhashrita Kamala	CC	MK	KH	DIS	PRN	F&S	II	
CO1	Enlist upadrava of Kamala	CK	MK	KH	L&PP T	QZ	F&S	II	
CO1	Describe sadhya asadhyata of Kamala	CC	MK	KH	TUT	M-CHT	F&S	II	
CO1,CO5	Describe Swatantra-Paratantra Kamala, Alpapitta-Bahupitta Kamala	CC	MK	KH	L&PP T	INT	F&S	II	
<b>Topic 27 27. Udara Roga</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1	Explain pratyatma lakshana of Udara	CC	MK	KH	L&PP T	PUZ	F&S	II	
CO1	Describe hetu and samprapti of Udara	CC	MK	KH	L&G D	WP	F&S	II	

CO1	Enlist bheda of Udara	CK	MK	K	L&PP T	QZ	F&S	II	
CO1,CO5	Describe purvaroop, samanya lakshana and sadhya asadhyata of Udara	CC	MK	KH	L&PP T	T-CS	F&S	II	
CO1	Explain avastha bheda of Udara	CC	MK	KH	DIS	PRN	F&S	II	
CO1,CO5	Differentiate Doshaja udara	CC	MK	KH	L&G D	M-CHT	F&S	II	
CO1,CO5	Explain Vishishta lakshana of Baddha gudodara, Pleehodara, Jalodara and Chidrodara	CC	MK	KH	L&PP T	M-CHT	F&S	II	
<b>Topic 28 28. Hepatobiliary diseases</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO2,CO5	Describe the clinical features of Liver cirrhosis, Alcoholic and Non - Alcoholic Liver Disease, Hepatitis, Jaundice and Ascites	CC	DK	KH	L_VC ,RP	C-VC	F&S	II	
CO3	Perform relevant clinical examination of Liver cirrhosis, Alcoholic and Non - Alcoholic Liver Disease, Hepatitis, Jaundice and Ascites	PSY- GUD	DK	SH	L_VC ,D_B ED	OSCE	F&S	II	
CO4	Order and interpret relevant investigations of Liver cirrhosis, Alcoholic and Non - Alcoholic Liver Disease, Hepatitis, Jaundice and Ascites	CAP	DK	SH	L&G D,LRI	PRN	F&S	II	
CO2,CO5	Describe the differential diagnosis of Liver cirrhosis, Alcoholic and Non - Alcoholic Liver Disease, Hepatitis, Jaundice and Ascites	CC	DK	KH	L&G D,PB L	M-CHT	F&S	II	
<b>Topic 29 29. Kushtha - Maha Kushtha &amp; Kshudra Kushtha (According to Charaka)</b> (Lecture :3 hours, Non lecture: 1 hours)									
CO1	Define Kushtha	CK	MK	K	L&PP T	O-QZ	F&S	III	

CO1	Describe hetu and samprapti of Kushtha	CC	MK	KH	L&G D	COM	F&S	III	
CO1	Enlist bheda of Maha Kushtha & Kshudra Kushtha	CK	MK	K	L&PP T	O-QZ	F&S	III	
CO1	Describe purvaroop of Kushtha	CC	MK	KH	L&G D	INT	F&S	III	
CO1,CO5	Describe vishishta lakshana of Maha Kushtha & Kshudra Kushtha	CC	MK	KH	L&PP T,CD	O-GAME	F&S	III	
CO1,CO5	Describe dosha anusara Kushtha lakshana	CC	MK	KH	L&G D	M-POS	F&S	III	
CO1	Describe sadhya asadhyata of Maha Kushtha & Kshudra Kushtha	CC	MK	KH	L&PP T	O-QZ	F&S	III	
CO1,CO5	Differentiate Maha kushtha & Kshudra kushtha	CC	MK	KH	DIS	CL-PR	F&S	III	
<b>Topic 30 30. Sheetapitta</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe Sheetapitta samprapti	CC	MK	KH	L&PP T	M-CHT	F&S	III	
CO1,CO5	Describe Sheetapitta and Udarda lakshana	CC	MK	KH	L&PP T	QZ	F&S	III	
CO1	Describe Kotha lakshana	CC	MK	KH	L&PP T	QZ	F&S	III	
CO1,CO5	Differentiate Sheetapitta and Udarda	CC	MK	KH	DIS	QZ	F&S	III	
<b>Topic 31 31. Shwitra</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Enlist types of Shwitra	CK	MK	K	L&PP	O-QZ	F&S	III	



					T				
CO1,CO5	Describe lakshana and sadhya asadhyata of Shwitra	CC	MK	KH	L&PP T	INT	F&S	III	
<b>Topic 32 32. Visarpa</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1	Define Visarpa	CK	MK	K	L&PP T	O-QZ	F&S	III	
CO1	Describe hetu and samprapti of Visarpa	CC	MK	KH	L&G D	M-CHT	F&S	III	
CO1	Enlist bheda of Visarpa	CK	MK	K	L&PP T	QZ	F&S	III	
CO1,CO5	Describe purvaroop of visarpa, features of Bahya and Abhyantara visarpa and sadhya asadhyata of Visarpa	CC	MK	KH	L&PP T	PRN	F&S	III	
CO1,CO5	Differentiate Doshaja Visarpa	CC	MK	KH	DIS	INT	F&S	III	
CO1,CO5	Explain Agni, Kardama and Granthi visarpa	CC	MK	KH	L&PP T	T-CS	F&S	III	
<b>Topic 33 33. Skin diseases</b> (Lecture :1 hours, Non lecture: 6 hours)									
CO2,CO5	Describe the clinical features of Allergic disorders - Eczema, Urticaria; Squamous lesions - Psoriasis, Lichen planus; Bullous lesion – Pemphigus and Pemphigoid; Mycotic skin diseases; Leprosy; Vitiligo; Cellulitis	CC	DK	KH	L_VC	C-VC	F&S	III	
CO3	Perform relevant clinical examination of Allergic disorders - Eczema, Urticaria; Squamous lesions - Psoriasis, Lichen planus; Bullous lesion – Pemphigus and Pemphigoid; Mycotic skin diseases; Leprosy; Vitiligo; Cellulitis	PSY-GUD	DK	SH	L_VC ,D_B ED	OSCE	F&S	III	

CO4	Order and interpret relevant investigations of Allergic disorders - Eczema, Urticaria; Squamous lesions - Psoriasis, Lichen planus; Bullous lesion – Pemphigus and Pemphigoid; Mycotic skin diseases; Leprosy; Vitiligo; Cellulitis	CAP	DK	SH	L&G D,LRI	INT	F&S	III	
<b>Topic 34 34. Galaganda</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe pratyatma lakshana and samprapti of Galaganda	CC	NK	KH	L&PP T	PUZ	F&S	III	
<b>Topic 35 35. Thyroid disorders</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO2,CO5	Describe the clinical features of Hypothyroidism and hyperthyroidism	CC	DK	KH	L_V _VC ,RP	M-POS	F&S	III	
CO3	Perform relevant clinical examination of Hypothyroidism and hyperthyroidism	PSY- GUD	DK	SH	L_V _VC ,D_B ED	OSCE	F&S	III	
CO4	Order and interpret relevant investigations of Hypothyroidism and hyperthyroidism	CAP	DK	SH	L&G D,LRI	SP	F&S	III	
<b>Topic 36 36. Sthoulya – Karshya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe nidana of Sthoulya and Karshya	CC	MK	KH	L&PP T	T-OBT	F&S	III	
CO1	Describe samprapti of Sthoulya	CC	MK	KH	L&G D	M-CHT	F&S	III	
CO1,CO5	Describe samanya and vishista lakshana of Sthoulya	CC	MK	KH	L&PP T	QZ	F&S	III	
CO1,CO5	Describe samanya lakshana of Karshya	CC	MK	KH	L&PP T	O-QZ	F&S	III	

CO1	Describe upadrava of Sthoulya	CC	MK	KH	L&PP T	O-QZ	F&S	III	
CO1,CO5	Differential diagnosis of Karshya	CC	MK	KH	DIS	CL-PR	F&S	III	
<b>Topic 37 37. Obesity</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO2,CO5	Describe the clinical features of Obesity	CC	DK	KH	FC	WP	F&S	III	H-SW
CO3	Perform relevant clinical examination of Obesity	PSY- GUD	DK	SH	L_VC ,D_B ED	OSCE	F&S	III	
CO4	Order and interpret relevant investigations of Obesity	CAP	DK	SH	PBL, LRI	INT	F&S	III	
CO2,CO5	Describe the differential diagnosis of Obesity	CC	DK	KH	L&G D,PB L	INT	F&S	III	
<b>Topic 38 38. Prameha</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1	Describe pratyatma lakshana of Prameha	CC	MK	KH	L&PP T	PUZ	F&S	III	
CO1	Describe hetu and samprapti of Prameha	CC	MK	KH	L&G D	M-CHT	F&S	III	
CO1	Enlist bheda of Prameha	CK	MK	K	L&PP T	QZ	F&S	III	
CO1,CO5	Describe purvaroop, vishishta lakshana, upadrava and sadhya asadhyata of Prameha	CC	MK	KH	L&PP T	PRN	F&S	III	
<b>Topic 39 39. Diabetes Mellitus and Pancreatitis</b> (Lecture :1 hours, Non lecture: 1 hours)									

CO2,CO5	Describe the clinical features of Diabetes Mellitus and Pancreatitis	CC	DK	KH	L&G D,CB L	INT	F&S	III	
CO2	Describe the complications of Diabetes Mellitus and Pancreatitis	CC	DK	KH	L_VC	T-CS	F&S	III	
CO3	Perform relevant clinical examination of Diabetes Mellitus and Pancreatitis	PSY- GUD	DK	SH	L_VC ,D_B ED	OSCE	F&S	III	
CO4	Order and interpret relevant investigations of Diabetes Mellitus and Pancreatitis	CAP	DK	SH	L&G D,LRI	SP	F&S	III	
CO2,CO5	Describe Pancreatitis induced Diabetes mellitus (Fibrocalculous pancreatic Diabetes)	CC	DK	KH	L&G D	INT	F&S	III	
<b>Topic 40 40. Vatavyadhi</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO5	Describe nidana, samanya purvaroop, and samanya lakshana of Vatavyadhi	CC	MK	KH	L&PP T	QZ	F&S	III	
<b>Topic 41 41. Snayugata vata</b> (Lecture :4 hours, Non lecture: 2 hours)									
CO1	Define Akshepaka	CK	MK	K	L&PP T	QZ	F&S	III	
CO1	Enlist Snayugata vata	CK	MK	K	L&PP T	QZ	F&S	III	
CO1,CO5	Describe Akshepaka	CC	MK	KH	L_VC	C-VC	F&S	III	
CO1	Enlist Akshepaka bheda	CK	MK	K	L&PP T	QZ	F&S	III	
CO1	Explain Akshepaka Samprapti	CC	MK	KH	L&G D	M-CHT	F&S	III	

CO1,CO5	Describe Apatanaka	CC	MK	KH	L&PP T	INT	F&S	III	
CO1	Enlist Apatanaka bheda	CK	MK	K	L&PP T	QZ	F&S	III	
CO1,CO5	Describe Dandapatanaka, Antarayama and Bahirayama	CC	MK	KH	L&PP T,CB L	C-VC	F&S	III	
CO1	Define Ardita	CK	MK	K	L&PP T	O-QZ	F&S	III	
CO1,CO5	Describe Ardita, samprapti of Ardita and lakshana of Ardita	CC	MK	KH	L_VC	INT, C-VC	F&S	III	
CO1	Compare Ardita according to Charaka and Sushruta	CC	MK	KH	DIS	C-VC	F&S	III	
CO1	Enlist Sadyasadyata of Ardita	CK	MK	K	L&PP T	INT	F&S	III	
CO1	Define Pakshaghata	CK	MK	K	L&PP T	QZ	F&S	III	
CO1,CO5	Describe Pakshaghata samprapti, and Pakshaghata lakshana	CC	MK	KH	L&G D,CD	C-VC	F&S	III	
CO1,CO5	Describe Kampavata	CC	MK	KH	L_VC	C-VC	F&S	III	
CO1,CO5	Describe Gridhrasi and Vishwachi with its lakshana	CC	MK	KH	CBL	T-CS	F&S	III	
CO1,CO5	Describe differential diagnosis of Gridhrasi and Viswachi	CC	MK	KH	L&G D	INT	F&S	III	
CO1,CO5	Describe Pangutwa	CC	MK	KH	L_VC	C-VC	F&S	III	
CO1,CO5	Differentiate Khanja with Gridhrasi	CC	MK	KH	L&G	C-VC	F&S	III	

					D				
<b>Topic 42 42. Common neurologic and spine disorders</b> (Lecture :2 hours, Non lecture: 4 hours)									
CO2,CO5	Describe the clinical features of Common neurologic diseases: Parkinson's disease, Stroke, Bell's Palsy, Motor Neuron Disease, Transverse myelitis, Epilepsy (Organic) and Common Spine disorders: Lumbago- Sciatica syndrome, Brachial neuralgia, Cervical and Lumber Spondylosis	CC	DK	KH	L_VC ,RP	C-VC	F&S	III	
CO3	Perform relevant clinical examination of Common neurologic diseases: Parkinson's disease, Stroke, Bell's Palsy, Motor Neuron Disease, Transverse myelitis, Epilepsy (Organic) and Common Spine disorders: Lumbago- Sciatica syndrome, Brachial neuralgia, Cervical and Lumber Spondylosis	PSY- GUD	DK	SH	L_VC ,D_B ED	OSCE	F&S	III	
CO4	Order and interpret relevant investigations of Common neurologic diseases: Parkinson's disease, Stroke, Bell's Palsy, Motor Neuron Disease, Transverse myelitis, Epilepsy (Organic) and Common Spine disorders: Lumbago- Sciatica syndrome, Brachial neuralgia, Cervical and Lumber Spondylosis	CAP	DK	SH	L&G D,LRI	INT	F&S	III	
<b>Topic 43 43. Sandhigatavata and Asthi majja gata vata</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO5	Describe Sandhigatavata	CC	MK	KH	L_VC	C-VC	F&S	III	
CO1,CO5	Describe Katigraha and Manyastambha	CC	MK	KH	L&PP T	INT	F&S	III	
CO1,CO5	Explain Vatakantaka	CC	MK	KH	L&PP T	T-CS	F&S	III	
CO1,CO5	Describe Avabahuka and Amsashosha	CC	MK	KH	L&PP T	INT	F&S	III	

CO1,CO5	Describe the differential diagnosis of Avabahuka with Vishwachi	CC	MK	KH	L&G D	QZ	F&S	III	
CO1,CO5	Describe Asthi-majjagata vata	CC	MK	KH	L&PP T	INT	F&S	III	
<b>Topic 44 44. Diseases of bone, joints, and muscles</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO2,CO5	Describe the clinical features of Diseases of bone and Joints - Osteoarthritis, Osteoporosis, Frozen Shoulder, Calcaneal spur/ Plantar fasciitis, Tennis elbow, Carpel tunnel syndrome; Muscular diseases - Muscular Dystrophy	CC	DK	KH	L_VC	C-VC	F&S	III	
CO3	Perform relevant clinical examination of Diseases of bone and Joints - Osteoarthritis, Osteoporosis. Frozen Shoulder, Calcaneal spur/ Plantar fasciitis, Tennis elbow, Carpel tunnel syndrome; Muscular diseases - Muscular Dystrophy	PSY- GUD	DK	SH	L_VC ,D_B ED	OSCE	F&S	III	
CO4	Order and interpret relevant investigations of Diseases of bone and Joints - Osteoarthritis, Osteoporosis. Frozen Shoulder, Calcaneal spur/ Plantar fasciitis, Tennis elbow, Carpel tunnel syndrome; Muscular diseases - Muscular Dystrophy	CAP	DK	SH	L&G D,XR ay,LR I	INT	F&S	III	
<b>Topic 45 45. Amavata</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1	Describe hetu and samprapti of Amavata	CC	MK	KH	L&PP T	M-CHT	F&S	III	
CO1	Enlist bheda of Amavata	CK	MK	K	L&PP T	QZ	F&S	III	
CO1,CO5	Describe samanya lakshana, vishishta lakshana, upadrava and sadhya asadhyata of Amavata	CC	MK	KH	L_VC	C-VC	F&S	III	
<b>Topic 46 46. Vatarakta</b> (Lecture :2 hours, Non lecture: 1 hours)									

CO1	Define Vatarakta with its synonyms	CK	MK	K	L&PP T	O-QZ	F&S	III	
CO1	Describe hetu and samprapti of Vatarakta	CC	MK	KH	L&G D	M-CHT	F&S	III	
CO1	Explain Samprapti of Avasthika Vatarakta	CC	MK	KH	L&G D	INT	F&S	III	
CO1,CO5	Enlist and explain vidhi samprapti of Vatarakta	CC	MK	KH	L&G D	INT	F&S	III	
CO1,CO5	Enlist and explain bheda of doshaja Vatarakta	CC	MK	KH	L&G D	T-CS	F&S	III	
CO1,CO5	Describe purvaroop, upadrava, and sadhya asadhyata of Vatarakta	CC	MK	KH	L&PP T	INT	F&S	III	
CO1,CO5	Describe the differential diagnosis of Sandhigata vata, Amavata and Vata rakta	CC	MK	KH	L&G D	T-CS,INT	F&S	III	
<b>Topic 47 47. Immunological &amp; Metabolic disorders</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO2,CO5	Describe the clinical features of Rheumatic fever, Rheumatoid arthritis, SLE, Ankylosing spondylitis, Gout	CC	DK	KH	L_VC ,RP	C-VC	F&S	III	
CO3	Perform relevant clinical examination of Rheumatic fever, Rheumatoid arthritis, SLE, Ankylosing spondylitis, Gout	PSY- GUD	DK	SH	L_VC ,D_B ED	OSCE	F&S	III	
CO4	Order and interpret relevant investigations of Rheumatic fever, Rheumatoid arthritis, SLE, Ankylosing spondylitis, Gout	CAP	DK	SH	L&G D,LRI	T-CS	F&S	III	
CO2,CO5	Describe the differential diagnosis of Arthritis	CC	DK	KH	L&G D,PB L	T-CS	F&S	III	



<b>Topic 48 48. Klaibya &amp; Vandhyatva</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe Klaibya and vandhyatva	CC	NK	KH	L&PP T	QZ	F&S	III	
CO1	Enlist types of Klaibya and Vandhyatva	CK	NK	K	L&PP T	QZ	F&S	III	
<b>Topic 49 49. Sexual dysfunction and Infertility</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO2	Order and interpret relevant investigations of Sexual dysfunction and Infertility	CAP	NK	SH	L&G D,LRI	T-CS	F&S	III	
CO2	Describe differential diagnosis of Sexual dysfunction and Infertility	CC	NK	KH	L&G D	INT	F&S	III	V-SP
<b>Topic 50 50. Unmada &amp; Apasmara</b> (Lecture :3 hours, Non lecture: 0 hours)									
CO1	Explain nirukti of Unmada and Apasmara	CC	NK	KH	L&PP T	O-QZ	F&S	III	
CO1	Explain pratyatmalakshana of Unmada and Apasmara	CC	NK	KH	L&PP T	PUZ	F&S	III	
CO1	Describe hetu and samprapti of Unmada and Apasmara	CC	NK	KH	L&G D	M-CHT	F&S	III	
CO1	Enlist bheda of Unmada and Apasmara	CK	NK	K	L&PP T	QZ	F&S	III	
CO1	Describe samanya lakshana of Unmada and Apasmara	CC	NK	KH	L&G D,L_ VC	QZ , C-VC	F&S	III	
<b>Topic 51 51. Vishada</b> (Lecture :1 hours, Non lecture: 0 hours)									

CO1	Define Vishada	CK	NK	K	L&PP T	QZ	F&S	III	
<b>Topic 52 52. Murchha, and Sanyasa</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe the Utpadaka hetu of Murchha, and Sanyasa	CC	NK	KH	L&PP T	INT	F&S	III	
CO1	Describe samprapti of Murchha, and Sanyasa	CC	NK	KH	L&G D	M-CHT	F&S	III	
<b>Topic 53 53. Common Psychiatric diseases</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO2,CO5	Describe clinical manifestation of Depression, Anxiety neurosis and Epilepsy (Non-organic)	CC	NK	KH	L&PP T	QZ	F&S	III	
CO2,CO5	Differentiate Depression, Anxiety neurosis, and Epilepsy (Non-organic)	CC	NK	KH	L&G D	CL-PR	F&S	III	
CO3	Perform mental status examination for Depression, Anxiety neurosis, and Epilepsy (Non-organic)	PSY- GUD	NK	SH	L_V ,D_B ED	INT	F&S	III	
<b>Topic 54 54. Phiranga and Upadamsha</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe nidana of Phiranga and Upadamsha	CC	NK	KH	L&PP T	QZ	F&S	III	
CO1	Explain the Upadamsha samprapti	CC	NK	KH	L&PP T	M-CHT	F&S	III	
CO1	Enlist the types of Phiranga	CK	NK	K	L&PP T	QZ	F&S	III	
<b>Topic 55 55. Syphilis &amp; Gonorrhoea</b> (Lecture :1 hours, Non lecture: 1 hours)									

CO2	Describe causative factors, and clinical features of Syphilis and Gonorrhoea	CC	NK	KH	L&G D	T-CS	F&S	III	
CO2	Describe differential diagnosis of Syphilis and Gonorrhoea	CC	NK	KH	FC	T-CS	F&S	III	
CO4	Order and interpret relevant investigation of Syphilis and Gonorrhoea	CAP	NK	SH	L&G D,LRI	INT	F&S	III	
<b>Topic 56 56. Krimiroga</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe hetu of Krimiroga	CC	NK	KH	L&PP T	O-QZ	F&S	III	
CO1	Enlist bheda of Krimiroga	CK	NK	K	L&PP T	O-QZ	F&S	III	
CO1	Describe samanya lakshana of Krimiroga	CC	NK	KH	L&PP T	O-GAME	F&S	III	
<b>Topic 57 57. Clinical presentation of common parasitic disorders</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO2,CO5	Describe the clinical presentation of Hook worm, Round worm, Thread worm, and Pin worm	CC	DK	KH	L_VC	C-VC	F&S	III	
CO3	Perform relevant examination of clinical presentation of Hook worm, Round worm, Thread worm, and Pin worm	PSY- GUD	DK	SH	L&PP T	INT	F&S	III	
CO4	Order and interpret relevant investigations of clinical presentation of Hook worm, Round worm, Thread worm, and Pin worm	CAP	DK	SH	L&G D,LRI	T-CS	F&S	III	
<b>Topic 58 58. Khalitya &amp; Palitya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe Khalitya and Palitya	CC	NK	KH	L&PP T	O-QZ	F&S	III	

<b>Topic 59 59. Shleepada</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Describe nidana and samprapti of Shleepada	CC	NK	KH	L&PP T	M-CHT	F&S	III	
CO1	Enlist bheda of Shleepada	CK	NK	K	L&PP T	QZ	F&S	III	
CO1	Enlist features of Shleepada	CK	NK	K	L&PP T	O-QZ	F&S	III	
<b>Topic 60 60. Tuberculosis</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO2,CO5	Describe the clinical presentation of Tuberculosis	CC	DK	KH	L_VC	INT, C-VC	F&S	III	H-SW
CO3	Perform relevant clinical examination of Tuberculosis	PSY- GUD	DK	SH	L&PP T	INT	F&S	III	
CO4	Order and interpret relevant investigations of clinical presentation of Tuberculosis	CAP	DK	SH	L&G D,LRI	INT	F&S	III	

**List of Practicals** (Term and Hours)

<b>PRACTICALS (Marks-100)</b>			
<b>S.No</b>	<b>List of Topics</b>	<b>Term</b>	<b>Hours</b>
1	1. Aptopadesha Pareeksha/Prashna Pareeksha	1	10
2	2. Introduction to case sheet. Pratyaksha and Anumana Pareeksha.	1	10
3	3. General clinical and Systemic examination -A	1	20
4	4. General clinical and Systemic examination - B	1	20
5	5. Common Symptomatology of different systems	2	20
6	6. Vyavachedaka nidana/ Differential diagnosis	2	4
7	7. Case presentation	2	40
8	8. Introduction to Diagnostic procedures - Hematology, Biochemistry, Microbiology, Urine, Stool	2	26
9	9. Introduction to Electro Cardio Gram (ECG), Different imaging techniques	2	10
10	10. Introduction to Histopathology	2	4
11	11. Study of Histopathology Specimens	3	4
12	12. Retas pareeksha	3	2
13	13. Pathology practical (Perform/ Observation/ Interpretation)	3	40

**Table 4: Learning objectives (Practical)**

<b>A4</b> Course outcome	<b>B4</b> Learning Objective (At the end of the session, the students should be able to)	<b>C4</b> Doma in/sub	<b>D4</b> Must to know / desirable to know / Nice to know	<b>E4</b> Level Does/ Shows how/ Knows how/ Know	<b>F4</b> T-L meth od	<b>G4</b> Assessment  (Refer abbreviations)	<b>H4</b> Form ative/ summ ative	<b>I4</b> Term	<b>K4</b> Integr ation
<b>Topic 1 1. Aptopadesha Pareeksha/Prashna Pareeksha</b>									
CO3,CO5	Perform Aptopadesha pareeksha, Prashna pareeksha or History taking mentioned in Ayurveda and contemporary medical literature for drawing clinical diagnosis and prognosis	PSY-GUD	MK	KH	D_BE D	CHK,RK	F&S	I	
CO7,CO8	Adopt and reflect ward ethics and communication skills while engaging in the process of examination	AFT-RES	MK	SH	SIM	SP,RK	F&S	I	
<b>Topic 2 2. Introduction to case sheet. Pratyaksha and Anumana Pareeksha.</b>									
CO3,CO5	Perform Darshanendriya, Sparshanendriya, Srotrendriya pareeksha mentioned in Ayurveda and contemporary medical literature for drawing clinical diagnosis and prognosis	PSY-GUD	MK	SH	D_BE D	P-CASE	F&S	I	
CO5	Perform Ghranendriya, & infer Rasanendriyataha pareeksha mentioned in Ayurveda and contemporary medical literature for drawing clinical diagnosis and prognosis	CAN	MK	KH	SIM	P-CASE,RK	F&S	I	
CO5,CO7	Report the findings of patient through structured case sheet	CC	MK	KH	CD	P-CASE,RK	F&S	I	
CO3,CO5	Perform Nadi pareeksha as per Ayurveda classics for identifying predominance of dosha.	PSY-GUD	MK	SH	D_BE D	P-PRF	F&S	I	

<b>Topic 3 3. General clinical and Systemic examination -A</b>									
CO3,CO5	Perform general examination and various systemic examination - General physical examination, Nervous system, Musculo skeletal system, Gastro intestinal system, Respiratory system, Integumentary system, Uro-genital system, Cardiovascular system, etc. (Inspection, Palpation, Percussion, Auscultation)	PSY-GUD	MK	SH	SIM, D_BE D	CL-PR,OSCE ,RK	F&S	I	
<b>Topic 4 4. General clinical and Systemic examination - B</b>									
CO3,CO5	Interpret the findings of general examination and various systemic examination - General physical examination, Nervous system, Musculo skeletal system, Gastro intestinal system, Respiratory system, Integumentary system, Uro-genital system, Cardiovascular system, etc. (Inspection, Palpation, Percussion, Auscultation)	CAP	MK	SH	SIM	SP,RK	F&S	I	
<b>Topic 5 5. Common Symptomatology of different systems</b>									
CO2,CO5	Describe the causes and mechanism of manifestation of Pain abdomen, Edema, Diarrhea, Dysentery, Dehydration and Constipation, Hiccough, Breathlessness, Cough, Vomiting, Joint pain with or without swelling Differential Diagnosis, Neck and Low back pain radiating to corresponding limb, Hematuria, Stroke in various case scenarios	CC	DK	KH	L_VC	COM	F&S	II	
CO2,CO5	Investigate the causes and mechanism of manifestation of Pain abdomen, Edema, Diarrhea, Dysentery, Dehydration and Constipation, Hiccough, Breathlessness, Cough, Vomiting, Joint pain with or without swelling, Neck and Low back pain radiating to corresponding limb, Hematuria, Stroke in various case scenarios	AFT-RES	DK	SH	IBL,P BL	INT	F&S	II	
<b>Topic 6 6. Vyavachedaka nidana/ Differential diagnosis</b>									

CO5	Infer diagnosis and prognosis based on a given clinical scenario	CAN	MK	KH	PBL, CD	SP	F&S	II	
CO5	Apply hypothetic-deductive model of clinical reasoning, Pattern recognition model, dual process diagnostic reasoning model, pathway for clinical reasoning model, integrative model of clinical reasoning model, model of diagnostic reasoning strategies in primary care for clinical diagnosis	CAP	DK	SH	SIM, CD	INT,SP	F&S	II	
CO5	Apply intuitive and analytical approach in clinical decision making	CAP	DK	SH	PBL,S IM,C D	SP	F&S	II	
CO5	Perform clinical diagnosis using these clinical reasoning models	PSY- GUD	DK	SH	SIM, CD	SP	F&S	II	
<b>Topic 7 7. Case presentation</b>									
CO5,CO7	Demonstrate case presentation skills	PSY- GUD	MK	SH	L_VC ,D_B ED	P-CASE,CL- PR	F&S	II	
<b>Topic 8 8. Introduction to Diagnostic procedures - Hematology, Biochemistry, Microbiology, Urine, Stool</b>									
CO4,CO5,CO 6	Order and interpret Diagnostic procedures - Haematology, Biochemistry, Microbiology, Urine, and Stool.	CAP	MK	SH	PBL, LRI	T-CS	F&S	II	
CO3	Suggest patient's preparation for Diagnostic procedures - Haematology, Biochemistry, Microbiology, Urine, and Stool	AFT- RES	MK	SH	L&PP T	SP	F&S	II	
CO3	Perform sample collection for Diagnostic procedures - Haematology, Biochemistry, Microbiology, Urine, and Stool	PSY- GUD	MK	SH	SIM	SP,RK	F&S	II	
<b>Topic 9 9. Introduction to Electro Cardio Gram (ECG), Different imaging techniques</b>									
CO4,CO5,CO	Order and interpret given report for Electro Cardio Gram (ECG)	CAP	DK	SH	L&PP	P-ID,CL-PR	F&S	II	



6	and different imaging techniques				T, XRay				
CO3	Suggest patient's preparation for Electro Cardio Gram (ECG) and different imaging techniques	AFT-RES	DK	SH	L&PPT	INT,SP	F&S	II	
<b>Topic 10 10. Introduction to Histopathology</b>									
CO4,CO5,CO6	Order and interpret tests for Histopathology specimens	CAP	NK	SH	LRI	INT	F&S	III	
<b>Topic 11 11. Study of Histopathology Specimens</b>									
CO4,CO5	Distinguish and describe prepared histopathology specimens of Lung and trachea/ Blood, Spleen and lymph/ Heart and vessels/ Glands/ Liver (Provide normal and abnormal slides to distinguish while deomonstration and spotting)	AFT-RES	NK	SH	D_L	P-ID	F&S	III	
<b>Topic 12 12. Retas pareeksha</b>									
CO1,CO5	Describe and interpret retas pareeksha	CC	DK	KH	D_L	INT	F&S	III	
<b>Topic 13 13. Pathology practical (Perform/ Observation/ Interpretation)</b>									
CO4,CO5,CO6	Order and interpret Hb, RBC Count, WBC count, Haematocrit, Platelet count, Differential count, RBC indices and ESR* - Haematology Analyser through Flow cytometry technique	CAP	MK	SH	CBL	INT,RK	F&S	III	
CO3	Perform Hb, RBC Count, WBC count, Haematocrit, Platelet count, Differential count, RBC indices procedure through - Haematology Analyser or Cell counter through Flow cytometry technique	PSY-GUD	MK	SH	PT	P-PRF	F&S	III	
CO4,CO5,CO6	Order and interpret Urine physical examination (Appearance, colour, odour)	CAP	MK	SH	LRI	INT	F&S	III	

CO3	Perform Urine physical examination ( <u>Appearance, colour, odour</u> ) through <u>Visual method</u>	PSY-GUD	MK	SH	CBL, PT	P-PRF	F&S	III	
CO4,CO5,CO6	Order and interpret Urine physical and chemical examination (Urine specific gravity, Urine-ph, Sugar, Albumin, Bile pigment, Bile salt, Occult blood, Ketone, Urobilinogen) - Multistix (Urine test strips)	CAP	MK	SH	CBL, LRI	INT,RK	F&S	III	
CO3	Perform Urine physical and chemical examination (Urine specific gravity, Urine-ph, Sugar, Albumin, Bile pigment, Bile salt, Occult blood, Ketone, Urobilinogen) - Multistix (Urine test strips) (Create or simulate abnormal samples to demonstrate positive results)	PSY-GUD	MK	SH	PRA	P-PRF	F&S	III	
CO4,CO5,CO6	Order and interpret Urine Microscopic Examination (Epithelial cells, RBCs, Leukocytes, Casts, Crystals) - Light microscopy on centrifuged sediment	CAP	MK	SH	CBL, LRI	INT	F&S	III	
CO3	Perform Urine Microscopic Examination (Epithelial cells, RBCs, Leukocytes, Casts, Crystals by Light microscopy on centrifuged sediment)	PSY-GUD	MK	SH	PRA	P-PRF	F&S	III	
CO4,CO5,CO6	Order and interpret Liver Function Test (LFT) (Total Bilirubin, Direct – indirect bilirubin, SGOT, SGPT, ALK Phosphates, T Protein, Albumin, Globulin, A/G Ratio) -Semi-automated/ fully automated biochemical analyser through Photometry	CAP	NK	SH	CBL, LRI	INT	F&S	III	
CO2	Describe Liver Function Test (LFT) (Total Bilirubin, Direct – indirect bilirubin, SGOT, SGPT, ALK Phosphates, T Protein, Albumin, Globulin, A/G Ratio) procedure through demonstration	CC	DK	KH	D_L	INT	F&S	III	

	- Semi-automated/ fully automated biochemical analyser through Photometry								
CO2	Explain the principle and mechanism of functioning of biochemical analyzer	CC	DK	KH	D_L	QZ	F&S	III	
CO4,CO5,CO6	Order and interpret Renal Function Test (RFT) (Urea, Creatinine, Uric acid) - Semi-automated/ fully automated biochemical analyser through Photometry	CAP	MK	SH	CBL, LRI	INT,RK	F&S	III	
CO4,CO5,CO6	Order and interpret Diabetic profile (Blood Glucose-FBS, PPBS, RBS. HbA1C, Insulin, C-peptide) - Semi-automated/ fully automated biochemistry analyser/ ELISA reader through Photometry/ immunoturbidometry/ELISA Technique	CAP	MK	SH	CBL, LRI	INT,RK	F&S	III	
CO4,CO5,CO6	Order and interpret Thyroid profile (TSH, T3, T4, F T3, F T4) - ELISA Reader/ CLIA through ELISA/ CLIA Technique	CAP	MK	KH	CBL, LRI	INT	F&S	III	
CO2	Describe Thyroid profile (TSH, T3, T4, F T3, F T4) procedure through demonstration - ELISA Reader/ CLIA through ELISA/ CLIA Technique	CAP	DK	KH	D_L	QZ	F&S	III	
CO4,CO5,CO6	Order and interpret Lipid profile (Cholesterol, HDL, LDL, TG) - Semi-automated/ fully automated biochemical analyser through Photometry	CAP	MK	SH	CBL, LRI	INT,RK	F&S	III	
CO4,CO5,CO6	Order and interpret Peripheral smear (Malaria, Microfilaria) - Microscopy through Leishmans staining	CAP	MK	SH	CBL, LRI	INT,RK	F&S	III	
CO2	Describe Peripheral smear (Malaria, Microfilaria) procedure through demonstration - Microscopy through Leishmans staining	CC	DK	KH	D_L	QZ	F&S	III	
CO4,CO5,CO6	Order and interpret RA factor (qualitative), WIDAL (qualitative), VDRL (qualitative), ASO (qualitative) and CRP (qualitative) - Microscopy (if required) through Latex agglutination/	CAP	MK	SH	CBL, LRI	INT,RK	F&S	III	

	Turbidometry								
CO3	Perform RA factor (qualitative), WIDAL (qualitative), VDRL (qualitative), ASO (qualitative) and CRP (qualitative) - Microscopy (if required) through Latex agglutination/ Turbidometry	PSY-GUD	MK	SH	PRA	P-PRF	F&S	III	
CO4,CO5,CO6	Order and interpret Stool examination (Colour, Consistency) - Visual method	CAP	NK	SH	CBL, LRI	INT,RK	F&S	III	
CO2	Describe Stool examination (Colour, Consistency) - Visual method	CC	DK	KH	D_L	INT	F&S	III	
CO4,CO5,CO6	Order and interpret Stool examination (Ova , Cyst, Pus cells) - Microscopy through Wet smear (saline and iodine)	CAP	NK	SH	CBL, LRI	INT,RK	F&S	III	
CO2	Describe Stool examination (Ova , Cyst, Pus cells) - Microscopy through Wet smear (saline and iodine)	CC	DK	KH	D_L	INT	F&S	III	
CO4,CO5,CO6	Order and interpret Semen examination (Colour, Liquefaction, Viscosity) - Visual method	CAP	DK	SH	CBL, LRI	INT,RK	F&S	III	
CO2	Describe Semen examination (Colour, Liquefaction, Viscosity) procedure through demonstration - Visual method	CC	DK	KH	D_L	INT	F&S	III	
CO4,CO5,CO6	Order and interpret Semen examination (Sperm count, Motility, Morphology) - Microscopy through Cytometry/ Wet smear/ stained smear	CAP	DK	SH	CBL, LRI	INT,RK	F&S	III	
CO2	Describe Semen examination (Sperm count, Motility, Morphology) procedure through demonstration - Microscopy through Cytometry/ Wet smear/ stained smear	CC	DK	KH	D_L	INT,COM	F&S	III	
CO4,CO5,CO6	Order and interpret BT, CT, Prothrombin Time - Coagulometer	CAP	MK	SH	CBL, LRI	INT,RK	F&S	III	

**Table 4a: List of Practical**

<b>S.No</b>	<b>Name of practical</b>	<b>Term</b>	<b>Activity</b>	<b>Practical hrs</b>
<b>1</b>	1. Aptopadesha Pareeksha/Prashna Pareeksha	1	History taking/ Ward ethics/ Communication skills	10
<b>2</b>	2. Introduction to case sheet. Pratyaksha and Anumana Pareeksha.	1	Darshanendriya, Sparshanedriya, Srotrendriya & Ghranendriya & Rasanendriyataha pareeksha. General principle of systemic examination – Inspection, Palpation, Percussion, Auscultation	10
<b>3</b>	3. General clinical and Systemic examination -A	1	Demonstration on patients and using simulators, software or applications	20
<b>4</b>	4. General clinical and Systemic examination - B	1	General and Systemic examination	20
<b>5</b>	5. Common Symptomatology of different systems	2	Pain abdomen, Edema, Diarrhea, Dysentery, Dehydration and constipation, Hiccough, Breathlessness, Cough, Vomiting, Joint pain with or without swelling Differential Diagnosis, Neck and Low back pain radiating to corresponding limb, Hematuria, Stroke Differential Diagnosis	20
<b>6</b>	6. Vyavachedaka nidana/ Differential diagnosis	2	Clinical reasoning models	4
<b>7</b>	7. Case presentation	2	Demonstrating and presenting steps of clinical diagnosis	40
<b>8</b>	8. Introduction to Diagnostic procedures - Hematology, Biochemistry, Microbiology, Urine, Stool	2	A. Order an investigation B. Patient's preparation C. Sample collection	26
<b>9</b>	9. Introduction to Electro Cardio Gram (ECG), Different imaging techniques	2	Order and interpret reports related to ECG and Diagnostic imaging	10
<b>10</b>	10. Introduction to Histopathology	2	Order and Interpret	4

<b>11</b>	11. Study of Histopathology Specimens	3	Prepared histopathology specimens to be demonstrated, observed and studied (Lung and trachea/ Blood, Spleen and lymph/ Heart and vessels/ Glands/ Liver)	4
<b>12</b>	12. Retas pareeksha	3	Interpret observations derived from reto pareeksha	2
<b>13</b>	13. Pathology practical (Perform/ Observation/ Interpretation)	3	13.1 Hematology (Discipline) - Hemogram (Profile) 13.2 Clinical pathology (Discipline) - Urine Physical Examination (Profile) 13.3 Clinical pathology (Discipline) - Urine Physical and Chemical Examination (Profile) 13.4 Clinical pathology (Discipline) - Urine Microscopic Examination (Profile) 13.5 Clinical biochemistry (Discipline) - Liver Function Test (LFT) (Profile) 13.6 Clinical biochemistry (Discipline) - Renal Function Test (RFT) (Profile) 13.7 Clinical biochemistry (Discipline) - Diabetic profile (Profile) 13.8 Clinical biochemistry (Discipline) - Thyroid profile (Profile) 13.9 Clinical biochemistry (Discipline) - Lipid profile (Profile) 13.10 Clinical Pathology/ Haematology (Discipline) - Peripheral Smear (Profile) 13.11 Serology (Discipline) - RA Factor/ WIDAL (Profile) 13.12 Clinical Pathology (Discipline) - Stool examination (Profile) 13.13 Clinical Pathology (Discipline) - Stool examination (Profile) 13.14 Clinical Pathology (Discipline) - Semen examination (Profile) 13.15 Serology (Discipline) - Coagulation test (Profile)	40
<b>Total Hr</b>				<b>210</b>

### Activity

CO	Topic name	Activity Details	Hours #
CO1,CO2,CO3,CO4,CO6,CO7,CO8	<p>1. Assessment of Dosha Vikriti:</p> <p>A. Nidana (Vyadhi janaka hetu)</p> <p>B. Agni bheda and Vikriti</p> <p>C. Dosha Vriddhi, Kshaya and Dushta Karma, Samsargaja, Sannipataja.</p> <p>D. Dosha swabhava - Nityasamshleshita (Leena) dosha and Parichedita dosha</p> <p>E. Paridhavamana dosha</p>	<p>Survey : After the completion of the topic the students are instructed to identify:</p> <p>The contemporary etiologies for the nidana or hetu are mentioned in various contexts as a part of case diagnosis.</p> <p>Identify Dosha Vriddhi, Kshaya and Dushta Karma, Samsargaja, Sannipataja features as a part of Case diagnosis.</p> <p>Minimum - 5 cases</p>	6
CO1,CO2	<p>2. Dhatu Paka</p> <p>A. Ojodusti lakshana</p> <p>B. Asatmya - Immune pathology,</p> <p>C. Cell Injury and Cellular Adaptations</p> <p>D. Inflammation</p> <p>E. Hemodynamic disorders</p> <p>F. Neoplasia</p>	<p>Creating video presentations (5 to 7 minutes):</p> <p>After understanding the basic concepts:</p> <p>Group of 5 students together are instructed to prepare one quality educational video with current research updates in the field in a structured format and submit the same to the instructor.</p> <p>Topics of Ayurveda and various contemporary learning objectives defined can be provided for the same.</p> <p>The topics for video presentations should be selected from the subtopics, it can be regarding a specific point or research update or collection</p>	5

		<p>and summary of scientific articles, etc. which will be assisting in clinical practice.</p> <p>The video presentations should be submitted to create a repository and presented to the department.</p>	
CO2	3. Infection and Nutritional disorders	<p>Class presentations:</p> <p>Group activity with self-directed learning:</p> <p>Students are instructed to compile the subtopics given to the group.</p> <p>Prepare a PPT presentation and present it in class with the groups.</p> <p>10 min. for presentation and 5 min for question answers for each group.</p> <p>Topics to be covered in the presentation:</p> <p>A) The detailed knowledge of specific organisms, infectious disease symptomatology, and diagnostic procedures with recent advancements and challenges in diagnosis. B) Nutritional disorders with the thought of understanding the spectrum of signs and symptoms with Ayurveda literature, methods to diagnose in contemporary science, complications, etc.</p> <p>Monitored by instructors or mentors assigned for each group.</p>	2
CO6	4. Digital health and Artificial intelligence in the context of Roganidana	<p>Poster making:</p> <p>After a basic understanding of the topic, the students are instructed to prepare Posters regarding the use of Information and Communication Technology and other recent digital developments in understanding diagnosis, prognosis, and developing repositories related to morbidities or Roganidana Evum Vikriti Vigyan in the current era aiding for academics and</p>	1



		clinical practice. Similarly, the implementation of artificial intelligence in diagnosis and prognosis also can be prepared.	
CO1,CO2,CO3,CO4,CO6,CO7,CO8	5. Methods of Rogi pareeksha	<p>Demonstration bed side:</p> <p>After understanding the core concepts of pareeksha the student will be Demonstrated regarding various pareekshas before performing the same in practical session.</p> <p>The students are supposed to observe the same, receive, understand and imitate the methods demonstrated.</p> <p>Students will be assigned with the mentioned topics as a part of the activity by the instructor in minimum 5 simulated patients or patients.</p>	5
CO6	6. Vyadhinamakarana	<p>Demonstration:</p> <p>The instructor will be demonstrating the operations of the NAMASTE (National AYUSH Morbidity and Standardized Terminologies Electronic Portal) portal.</p> <p>The student should observe and implement the same for reporting terminologies or diagnosis. The instructor can give modified data indicating the disease diagnosis with masked patient details for mentioning the allotted codes of diseases or conditions from NAMASTE portal and WHO international standard terminologies on Ayurveda or A list of common diseases prevailing in the area can be given to the students to search the portal and mention the codes by themselves.</p> <p>Students can be assigned with any of the mentioned topics as a part of the activity by the instructor.</p>	1

CO2,CO3,CO6,CO7,CO8	<p>7. Perform relevant clinical examinations in the following disorders:</p> <p>Gastrointestinal disorders: Ulcerative and Non-ulcerative dyspepsia, Irritable Bowel Syndrome, Inflammatory Bowel Diseases.</p> <p>Urinary disorders: Urinary Tract Infection, Prostatomegaly, Nephrotic syndrome, Nephritic syndrome, Acute Kidney Injury and Chronic Kidney Disease.</p> <p>Respiratory disorders: Pneumonia, Chronic Obstructive Pulmonary Disease, Pleural effusion and Bronchiectasis.</p> <p>Measles, Chickenpox and herpes zoster, Hand foot mouth disease, Rubella, Malaria, Filariasis, Influenza, Dengue, Leptospirosis, Chikungunya, Typhoid, and other common regional disorders presenting with fever.</p> <p>Coronary Artery Disease (Ischemic Heart Disease, and Myocardial Infarction) and Congestive cardiac failure.</p> <p>Hepatobiliary diseases - Liver cirrhosis, Alcoholic and Non - Alcoholic Liver Diseases, Hepatitis, Jaundice, and Ascites.</p>	<p>Demonstration bedside (Simulated patients):</p> <p>The students will be instructed to observe the bedside demonstration activity by the instructor, followed by students imitating or performing the same activity relevant to the condition associated.</p> <p>The case study will be written in the activity book.</p>	8
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Allergic disorders -  
Eczema, Urticaria;  
Squamous lesions -  
Psoriasis, Lichen planus;  
Bullous lesion –  
Pemphigus and  
Pemphigoid. Mycotic skin  
diseases. Leprosy.  
Vitiligo. Cellulitis.

Hypothyroidism and  
hyperthyroidism.

Obesity.

Diabetes Mellitus and  
Pancreatitis.

Common neurologic  
diseases: Parkinson's  
disease, Stroke, Bell's  
Palsy, Motor Neuron  
Disease, Transverse  
myelitis, Epilepsy  
(Organic)

Common Spine disorders:  
Lumbago- Sciatica  
syndrome, Brachial  
neuralgia, Cervical and  
Lumber Spondylosis.

Diseases of bone and  
Joints - Osteoarthritis,  
Osteoporosis. Frozen  
Shoulder, Calcaneal spur/  
Plantar fasciitis, Tennis  
elbow, Carpel tunnel  
syndrome.

Muscular diseases -  
Muscular Dystrophy.  
Rheumatic fever,  
Rheumatoid arthritis,  
SLE, Ankylosing  
spondylitis, Gout.

Mental status examination  
for Depression, Anxiety  
neurosis and Epilepsy

	<p>(Non - organic).</p> <p>Common parasitic infestations: Hookworm, Roundworm, Threadworm, and Pinworm.</p>		
CO4,CO6,CO7,CO8	<p>8. Order and interpret relevant investigations with the clinical correlation of the following disorders:</p> <p>Gastrointestinal disorders: Ulcerative and Non-ulcerative dyspepsia, Irritable Bowel Syndrome, Inflammatory Bowel Diseases.</p> <p>Urinary Tract Infection, Prostatomegaly, Nephrotic syndrome, Nephritic syndrome, Acute Kidney Injury, and Chronic Kidney Disease.</p> <p>Pneumonia, Chronic Obstructive Pulmonary Disease, Pleural effusion, and Bronchiectasis.</p> <p>Measles, Chicken pox and Herpes zoster, Hand foot mouth disease, Rubella, Malaria, Filariasis, Influenza, Dengue, Leptospirosis, Chikungunya, Typhoid, and other common regional disorders presenting with fever.</p> <p>Anaemia, Nutritional anaemia, Thalassemia, Sickle cell anaemia, Leukaemia, and</p>	<p>Lab report interpretation:</p> <p>Students will be given a clinical scenario or a case or report in the respective training hour.</p> <p>Based on the training given the students are expected to draw a provisional diagnosis based on the Lab report interpretation.</p> <p>The same has to be recorded in the activity book</p>	8

Thrombocytopenia.

Coronary Artery Disease (Ischemic Heart Disease, and Myocardial Infarction) and Congestive cardiac failure.

Hepatobiliary diseases - Liver cirrhosis, Alcoholic and Non - Alcoholic Liver Diseases, Hepatitis, Jaundice, and Ascites.

Allergic disorders - Eczema, Urticaria; Squamous lesions - Psoriasis, Lichen planus; Bullous lesion – Pemphigus and Pemphigoid. Mycotic skin diseases. Leprosy. Vitiligo. Cellulitis.

Hypothyroidism and hyperthyroidism. Obesity. Diabetes Mellitus and Pancreatitis. Common neurologic diseases: Parkinson's disease, Stroke, Bell's Palsy, Motor Neuron Disease, Transverse myelitis, Epilepsy (Organic).

Common Spine disorders: Lumbago - Sciatica syndrome, Brachial neuralgia, Cervical and Lumber Spondylosis.

Diseases of bone and Joints - Osteoarthritis, Osteoporosis. Frozen Shoulder, Calcaneal spur/ Plantar fasciitis, Tennis elbow, Carpel tunnel syndrome.

	<p>Muscular diseases - Muscular Dystrophy.</p> <p>Rheumatic fever, Rheumatoid arthritis, SLE, Ankylosing spondylitis, Gout.</p> <p>Sexual dysfunction and Infertility. Syphilis and Gonorrhoea.</p> <p>Parasitic infestations: Hookworm, Roundworm, Threadworm, and Pinworm.</p> <p>Tuberculosis</p>		
CO1,CO2	<p>9. Differential diagnosis:</p> <p>Differentiate between Atisara and Pravahika.</p> <p>Differentiate Atisara and Grahani Roga.</p> <p>Differentiate Grahani dosha and Grahani Roga.</p> <p>Describe the differential diagnosis of Ulcerative and Non-ulcerative dyspepsia, Irritable Bowel Syndrome, and Inflammatory Bowel Diseases.</p> <p>Enlist conditions of Mutra shoshana (Kshaya and Aukasada) and Mutra pratihanyate (Avarodha) among different types of Mutraghata.</p> <p>Describe different types of Mutraghata.</p>	<p>Problem-Based Learning:</p> <p>The students will be grouped for PBL sessions with a specific topic from the topic list given.</p> <p>At the end of the session, the groups will present in class.</p> <p>Peer learning will also be achieved with this activity.</p>	10

Differentiate  
Mootrakrichra and  
Mootraghata.

Describe the differential  
diagnosis of Pneumonia,  
Chronic Obstructive  
Pulmonary Disease,  
Pleural effusion, and  
Bronchiectasis.

Describe the differential  
diagnosis of Measles,  
Chicken pox and Herpes  
zoster, Hand foot mouth  
disease, Rubella, Malaria,  
Filariasis, Influenza,  
Dengue, Leptospirosis,  
Chikungunya, Typhoid  
and other common  
regional disorders  
presenting with fever.

Describe the differential  
diagnosis of Anaemia,  
Nutritional anemia,  
Thalassemia, Sickle cell  
anemia, Leukaemia, and  
Thrombocytopenia.

Describe the differential  
diagnosis of Coronary  
Artery Disease (Ischemic  
Heart Disease, and  
Myocardial Infarction)  
and Congestive cardiac  
failure.

Describe the differential  
diagnosis of Hepatobiliary  
diseases - Liver cirrhosis,  
Alcoholic and Non -  
Alcoholic Liver Diseases,  
Hepatitis, Jaundice, and  
Ascites.

Describe the differential  
diagnosis of  
Hypothyroidism and  
hyperthyroidism.

Describe the differential diagnosis of Obesity.

Describe the differential diagnosis of Diabetes Mellitus and Pancreatitis.

Describe the differential diagnosis of Common neurologic diseases: Parkinson's disease, Stroke, Bell's Palsy, Motor Neuron Disease, Transverse myelitis, Epilepsy (Organic), and Common Spine disorders: Lumbago- Sciatica syndrome, Brachial neuralgia, Cervical, and Lumber Spondylosis.

Describe the differential diagnosis of Diseases of bone and Joints - Osteoarthritis, Osteoporosis. Frozen Shoulder, Calcaneal spur/ Plantar fasciitis, Tennis elbow, Carpel tunnel syndrome, and Muscular diseases - Muscular Dystrophy.

Describe the differential diagnosis of Rheumatic fever, Rheumatoid arthritis, SLE, Ankylosing spondylitis, and Gout.

Describe differential diagnosis of Sexual dysfunction and Infertility.

Describe differential diagnosis of Syphilis and Gonorrhoea.

Describe the differential



	<p>diagnosis of clinical presentation of Hookworm, Roundworm, Threadworm, and Pinworm.</p> <p>Describe the differential diagnosis of the clinical presentation of Tuberculosis.</p>		
CO2,CO5	<p>10. Clinical features - Role plays in learning:</p> <p>Describe the clinical features of Ulcerative and Non-ulcerative dyspepsia, Irritable Bowel Syndrome, and Inflammatory Bowel Diseases.</p> <p>Describe the clinical features of Urinary Tract Infection, Prostatomegaly, Nephrotic syndrome, Nephritic syndrome, Acute Kidney Injury, and Chronic Kidney Disease.</p> <p>Describe the clinical features of Pneumonia, Chronic Obstructive Pulmonary Disease, Pleural effusion, and Bronchiectasis.</p> <p>Describe the clinical features of Measles, Chicken pox and Herpes zoster, Hand foot mouth disease, Rubella, Malaria, Filariasis, Influenza, Dengue, Leptospirosis, Chikungunya, typhoid, and other common regional disorders presenting with fever.</p>	<p>Role plays:</p> <p>Role plays are an effective method of teaching to create a real-world scenario in a controlled manner.</p> <p>In this certain group of students will be trained for pre-class preparation regarding a disease or condition to be presented in the class in front of small cluster groups of students.</p> <p>Further, the groups are asked to interact with the performing student to understand more about a condition and use their clinical acumen to diagnose the condition moderated by an instructor.</p>	10

Describe the complications of Measles, Chicken pox and Herpes zoster, Hand foot mouth disease, Rubella, Malaria, Filariasis, Influenza, Dengue, Leptospirosis, Chikungunya, Typhoid, and other common regional disorders presenting with fever.

Describe the clinical features of Anaemia, Nutritional anemia, Thalassemia, Sickle cell anemia, Leukaemia, and Thrombocytopenia.

Describe the clinical features of Coronary Artery Disease (Ischemic Heart Disease, and Myocardial Infarction) and Congestive cardiac failure.

Describe the clinical features of Hepatobiliary diseases - Liver cirrhosis, Alcoholic and Non - Alcoholic Liver Diseases, Hepatitis, Jaundice, and Ascites.

Describe the clinical features of Hypothyroidism and hyperthyroidism.

Describe the clinical features of Diabetes Mellitus and Pancreatitis.

Describe the clinical features of Common neurologic diseases: Parkinson's disease, Stroke, Bell's Palsy,

	<p>Motor Neuron Disease, Transverse myelitis, Epilepsy (Organic), and Common Spine disorders: Lumbago- Sciatica syndrome, Brachial neuralgia, Cervical, and Lumber Spondylosis.</p> <p>Describe the clinical features of Diseases of bone and Joints - Osteoarthritis, Osteoporosis. Frozen Shoulder, Calcaneal spur/ Plantar fasciitis, Tennis elbow, Carpel tunnel syndrome, and Muscular diseases - Muscular Dystrophy.</p> <p>Describe the clinical features of Rheumatic fever, Rheumatoid arthritis, SLE, Ankylosing spondylitis, and Gout.</p>		
CO4,CO6,CO8	<p>11. Field visits:</p> <p>Visit to Pathology laboratory and Diagnostic imaging center.</p>	<p>Visit: Students are instructed to visit at least one pathology laboratory and one imaging center; observe the procedures followed. Record the observations and submit the report to the instructor.</p>	10

# Hours indicated are included in calculations of Table 3 and 4

**Table 5- Teaching learning method**

Sr No	Teaching learning methods in the course	No of Activities
1	Lecture	2
2	Lecture with Power point presentation	222
3	Lecture & Group Discussion	133

4	Lecture with Video clips	45
5	Discussions	16
6	Brainstorming	3
7	Inquiry-Based Learning	4
8	PBL	14
9	CBL	9
10	Project-Based Learning	16
11	Team project work	2
12	Flipped classroom	4
13	Blended Learning	3
14	Edutainment	2
15	Simulation	1
16	Role plays	10
17	Self-directed learning	6
18	Problem solving method	1
19	Recitation	31
20	Tutorial	3
21	Presentations	3
22	X ray identification	2
23	Case diagnosis	3
24	Lab report interpretation	18
25	Demonstration	2
26	Demonstration bedside	15
27	Demonstration Lab	1

These are overall teaching learning methods listed in Table 3 and 4. Teachers can select the best possible method amongst the given methods as per objective, available time etc.

**Table 6: Assessment Summary: Assessment is subdivided in A to H points**

### 6 A-Number of Papers and Marks Distribution

Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand
			Practical	Viva	Elective	IA	Sub	

							<b>Total</b>	<b>Total</b>
AyUG- RN	2	200	100	70	-	30	200	400

**6 B - Scheme of Assessment (formative and Summative)**

<b>PROFESSIONAL COURSE</b>	<b>DURATION OF PROFESSIONAL COURSE</b>		
	<b>First Term (1-6 Months)</b>	<b>Second Term (7-12 Months)</b>	<b>Third Term (13-18 Months)</b>
Second	3 PA & First TT	3 PA & Second TT	3 PA & UE **

**PA:** Periodical Assessment; **TT:** Term Test; **UE:** University Examinations.

\*\* University Examination shall be on entire syllabus

## 6 C - Calculation Method for Internal assessment Marks

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A 3	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 30 Marks (D/15*30)	Term Test (Marks converted to 30)	Sub Total _/60 Marks	Term Assessment (.../30)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert to 30 marks.							

## 6 D - Evaluation Methods for Periodical Assessment

S. No	Evaluation Methods
1	Activities Indicated in Table 3 - Column G3 as per Indicated I, II or III term in column I3

### Evaluation Methods in MSE

1. Practical / Clinical Performance
2. Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
3. Open Book Test (Problem Based)
4. Summary Writing (Research Papers/ Samhitas)
5. Class Presentations; Work Book Maintenance
6. Problem Based Assignment
7. Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)

## 6 E Question Paper Pattern

### II PROFESSIONAL BAMS EXAMINATIONS AyUG-RN

#### PAPER-1

Time: 3 Hours Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

		<b>Number of Questions</b>	<b>Marks per question</b>	<b>Total Marks</b>
Q 1	MULTIPLE CHOICE QUESTIONS (MCQ)	20	1	20
Q 2	SHORT ANSWER QUESTIONS (SAQ)	8	5	40
Q 3	LONG ANSWER QUESTIONS (LAQ)	4	10	40
				100

Similar for Paper II

## 6 F Distribution of theory examination

<b>Paper 1 Fundamental Principles of Vikriti Vigyan</b>						
<b>Sr. No</b>	<b>A List of Topics</b>	<b>B Term</b>	<b>C Marks</b>	<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
1	<b>1. Roga nidana – Pathophysiology and clinical diagnosis</b>	1	43	No	Yes	No
2	<b>2. Pareeksha</b>	1		Yes	Yes	Yes
3	<b>3. Methods of Rogi pareeksha</b>	1		No	Yes	Yes
4	<b>4. Sapeksha nidana - Vyavacchedaka nidana</b>	1		No	Yes	Yes
5	<b>5. Upashaya/ Anupashaya</b>	1		Yes	Yes	No
6	<b>6. Dosha Vikriti</b>	1		Yes	Yes	Yes
7	<b>7. Doshagati and Rogamarga</b>	1		Yes	Yes	Yes
8	<b>8. Srotodushti</b>	1		Yes	Yes	Yes
9	<b>9. Concept of Ama</b>	1		Yes	Yes	Yes
10	<b>10. Assessment of Ama</b>	1		Yes	Yes	No
11	<b>11. Sthana samshraya – Poorvaroop</b>	1	49	No	Yes	Yes
12	<b>12. Dushya dushti</b>	1		Yes	Yes	Yes
13	<b>13. Samprapti</b>	1		No	Yes	Yes
14	<b>14. Rupa</b>	1		Yes	Yes	Yes
15	<b>15. Vyadhinamakarana</b>	1		Yes	Yes	No
16	<b>16. Vyadhi</b>	1		Yes	Yes	Yes



17	17. Ashtanindita (Endocrine disorders)	1		Yes	Yes	No
18	18. Janapadodhwamsa vikara (Pandemic disorders)	1		Yes	Yes	No
19	19. Nidanarthakara Vyadhi, Vyadhisankara	1		Yes	Yes	No
20	20. Vyadhikshamatva	1		Yes	Yes	Yes
21	21. Rogi bala Pareeksha	1		Yes	Yes	No
22	22. Dhatu Paka	1		Yes	Yes	Yes
23	23. Infection and Nutritional disorders	1	8	Yes	Yes	No
24	24. Upadrava	2		Yes	Yes	No
25	25. Arishta	2		Yes	No	No
26	26. Vyadhi bala pareeksha	2		Yes	Yes	No
27	27. Sadhyasadhyatva – Prognosis	2		Yes	Yes	No
28	28. Digital health and Artificial intelligence in the context of Roganidana	2		Yes	No	No
<b>Total Marks</b>			<b>100</b>			

<b>Paper 2 Vyadhi Vigyan, contemporary understanding and updates</b>						
<b>Sr. No</b>	<b>A List of Topics</b>	<b>B Term</b>	<b>C Marks</b>	<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
29	1. Agnimandya – Ajeerna, Anaha, Adhmana, Atopa	2	43	Yes	Yes	Yes
30	2. Chhardi	2		Yes	Yes	No

31	<b>3. Amlapitta</b>	2		Yes	Yes	No
32	<b>4. Shoola</b>	2		Yes	Yes	Yes
33	<b>5. Atisara, and Pravahika</b>	2		Yes	Yes	Yes
34	<b>6. Grahani</b>	2		No	Yes	Yes
35	<b>7. Visuchika, Alasaka, Vilambika</b>	2		Yes	Yes	No
36	<b>8. Common GIT diseases</b>	2		Yes	Yes	No
37	<b>9. Mutrakrichhra</b>	2		Yes	Yes	No
38	<b>10. Mutraghata</b>	2		Yes	Yes	No
39	<b>11. Common Urinary diseases</b>	2		Yes	Yes	No
40	<b>12. Hikka</b>	2		Yes	Yes	No
41	<b>13. Shwasa</b>	2		Yes	Yes	Yes
42	<b>14. Kasa</b>	2		Yes	Yes	Yes
43	<b>15. Rajayakshma &amp; Shosha</b>	2		Yes	Yes	No
44	<b>16. Common lung disorders</b>	2		Yes	Yes	No
45	<b>17. Jwara</b>	2		Yes	Yes	Yes
46	<b>18. Masurika – Romantika</b>	2		Yes	No	No
47	<b>19. Fever</b>	2		Yes	Yes	No
48	<b>20. Pandu</b>	2		No	Yes	Yes
49	<b>21. Raktapitta</b>	2	25	Yes	Yes	Yes

50	<b>22. Hematopoietic diseases</b>	2		Yes	Yes	No
51	<b>23. Hridroga</b>	2		Yes	Yes	No
52	<b>24. Shotha</b>	2		No	Yes	Yes
53	<b>25. Cardiovascular disorders</b>	2		Yes	Yes	No
54	<b>26. Kamala</b>	2		No	Yes	Yes
55	<b>27. Udara Roga</b>	2		No	Yes	Yes
56	<b>28. Hepatobiliary diseases</b>	2		Yes	Yes	No
57	<b>29. Kushtha - Maha Kushtha &amp; Kshudra Kushtha (According to Charaka)</b>	3		No	Yes	Yes
58	<b>30. Sheetapitta</b>	3		No	Yes	Yes
59	<b>31. Shwitra</b>	3		No	Yes	Yes
60	<b>32. Visarpa</b>	3		No	Yes	Yes
61	<b>33. Skin diseases</b>	3		Yes	Yes	No
62	<b>34. Galaganda</b>	3		Yes	No	No
63	<b>35. Thyroid disorders</b>	3		Yes	Yes	No
64	<b>36. Sthoulya – Karshya</b>	3	32	No	Yes	Yes
65	<b>37. Obesity</b>	3		Yes	Yes	No
66	<b>38. Prameha</b>	3		No	Yes	Yes
67	<b>39. Diabetes Mellitus and Pancreatitis</b>	3		Yes	Yes	No

68	<b>40. Vatavyadhi</b>	3
69	<b>41. Snayugata vata</b>	3
70	<b>42. Common neurologic and spine disorders</b>	3
71	<b>43. Sandhigatavata and Asthi majja gata vata</b>	3
72	<b>44. Diseases of bone, joints, and muscles</b>	3
73	<b>45. Amavata</b>	3
74	<b>46. Vatarakta</b>	3
75	<b>47. Immunological &amp; Metabolic disorders</b>	3
76	<b>48. Klaibya &amp; Vandhyatva</b>	3
77	<b>49. Sexual dysfunction and Infertility</b>	3
78	<b>50. Unmada &amp; Apasmara</b>	3
79	<b>51. Vishada</b>	3
80	<b>52. Murchha, and Sanyasa</b>	3
81	<b>53. Common Psychiatric diseases</b>	3
82	<b>54. Phiranga and Upadamsha</b>	3
83	<b>55. Syphilis &amp; Gonorrhoea</b>	3
84	<b>56. Krimiroga</b>	3
85	<b>57. Clinical presentation of common parasitic disorders</b>	3

No	Yes	Yes
No	Yes	Yes
Yes	Yes	No
No	Yes	Yes
Yes	Yes	No
No	Yes	Yes
No	Yes	Yes
Yes	Yes	No
Yes	No	No
Yes	No	No
Yes	No	No
Yes	No	No
Yes	No	No
Yes	No	No
Yes	Yes	No

86	<b>58. Khalitya &amp; Palitya</b>	3		Yes	No	No
87	<b>59. Shleepada</b>	3		Yes	No	No
88	<b>60. Tuberculosis</b>	3				
<b>Total Marks</b>			<b>100</b>			

Paper No:1		
Question No	Type of Question	Question Paper Format
Q1	<p><b>Multiple choice Questions</b>  <b>20 Questions</b>  <b>1 mark each</b>  <b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b>  <b>Desirable to know - 3 MCQ</b>  <b>Nice to know part - 2 MCQ</b></p>	<p>1. 2. Pareeksha  2. 5. Upashaya/ Anupashaya  3. 7. Doshagati and Rogamarga  4. 6. Dosha Vikriti  5. 8. Srotodushti  6. 9. Concept of Ama  7. 12. Dushya dushti  8. 15. Vyadhinamakarana  9. 16. Vyadhi  10. 17. Ashtanindita (Endocrine disorders)  11. 18. Janapadodhwamsa vikara (Pandemic disorders)  12. 19. Nidanarthakara Vyadhi, Vyadhisankara  13. 20. Vyadhikshamatva  14. 21. Rogi bala Pareeksha  15. 22. Dhatu Paka  16. 23. Infection and Nutritional disorders  17. 27. Sadhyasadhyatva – Prognosis / 24. Upadrava  18. 25. Arishta  19. 26. Vyadhi bala pareeksha  20. 28. Digital health and Artificial intelligence in the context of Roganidana</p>
Q2	<p><b>Short answer Questions</b>  <b>Eight Questions</b>  <b>5 Marks Each</b>  <b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b>  <b>Desirable to know - 1 SAQ</b>  <b>No questions on Nice to know</b></p>	<p>1. 1. Roga nidana – Pathophysiology and clinical diagnosis / 2. Pareeksha  2. 11. Sthana samshraya – Poorvaroop / 8. Srotodushti / 12. Dushya dushti / 7. Doshagati and Rogamarga / 6. Dosha Vikriti  3. 13. Samprapti / 16. Vyadhi / 19. Nidanarthakara Vyadhi, Vyadhisankara / 17. Ashtanindita (Endocrine disorders) / 14. Rupa  4. 20. Vyadhikshamatva / 21. Rogi bala Pareeksha / 18. Janapadodhwamsa vikara (Pandemic disorders) / 19. Nidanarthakara Vyadhi, Vyadhisankara / 22. Dhatu Paka  5. 26. Vyadhi bala pareeksha / 27. Sadhyasadhyatva – Prognosis / 24. Upadrava  6. 23. Infection and Nutritional disorders  7. 10. Assessment of Ama / 9. Concept of Ama  8. 5. Upashaya/ Anupashaya</p>

<p><b>Q3</b></p>	<p><b>Long answer Questions</b>  <b>Four Questions</b>  <b>10 marks each</b>  <b>All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable to know</b></p>	<p><b>1.</b> 4. Sapeksha nidana - Vyavacchedaka nidana / 3. Methods of Rogi pareeksha / 12. Dushya dushti / 6. Dosha Vikriti / 2. Pareeksha</p> <p><b>2.</b> 11. Sthana samshraya – Poorvarooopa / 14. Rupa</p> <p><b>3.</b> 9. Concept of Ama / 22. Dhatu Paka / 8. Srotodushti / 7. Doshagati and Rogamarga</p> <p><b>4.</b> 20. Vyadhikshamatva / 22. Dhatu Paka</p>
<p><b>Paper No:2</b></p>		
<p><b>Question No</b></p>	<p><b>Type of Question</b></p>	<p><b>Question Paper Format</b></p>
<p><b>Q1</b></p>	<p><b>Multiple choice Questions</b>  <b>20 Questions</b>  <b>1 mark each</b>  <b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b>  <b>Desirable to know - 3 MCQ</b>  <b>Nice to know part - 2 MCQ</b></p>	<p><b>1.</b> 1. Agnimandya – Ajeerna, Anaha, Adhmana, Atopa / 2. Chhardi</p> <p><b>2.</b> 3. Amlapitta / 4. Shoola / 7. Visuchika, Alasaka, Vilambika</p> <p><b>3.</b> 5. Atisara, and Pravahika / 8. Common GIT diseases</p> <p><b>4.</b> 13. Shwasa / 15. Rajayakshma &amp; Shosha / 12. Hikka / 14. Kasa</p> <p><b>5.</b> 16. Common lung disorders</p> <p><b>6.</b> 11. Common Urinary diseases</p> <p><b>7.</b> 17. Jwara / 19. Fever / 18. Masurika – Romantika</p> <p><b>8.</b> 25. Cardiovascular disorders / 22. Hematopoietic diseases</p> <p><b>9.</b> 28. Hepatobiliary diseases</p> <p><b>10.</b> 33. Skin diseases</p> <p><b>11.</b> 35. Thyroid disorders / 34. Galaganda</p> <p><b>12.</b> 37. Obesity</p> <p><b>13.</b> 39. Diabetes Mellitus and Pancreatitis</p> <p><b>14.</b> 42. Common neurologic and spine disorders</p> <p><b>15.</b> 44. Diseases of bone, joints, and muscles / 47. Immunological &amp; Metabolic disorders</p> <p><b>16.</b> 48. Klaibya &amp; Vandhyatva / 49. Sexual dysfunction and Infertility</p> <p><b>17.</b> 51. Vishada / 50. Unmada &amp; Apasmara</p> <p><b>18.</b> 57. Clinical presentation of common parasitic disorders / 52. Murchha, and Sanyasa</p> <p><b>19.</b> 54. Phiranga and Upadamsha / 55. Syphilis &amp; Gonorrhoea</p> <p><b>20.</b> 57. Clinical presentation of common parasitic disorders / 59. Shleepada / 56. Krimiroga / 60. Tuberculosis</p>

<p><b>Q2</b></p>	<p><b>Short answer Questions</b>  <b>Eight Questions</b>  <b>5 Marks Each</b>  <b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b>  <b>Desirable to know - 1 SAQ</b>  <b>No questions on Nice to know</b></p>	<ol style="list-style-type: none"> <li>1. 5. Atisara, and Pravahika / 1. Agnimandya – Ajeerna, Anaha, Adhmana, Atopa / 2. Chhardi / 8. Common GIT diseases / 6. Grahani / 3. Amlapitta / 4. Shoola / 7. Visuchika, Alasaka, Vilambika</li> <li>2. 11. Common Urinary diseases / 9. Mutrakrichhra / 10. Mutraghata</li> <li>3. 25. Cardiovascular disorders / 23. Hridroga / 20. Pandu / 17. Jwara / 26. Kamala / 28. Hepatobiliary diseases / 19. Fever / 21. Raktapitta / 22. Hematopoietic diseases / 24. Shotha</li> <li>4. 32. Visarpa / 31. Shwitra / 27. Udara Roga / 29. Kushtha - Maha Kushtha &amp; Kshudra Kushtha (According to Charaka) / 33. Skin diseases / 26. Kamala / 28. Hepatobiliary diseases / 30. Sheetapitta</li> <li>5. 40. Vatavyadhi / 44. Diseases of bone, joints, and muscles / 43. Sandhigatavata and Asthi majja gata vata / 46. Vatarakta / 42. Common neurologic and spine disorders / 45. Amavata / 41. Snayugata vata / 47. Immunological &amp; Metabolic disorders</li> <li>6. 57. Clinical presentation of common parasitic disorders / 60. Tuberculosis</li> <li>7. 13. Shwasa / 15. Rajayakshma &amp; Shosha / 12. Hikka / 16. Common lung disorders / 14. Kasa</li> <li>8. 39. Diabetes Mellitus and Pancreatitis / 37. Obesity / 38. Prameha</li> </ol>
<p><b>Q3</b></p>	<p><b>Long answer Questions</b>  <b>Four Questions</b>  <b>10 marks each</b>  <b>All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable to know</b></p>	<ol style="list-style-type: none"> <li>1. 13. Shwasa / 5. Atisara, and Pravahika / 1. Agnimandya – Ajeerna, Anaha, Adhmana, Atopa / 6. Grahani / 4. Shoola / 14. Kasa</li> <li>2. 20. Pandu / 17. Jwara / 38. Prameha / 21. Raktapitta / 36. Sthoulya – Karshya / 24. Shotha</li> <li>3. 32. Visarpa / 31. Shwitra / 27. Udara Roga / 29. Kushtha - Maha Kushtha &amp; Kshudra Kushtha (According to Charaka) / 26. Kamala / 30. Sheetapitta</li> <li>4. 40. Vatavyadhi / 43. Sandhigatavata and Asthi majja gata vata / 46. Vatarakta / 41. Snayugata vata</li> </ol>



## 6 H Distribution of Practical Exam

S.No	Heads	Marks
1	<p><b>Spotting/ Identification: (10 Questions X 3 Marks = 30 Marks): (Note: Minimum of one spotting should be kept mandatorily from all the different heads mentioned below)</b></p> <p><b>X-Ray/ECG/ Clinical sign picture/ Slide/ Diagnostic report/ Causative factors</b></p> <p><b>X-Ray (Assessment format):</b></p> <p>On a given X-Ray film (Any of the below):</p> <ul style="list-style-type: none"> <li>• Comment on inspiration and rotation (chest), position, penetration or exposure, and artifacts in a given X-Ray film</li> <li>• Find out the abnormal findings or sign that indicates a specific condition (By assessing size, shape, density, and location of structures) – Airway/ Bones and soft tissue/ Cardiac/ Diaphragm/ Effusion/ Gastric bubble/ Hila and mediastinum)</li> </ul> <p><b>ECG (Assessment format):</b></p> <p>On a given Electro Cardio Gram (Any of the below):</p> <ul style="list-style-type: none"> <li>• Determine and comment on rhythm and rate (Paper and pencil method/ Caliper method/ 10-times method/ 1500 method)</li> <li>• P wave interpretation (Location/ Amplitude/ Duration/ Configuration/ Deflection)</li> <li>• PR interval interpretation (Location and duration)</li> <li>• QRS complex interpretation (Location/ Amplitude/ Duration/ Configuration/ Deflection)</li> <li>• ST segment interpretation (Location and deflection)</li> <li>• T wave interpretation (Location/ Amplitude/ Configuration/ Deflection)</li> </ul> <p><b>Clinical sign/ image or picture (Assessment format):</b></p> <p>On a given image of a patient with sign (Any of the below):</p> <ul style="list-style-type: none"> <li>• Identify the sign</li> <li>• Possible aetiologies behind the case</li> <li>• Possible investigations for further confirmation of a case</li> <li>• Differential diagnosis</li> <li>• Diagnose the condition or disease associated with the sign</li> </ul> <p><b>Slide (Assessment format):</b></p> <p>Identify and mention the provisional diagnosis of (Any of the below):</p> <ul style="list-style-type: none"> <li>• Haematology (Peripheral blood smear)</li> <li>• Histopathology (Lung and trachea/ Blood, Spleen and lymph/ Heart and vessels/ Glands/ Liver)</li> <li>• Stool microscopy (Ova, Cyst, Pus cells)</li> </ul>	30

	<ul style="list-style-type: none"> <li>• Urine microscopy (Epithelial cells, RBCs, Leukocytes, Casts, Crystals)</li> <li>• Microbiology (Bacterial identification – Shape, Gram+ve/ Gram –ve)</li> <li>• Parasitology (Slide/ Specimen)</li> </ul> <p><b>Diagnostic report (Assessment format):</b> Interpret the report and mention the provisional diagnosis (Any of the below):</p> <ul style="list-style-type: none"> <li>• Hemogram</li> <li>• Liver Function Test (LFT)</li> <li>• Renal Function Test (RFT)</li> <li>• Diabetic profile</li> <li>• Thyroid profile</li> <li>• Lipid profile</li> </ul> <p><b>Causative factors/ Hetu (Assessment format):</b> Mention the disease or diseases that are associated with the cause or hetu (Shown as an object/ model/ specimen/ picture) with brief justification (Any of the below):</p> <ul style="list-style-type: none"> <li>• Any specific diet</li> <li>• Any specific regimen</li> <li>• Any specific factor mentioned for causing a disease</li> </ul>	
2	<p><b>Long Case: History taking, Examination, Investigation (Order and interpretation), Differential Diagnosis, Provisional Diagnosis (1 Case X 40 Marks = 40 Marks)</b></p> <p><b>a. History taking (Including communication skills) - 10 Marks</b></p> <p>History taking should cover the following points:</p> <ul style="list-style-type: none"> <li>• AturaVivara (Basic patient details)</li> <li>• Pradhana Vedana with Kala prakarsha (Chief complaints with duration)</li> <li>• Vartamana vyadhi vruttant (History of present illness)</li> <li>• Poorva vyadhi Vrittanta (Past illness)</li> <li>• Kula vruttanta (Family history)</li> <li>• Chikitsa Vruttanta (Treatment history)</li> <li>• Vayaktika Vruttanta (Personal history) – Ahara, Vihara, Vyasana, Vyayama shakti, Mala pravritti, Mutra pravritti, Raja pravritti, Koshtha, Nature of work and duration of work, Emotional makeup, and Social Relation.</li> </ul> <p><b>b. Examination &amp; Order and interpretation of investigations – 20 Marks</b></p> <p>The examination should include the following points:</p> <ul style="list-style-type: none"> <li>• General examination including Ashtasthana pareeksha</li> <li>• Systemic examination - Pratyaksha and Anumana Pariksha/ Panchajnanendriyataha Pareeksha (Affected system/ systems), Sroto pareeksha and Mana pareeksha</li> </ul>	40

	<p>Investigations should include the following points: • Ordered investigation to patient</p> <ul style="list-style-type: none"> <li>• Any further comment on the previously ordered investigations and any further suggestions</li> <li>• Interpretation of ordered investigation to the relevant case</li> </ul> <p><b>c. Differential Diagnosis, Provisional Diagnosis, and Final diagnosis. – 10 Marks</b></p> <p>Differential diagnosis and diagnosis (Vyavachedaka nidana and vyadhi vinischaya) should include the following:</p> <ul style="list-style-type: none"> <li>• Group of suspicious diseases based on your knowledge on Ayurveda and contemporary science against your observation on patient</li> <li>• Justification for inclusion and exclusion of diseases based on pratyatma lakshana</li> <li>• Arriving at a final diagnosis based on the clinical acumen</li> <li>• Drafting the samprapti ghataka (Involvement of dosha, dushya, indriya, manas, agni, koshta, srotas, srotodushti prakara, udbhava sthana, sanchara sthana vyakta sthana, rogamarga, upadrava, arishta, sadhyasadhyata)</li> </ul>	
3	<p><b>Demonstration: Clinical examination on the simulator or a patient or Simulated patient (SP) (1 Demonstration X 30 Marks = 30 Marks):</b></p> <p>The student will be given a specific case or a scenario (other than the case given for long case taking) and asked to perform the examination of a particular system as a whole or a part of the examination such as inspection or palpation or percussion or auscultation or any specific tests or group of tests or elicit any particular sign for any of the following system (Only steps of examination to be written with observation and interpretation after demonstration):</p> <ul style="list-style-type: none"> <li>• Respiratory system examination</li> <li>• Cardiovascular System examination</li> <li>• Oral cavity and per abdominal examination</li> <li>• Nervous system examination</li> <li>• Locomotor system examination</li> <li>• Integumentary system examination</li> </ul>	30
4	<p><b>Viva mark distribution and basic instructions</b></p> <p><b>Conceptual and theoretical questions:</b></p> <p><b>MK:</b></p>	70

Pareeksha, Dosha Vkr̥ti, Dhatu and Sroto vaigunya, Ama, Nidana Panchaka, Kriyakala, Vyadhi, Vyadhikshamatwa, Dhatu Paka etc. Annavaha, Pureeshavaha, Pranavaha, Mutravaha, Rasavaha, Raktavaha, Medovaha, Vatavyadhi, Snayugata, Sandhigata vikara etc. **(20 Marks)**

**DK:**

Rogi and Roga Bala pareeksha, Doshagata and Rogamarga, Nidanarthakara roga, Vyadhi namakarana, Sadyasadyata, Upadrava etc. Common GIT diseases, Common Urinary diseases, Common lung disorders, Fever, Hematopoietic diseases, Cardiovascular disorders, Hepato-biliary disorders, Skin diseases, Thyroid disorders, Obesity, Metabolic diseases, Common neurologic and spine disorders, Diseases of bone, joints, and muscles, Immunological & Metabolic disorders, Common parasitic disorders, Tuberculosis etc. **(10 Marks)**

**Link to existing literature and critical thinking:**

**MK:**

Pareeksha, Dosha Vkr̥ti, Dhatu and Sroto vaigunya, Ama, Nidana Panchaka, Kriyakala, Vyadhi, Vyadhikshamatwa, Dhatu Paka etc. Annavaha, Pureeshavaha, Pranavaha, Mutravaha, Rasavaha, Raktavaha, Medovaha, Vatavyadhi, Snayugata, Sandhigata vikara etc. **(20 Marks)**

**DK:**

Rogi and Roga Bala pareeksha, Doshagata and Rogamarga, Nidanarthakara roga, Vyadhi namakarana, Sadyasadyata, Upadrava etc. **(10 Marks)**

**Viva on activity book:**

Questions to be asked as per the heads provided in the activity book (10 Marks)

**Basic instructions:**

Number of questions: There must be a total minimum of 10 questions and a maximum of 15 questions from both examiners.

1. The questions asked during a viva should be relevant, thought-provoking, and designed to assess the candidate's understanding, knowledge, and critical thinking skills.
2. Breadth and depth: The questions should cover a wide range of topics related to both the papers as well as activity and practical with equal importance, ensuring that they have a comprehensive understanding, critical thinking, and analysis.
3. Open-ended: Questions should be open-ended rather than requiring simple yes/no answers. This allows the candidate to demonstrate their understanding and ability to provide detailed explanations and justifications.

	<p>4. Conceptual and theoretical: Some questions should focus on the candidate's understanding of key concepts, theories, and methodologies within their syllabus. This helps evaluate their grasp of foundational knowledge and their ability to apply it.</p> <p>5. Critical thinking: The questions should encourage the candidate to think critically, analyze the subject, and findings, and identify limitations or alternative perspectives.</p> <p>6. Link to existing literature: Some questions can explore the candidate's knowledge and understanding of relevant literature in contemporary science.</p> <p>7. Follow-up questions: It can be effective to ask follow-up questions to probe deeper into the candidate's responses. This helps assess their ability to defend, respond to challenges, and think on their feet.</p> <p>8. Avoid leading questions: It is important to avoid leading questions that provide the candidate with clues or guide them towards a specific answer. The goal is to assess their independent thinking and understanding.</p> <p>9. Balance: The questions should strike a balance between being challenging and fair. It should push the candidate's limits without being excessively difficult or intimidating.</p> <p>10. No questions will be asked from Nice to know category. However, 70% of the questions are to be asked from Must Know category and 30% from the Desirable to Know category by the examiner.</p>	
5	Internal assessments	30
<b>Total Marks</b>		<b>200</b>

## References Books/ Resources

S.No	Book	Resources
1	1. Madhava Nidana	Srikanta Murthy KR. Madhava Nidanam (Rogaviniscaya) of Madhavakara. Varanasi: Chaukhambha Orientalia; 2013
2	2. Charaka Samhita	Agnivesh, Charaka, Dridhbala . Reprint. Varanasi: Chowkhamba Sanskrit Series Office; 2009. Charaka Samhita
3	3. Susruta Samhita	Acharya YT, editor. Sushruta Samhita of Sushruta. Reprint ed. Varanasi: Chaukhambha Orientalia; 2017
4	4. Ashtanga Hrudaya	Sadashiva HS, editor. 1st ed. Varanasi: Chaukhambha Sanskrit Sansthan; 2011. Astanga Hrudaya of Vagbhata
5	5. Ashtanga Sangraha	Vagbhata. Ashtanga Sangraha. Edited by Shivprasad Sharma. Chowkhambha Sanskrit series office, Varanasi
6	6. Roga vigyan evum vikruti vigyan	Yashwant Govind Joshi
7	7. Roganidan evum vikruti vigyan	Prof. Ajay Kumar Sharma; Chaukhambha Bharati Academy
8	8. Textbook of Ayurvediya vikrti-vijnana & Roga Vijnana	Dr. Parameswarappa S. Byadgi; Chaukhambha publications, New Delhi
9	9. Textbook of Pathology with Pathology Quick Review and MCQs	2018; Jaypee Brothers Medical Publishers; Harsh Mohan
10	10. A guide to pathology	Jaypee Brothers Medical Publishers; Eighth edition (2005); K Chaudhary
11	11. Robbins & Cotran Pathologic Basis of Disease	10th Edition - May 11, 2020; Kumar, Abbas, Aster; Elsevier publishers
12	12. Davidson's Principles and Practice of Medicine	24 <sup>th</sup> Edition 2022 by Ian Penman (Editor), Stuart H. Ralston (Editor), Mark Strachan (Editor), Richard Hobson (Editor); Elsevier publishers
13	13. A textbook of pathology	N.C Dey & T. K Dey; NCBA publisher 2009
14	14. Boyds Textbook of Pathology	10th Edition by J R Bhardwaj, Prabal Deb (Author), Wolters Kluwer India (Publisher)
15	15. Kundu's Bedside Clinics in Medicine	2020; KSP Udyog Publisher; Arup Kumar Kundu
16	16. P. J. Mehta's Practical Medicine	21st Edition – 2021; The National Book Depot; Nihar P Mehta, SP Mehta, SR Joshi
17	17. Macleod's Clinical Examination	13 <sup>th</sup> Edition, 2013 by J. Alastair Innes, Anna R. Dover, Karen Fairhurst
18	18. Clinical Methods in Medicine : Clinical Skills and Practices	2015; Jaypee Brothers Medical Publishers; S. N. Chugh, Eshan Gupta

19	19. Chamberlain's Symptoms and Signs in Clinical Medicine	2010; CRC Press; Andrew R. Houghton & David Gray
20	20. Hutchison's Clinical Methods: An Integrated Approach to Clinical Practice	2012; Elsevier publishers Michael Glynn, William M. Drake
21	21. Bates' Guide to Physical Examination and History Taking	Lippincott Williams & Wilkins; 2016 by M.D. Bickley, Lynn S. (Author), M.D. Szilagy, Peter G. (Author), M.D. Hoffman, Richard M. (Editor)
22	22. French's Index of Differential Diagnosis An A-Z 1	2016; CRC Press; by Mark T. Kinirons (Editor)
23	23. Savills System Of Clinical Medicine	14 <sup>th</sup> Edition 2005; CBS Publishers; by E C Warner (Author)
24	24. Todd-Sanford-Davidsohn clinical diagnosis and management by laboratory methods	2016; Saunders publishers; by Campbell James Todd (Author)
25	25. Clinical Methods In Ayurveda	2013; Chaukhamba Orientalia; by Prof. K.R. Srikantha Murthy (Author)
26	26. Clinical Diagnosis in Ayurveda (A Practical book of Ayurvedic Diagnosis in the Light of Modern Medical Science)	2015; Chaukhamba Sanskrit Pratishthan; by M. Srinivasulu (Author)
27	27. Medical Laboratory Technology	2009; Jaypee Brothers Medical Publishers; by Ramnik Sood (Author)
28	28. Textbook of Medical Laboratory Technology	Revised Reprint 2021; B. Godkar, Darshan P. Godkar; Bhalani publishing house
29	29. Practical biochemistry for medical, dental and allied courses	3 <sup>rd</sup> Edition; by Bd Toora G Rajagopal (Author)
30	30. Essential of clinical pathology	2010; First edition; Jaypee Brothers Medical Publishers; by Shirish M Kawthalkar (Author)
31	31. Textbook of human parasitology protozoology and helminthology	2020; CBS Publishers by Sood R. (Author)
32	32. Clinical Pathology & Clinical Bacteriology (For Medical Students and Practitioners)	Jaypee Brothers Medical Publishers; 9 <sup>th</sup> Edition; 2000 by Sachdev (Author)
33	33. Practical Pathology	Arya Publications; by K. Uma Chaturvedi (Author), Tejindar Singh (Author)
34	34. Text book on clinical biochemistry and hematology	Naveen Chandra, Anmol Publisher ; First edition, 2015

35	35. Medical Laboratory Technology	Third Edition, 2019; NCBA publishers by C R Maiti
36	36. Diagnosis and Treatment of Common Skin Diseases	2016; Jaypee Brothers Medical Publishers; by Virendra N Sehgal (Author)
37	37. Ananthanarayan and Paniker's Textbook of Microbiology	Eleventh Edition; 2020; Universities Press (India) Pvt. Ltd; by R Ananthanarayan and CK Jayaram Paniker (Author), Reba Kanungo (Editor)
38	38. Learning Radiology: Recognizing the Basics	2015; Saunders publishers; by William Herring MD FACR (Author)
39	39. Radiology in Medical Practice	2015; Elsevier India; by A B M Abdullah (Author)
40	40. Clark's Positioning in Radiography	13 <sup>th</sup> Edition; 2015; CRC Press; by A. Stewart Whitley (Author), Gail Jefferson (Author), Ken Holmes (Author), Charles Sloane (Author), Craig Anderson (Author), Graham Hoadley (Author)
41	41. Textbook Of Radiology For Residents And Technicians	2018; CBS Publishers; by Bhargava S. K (Author)
42	42. Essentials Of ECG	2017; Avichal Publishing Company; by Vipin Gupta (Author)
43	43. Nidana chikitsa hastamalaka	2016; Baidyanath Ayurved publication; by Vaidya Ranjit Rai Desai
44	44. Rasavaisheshikam	Kottakal Ayurveda Series:120; 3 <sup>rd</sup> Edition; 2014; by K. Raghavan Tirumulpad
45	45. Taber's Cyclopedic Medical Dictionary	23 <sup>rd</sup> Edition; 2017; F.A. Davis Company; by Venes (Author)
46	46. Doshakaranatwa Mimamsa	Chowkhamba Bharati Academy ; 2013; by Acharya P.V. Sharma
47	47. Nadi Darshan	Motilal Banarsidass publishers; by Vaidya Tara Shankar Mishra
48	48. Ayurvediya shabdakosha	Laxmanshastri Joshi, Maharashtra Rajya Sahitya Mandal; 1968; by Veni Madhava Shastri
49	49. Kayachikitsa	Indrayani Sahithya Prakashan; 2015; by Vd Yashwant Govind Joshi
50	50. Dermatological Diseases A Practical Approach	3rd Edition – 2023; TreeLife Media (A division of Kothari Medical); by _ (Author), Venkataram Mysore, K H Satyanarayana Rao, Sacchidanand S, M Deepthi, (Editor)
51	51. Introduction to Kayachikitsa	Chaukhamba Orientalia Varanasi; 3 <sup>rd</sup> Edition; 1996; C. Dwarakanath



52	52. Digestion and metabolism in Ayurveda	Chowkhambha Krishnadas Academy; 1997; 2 <sup>nd</sup> Edition; by C. Dwarakanath
53	53. Ayurvedic Nadi Pariksha Vijnana	Chaukhamba Surbharati Prakashan; 2015; by Dr. Govind Prasad Upadhyay
54	54. NAMASTE portal	<a href="http://namstp.ayush.gov.in/#/index">http://namstp.ayush.gov.in/#/index</a>
55	55. AYUR PRAKRITI WEB PORTAL	<a href="http://www.ccras.res.in/ccras_pas/">http://www.ccras.res.in/ccras_pas/</a>
56	56. AYUSH research portal	<a href="https://ayushportal.nic.in/">https://ayushportal.nic.in/</a>
57	57. Dharaonline	<a href="http://www.dharaonline.org/Forms/Home.aspx">http://www.dharaonline.org/Forms/Home.aspx</a>
58	58. Stanford Medicine25	<a href="https://stanfordmedicine25.stanford.edu/">https://stanfordmedicine25.stanford.edu/</a>
59	59. Medscape Clinical Reference	<a href="http://www.medscape.com">www.medscape.com</a>
60	60. UpToDate	<a href="http://www.uptodate.com">www.uptodate.com</a>
61	61. Merck Manual Professional Edition	<a href="http://www.merckmanuals.com/professional">www.merckmanuals.com/professional</a>
62	62. DynaMed	<a href="http://www.dynamed.com">www.dynamed.com</a>
63	63. ClinicalKey	<a href="http://www.clinicalkey.com">www.clinicalkey.com</a>
64	64. Taber's Medical Dictionary	<a href="http://www.tabers.com/tabersonline">www.tabers.com/tabersonline</a>
65	65. MedlinePlus Medical Dictionary	<a href="https://medlineplus.gov/">https://medlineplus.gov/</a>
66	66. WebMD Symptom Checker	<a href="https://symptoms.webmd.com/">https://symptoms.webmd.com/</a> .
67	67. Mayo Clinic Symptom Checker	<a href="https://www.mayoclinic.org/symptom-checker/select-symptom/itt-20009075">https://www.mayoclinic.org/symptom-checker/select-symptom/itt-20009075</a> .
68	68. Simulated cases EM SIM CASES	<a href="https://emsimcases.com/">https://emsimcases.com/</a>
69	69. Daily rounds	<a href="https://dailyrounds.org/">https://dailyrounds.org/</a>
70	70. Prognosis	<a href="https://play.google.com/store/apps/details?id=com.medicalj oyworks.prognosis&amp;hl=en&amp;gl=US&amp;pli=1">https://play.google.com/store/apps/details?id=com.medicalj oyworks.prognosis&amp;hl=en&amp;gl=US&amp;pli=1</a>
71	71. PubMed Central	<a href="https://www.ncbi.nlm.nih.gov/pmc/">https://www.ncbi.nlm.nih.gov/pmc/</a>
72	72. Radiopaedia	<a href="https://radiopaedia.org/">https://radiopaedia.org/</a>

## Abbreviations

### Assessment

S.No	Short form	Discription
1	T-EMI	Theory extended matching item
2	T- EW	Theory Essay writing
3	T- MEQs	Theory MEQs
4	T-CRQs	Theory CRQs
5	T-CS	Theory case study
6	T-OBT	Theory open book test
7	P-VIVA	Practical Viva
8	P-REC	Practical Recitation
9	P-EXAM	Practical exam
10	PRN	Presentation
11	P-PRF	Practical Performance
12	P-SUR	Practical Survey
13	P-EN	Practical enact
14	P-RP	Practical Role play
15	P-MOD	Practical Model
16	P-POS	Practical Poster
17	P-CASE	Practical Case taking
18	P-ID	Practical identification
19	P-PS	Practical Problem solving
20	QZ	Quiz
21	PUZ	Puzzles
22	CL-PR	Class Presentation,
23	DEB	Debate
24	WP	Word puzzle
25	O-QZ	Online quiz

26	O-GAME	Online game-based assessment
27	M-MOD	Making of Model
28	M-CHT	Making of Charts
29	M-POS	Making of Posters
30	C-INT	Conducting interview
31	INT	Interactions
32	CR-RED	Critical reading papers
33	CR-W	Creativity Writing
34	C-VC	Clinical video cases,
35	SP	Simulated patients
36	PM	Patient management problems
37	CHK	Checklists
38	OSCE	OSCE
39	OSPE	OSPE,
40	Mini-CEX	Mini-CEX
41	DOPS	DOPS
42	CWS	CWS
43	RS	Rating scales
44	RK	Record keeping
45	COM	Compilations
46	Portfolios	Portfolios
47	Log book	Log book
48	TR	Trainers report
49	SA	Self-assessment
50	PA	Peer assessment
51	360D	360-degree evaluation
52	TT-Theory	Theory
53	PP-Practical	Practical
54	VV-Viva	Viva

## Domain

S.No	Short form	Discription
1	CK	Cognitive/Knowledge
2	CC	Cognitive/Comprehension
3	CAP	Cognitive/Application
4	CAN	Cognitive/Analysis
5	CS	Cognitive/Synthesis
6	CE	Cognitive/Evaluation
7	PSY-SET	Psychomotor/Set
8	PSY-GUD	Psychomotor/Guided response
9	PSY-MEC	Psychomotor/Mechanism
10	PSY-ADT	Psychomotor Adaptation
11	PSY-ORG	Psychomotor/Origination
12	AFT-REC	Affective/ Receiving
13	AFT-RES	Affective/Responding
14	AFT-VAL	Affective/Valuing
15	AFT-SET	Affective/Organization
16	AFT-CHR	Affective/ characterization

## T L method

S.No	Short form	Discription
1	L	Lecture
2	L&PPT	Lecture with Power point presentation
3	L&GD	Lecture & Group Discussion
4	L_VC	Lecture with Video clips
5	DIS	Discussions
6	BS	Brainstorming
7	IBL	Inquiry-Based Learning
8	PBL	PBL
9	CBL	CBL
10	PrBL	Project-Based Learning
11	TBL	TBL
12	TPW	Team project work
13	FC	Flipped classroom
14	BL	Blended Learning
15	EDU	Edutainment
16	ML	Mobile learning
17	ECE	ECE
18	SIM	Simulation
19	RP	Role plays
20	SDL	Self-directed learning
21	PSM	Problem solving method
22	KL	Kinesthetic Learning
23	W	Workshops
24	GBL	Game-Based Learning
25	D-M	Demo on Model

26	LS	Library Session
27	PL	Peer learning
28	RLE	Real life experience
29	REC	Recitation
30	SY	Symposium
31	TUT	Tutorial
32	PER	Presentations
33	PT	Practical
34	XRy	X ray identification
35	CD	Case diagnosis
36	LRI	Lab report interpretation
37	DA	Drug analysis
38	D	Demonstration
39	D_BED	Demonstration bedside
40	D_L	Demonstration Lab
41	DG	Demonstration Garden
42	FV	Field visit
43	PRA	Practical

॥ आयुषे सर्वलोकानाम् ॥



**Course curriculum for Second Professional BAMS**

**(PRESCRIBED BY NCISM)**

# **Samhita Adhyayan-2**

**(SUBJECT CODE : AyUG-SA2)**

**(Applicable from 2021-22 batch, from the academic year 2023-24 onwards for 5 years or until further notification by NCISM, whichever is earlier)**

**BOARD OF AYURVEDA**

**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE NEW DELHI-  
110058**

NCISM

## II Professional Ayurvedacharya (BAMS)

**Subject Code : AyUG-SA2**

### Summary

Total number of Teaching hours: 240			
Lecture hours(LH)-Theory		100	100(LH)
Paper I	100		
Non Lecture hours(NLH)-Theory		140	140(NLH)
Paper I	40		
Non Lecture hours(NLH)-Practical			
Paper I	NA		

Examination (Papers & Mark Distribution)					
Item	Theory Component Marks	Practical Component Marks			
		Practical	Viva	(Set SB)	IA
Paper I	100	-	75	10	15
Sub-Total	100	100			
Total marks	200				

**Important Note:-**The User Manual II BAMS is a valuable resource that provides comprehensive details about the curriculum file. It will help you understand and implement the curriculum. Please read the User Manual II before reading this curriculum file. The curriculum file has been thoroughly reviewed and verified for accuracy. However, if you find any discrepancies, please note them. Details in Practical list, Table 4 and Table 4a, considered authentic.

In case of difficulty and questions regarding curriculum write to [cur.imp@ncismindia.org](mailto:cur.imp@ncismindia.org)



## PREFACE

In continuation with the curriculum reforms started previous year, **Samhita Adhyayan-2** focuses on learning Samhita with due significance to the methodology of textual structuring and interpretation. Charakasamhita is taken as a model text here considering its vast contributions to Ayurveda. Students who learn Ayurveda will benefit by Samhita Adhyayan to comprehend sense of importance of its traditional classical literature. SA2 tries to justify the methodology of structuring samhita and appraise the importance of tools of decoding samhita such as tantrayukti and vyakhyana. Relating and interpreting the various references, explaining and interpreting important sidhantas, applying sidhantas in clinical practice, making use of specific diagnostic and assessment guidelines mentioned in Carakasamhita, demonstrating principles of management of various clinical conditions etc. are some of the thrust areas addressed. Importance of by hearting important slokas also is highlighted. The content of SA2 belongs to 54 chapters of Carakasamhita viz. Sutrasthana (18 chapters 13-30, initial 12 chapters already dealt in SA1), Nidanasthana (8 chapters), Vimanasthana (8 chapters), Shareerasthana (8 chapters) and Indriyasthana (12 chapters). Each chapter is taken as a unit in the syllabus. A chapter starts with short introduction (**adhyaya parichaya**) through justifying the position of the chapter and introducing key terms in the chapter. This is followed by explaining important sidhantas (**sidhanta-vivarana**) in the chapter. At the end summary of the chapter (**adhyayasangraha**) is done with the help of summarizing slokas at the end of the chapter. This will help students to map the whole content of the chapter, even though some of them are not dealt in detail during sidhanta-vivarana. **Sloka sangraha** (compilation of sloka) compiles the most important slokas in the chapter. Application of **Tantrayukti** and **Vyakhyana** in proper understanding of Samhita also is envisaged as a separate section while planning practicals. Efforts have been taken to design some interesting and innovative activities and practical as a part of developing this syllabus. They have been added to respective tables here. It does not restrict our teachers from designing and implementing more attractive and effective activities or customizing those ones which are enlisted, as and when needed, without losing spirit of the new outlook.

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**Course Code and Name of Course**

<b>Course code</b>	<b>Name of Course</b>
AyUG-SA2	Samhita Adhyayan-2

**Table 1- Course learning outcomes and matched PO**

<b>SR1 CO No</b>	<b>A1 Course learning Outcomes (CO) AyUG-SA2 At the end of the course AyUG-SA2, the students should be able to-</b>	<b>B1 Course learning Outcomes matched with program learning outcomes.</b>
CO1	<b>Justify the Methodology of structuring samhitas and appraise the importance of tools of decoding Charakasamhita (Tantrayukti and vyakhyana)</b>	PO1
CO2	<b>Relate and interpret various references of concepts in Charakasamhita</b>	PO1
CO3	<b>Explain and interpret biological factors and their measurements in the manifestation of diseases.</b>	PO1,PO3
CO4	<b>Explain and utilize various siddhantas in different dimensions of clinical practice.</b>	PO1,PO3,PO5
CO5	<b>Demonstrate the knowledge of dravya and adravya based therapeutics.</b>	PO1,PO3,PO5
CO6	<b>Apply diagnostic guidelines regarding diseases including arishta lakshana based on the principles mentioned in Charakasamhita</b>	PO1,PO3,PO7
CO7	<b>Explore the determinants of health in the background of Charakasamhita.</b>	PO1
CO8	<b>Develop ethical professional and moral codes and conducts as a physician.</b>	PO6,PO8,PO9

**Table 2 : Contents of Course**

<b>Paper 1</b>					
<b>Sr. No</b>	<b>A2 List of Topics</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
1	<b>Cha.Su.13- Sneha Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sneha yoni 2. Chaturvidha sneha and its qualities 3. Sneha kaala and its anupana 4. Pravicharana sneha 5. Acchapeya 6. Sneha matra and its indications 7. Introduction to sneha yogya and ayogya purusha 8. Introduction to ayoga, samyak yoga and atiyoga of snehapana 9. Koshta pariksha 10. Introduction to snehapana vidhi 11. Introduction to sadyasneha 12. Sneha vyapat kaarana, lakshana and chikitsa <b>III. Adhyaya sangraha</b>	1	37	3	1
2	<b>Cha.Su.14- Sveda Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Benefits of swedana 2. Swedana bheda 3. Swedana vidhi 4. Samyak swinna lakshana 5. Atiswinna lakshana and chikitsa 6. Swedana yogya and ayogya 7. Trayodasha agni sweda vivarana 8. Dasha vidha niragni sweda <b>III. Adhyaya sangraha</b>	1		2	1
3	<b>Cha.Su.15- Upakalpaneeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Samshodhana upayogi dravya sangraha 2. Aturalaya nirmana 3. Introduction to vamaana vidhi 4. Samsarjana krama 5. Introduction to virechana vidhi 6. Benefits of samshodhana <b>III. Adhyaya sangraha</b>	1		2	3
4	<b>Cha.Su.16- Chikitsaprabhritiya Adhyaya</b> <b>I. Adhyaya parichaya</b>	1		2	2

	<b>II. Siddhanta vivarana</b> 1. Samyak virikta – avirikta - ativirikta lakshana 2. Bahudosha lakshana 3. Benefits of samshodhan 4. Importance of samshodhan 5. Samshodhana atiyoga and ayoga chikitsa 6. Swabhavoparama vada 7. Chikitsa paribhasha 8. Qualities of chikitsa-prabhrita vaidya <b>III. Adhyaya sangraha</b>			
5	<b>Cha.Su.17- Kiyantashiraseeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Importance of shiras 2. Introduction to shiroroga, hridroga, vidradhi, madhumeha and madhumeha pidaka 3. 62 types of permutation and combination of doshas 4. Trayodasa sannipata (13 types of combination of doshas) 5. 12 types of vishama sannipata (Doshavikalpa) 6. Types of kshaya 7. Ojus 8. Doshagati <b>III. Adhyaya sangraha</b>	1	3	0
6	<b>Cha.Su.18-Trisotheeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Types of shotha 2. Trividha bodhya (three types of assessment of diseases) 3. Ekadeshaja shotha 4. Aparisankhyeyatwa of roga 5. Anukta roga (unnamed diseases) and its management 6. Karmas of prakrita doshas <b>III. Adhyaya sangraha</b>	1	1	3
7	<b>Cha.Su.19-Ashtodareeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sankhya samprapti of samanyaja vyadhi 2. Tridosha pradhanyata 3. Nija-agantu sambandha <b>III. Adhyaya sangraha</b>	1	1	3
8	<b>Cha.Su.20- Maharoga adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Vyadhibheda (classification of disease) 2. Agantu-mukha (causes of agantu diseases) 3. Trividha-prerana (three etiological factors) 4. Samanyaja-nanatmaja-vikara – classification	1	2	2

	5. Vataja-nanatmaja vikaras, atmarupa and prakupitakarma 6. Pittaja- nanatmaja vikaras, atmarupa and prakupitakarma 7. Kaphaja- nanatmaja vikaras, atmarupa and prakupitakarma <b>III. Adhyaya sangraha</b>			
9	<b>Cha.Su.21- Ashtauninditeeya adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Ashta nindita purusha 2. Ati sthula and ati karshya 3. Ashta dosha of sthaulya 4. Dosha-lakshana-hetu of karsya and sthaulya 5. Prasasta purusha lakshana 6. Chikitsa sutra of sthaulya and karsya 7. Nidra paribhasha 8. Arha and varjya for divaswapna 9. Effects of ratri jagarana and divaswapna 10. Types of Nidra <b>III. Adhyaya sangraha</b>	1	3	3
10	<b>Cha.Su.22- Langhanabrimhaneeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Shadupakrama 2. Swarooma and lakshana of shadupakrama 3. Dasavidhalanghana 4. Dasavidhalanghana-prayoga-niyama 5. Properties of dravyas used in shadupakrama 6. Samyaklakshana of langhana, brimhana and sthambhana 7. Atiyoga and ayoga of shadupakrama <b>III. Adhyaya sangraha</b>	1	3	2
11	<b>Cha.Su.23- Santarpaneeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Santarpana dravya 2. Santarpanajanya vyadhi 3. Chikitsasutra of santarpanajanya vyadhi 4. Apatarpanajanya vyadhi 5. Chikitsasutra of apatarpanajanya vyadhi <b>III. Adhyaya sangraha</b>	1	2	0
12	<b>Cha.Su.24- Vidhishoniteeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Shonita-pradhanyata 2. Shonita-dushti-karana 3. Shonitajanya roga 4. Shonita-dushti-chikitsa 5. Raktadushtilakshana in relation to dosha	1	3	2



	6. Vishuddharaktalakshana 7. Vishuddharakta-purusha-lakshana 8. Pathya in raktamoksha 9. Introduction to mada-murchaya-sanyasa <b>III. Adhyaya sangraha</b>			
13	<b>Cha.Su.25- Yajjapurushheeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Factors responsible for generation of purusha and diseases 2. Concept of hita ahara and its importance 3. Different factors related with ahara like aharayoni, prabhava, udarka, upayoga, rasa, gurvadi guna etc 4. Agryasangraha- (Aushadha- Anna-Vihara) 5. Terminology of pathya and apathya 6. Enumeration of aasavayoni <b>III. Adhyaya sangraha</b>	1	2	4
14	<b>Cha.Su.26- Atreyabhadhrakaapeeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sambhasha parishat on number of rasa 2. Gunas of parthivadi dravyas 3. Dravya prabhava and guna prabhava 4. Dravya karmukata siddhanta (pharmacodynamics) with respect to adhikarana, kala, karma, veerya, upaya and phala 5. Paradi guna 6. Rasadi-panchaka – Additional knowledge 7. Examples of samanapratyabdhha and vichitra pratyabdhha dravyas 8. Properties of vipaka 9. Perception of rasa, vipaka and veerya 10. Examples of prabhava 11. Types of viruddha and management of complications 12. Principles of treatment of diseases caused by viruddha ahara <b>III. Adhyaya sangraha</b>	1	3	3
15	<b>Cha.Su.27- Annapaana vidhi Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Benefits of hita ahara 2. Examples of hita ahara and ahita ahaara 3. Ahara Vargas 4. Importance of anna <b>III. Adhyaya sangraha</b>	1	4	2
16	<b>Cha.Su.28- Vividhashitapeeteeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b>	1	4	14





	<p>1. Caturvidha-ahara  2. Difference between hita aahara and ahita aahara  3. Susceptibility to diseases (with respect to pathya and apathya)  4. Vyadhi-saha shareera  5. Dhatupradoshaj, upadhatupradoshaj, indriyapradoshaja, malapradoshaja vikaras and treatment principles  6. Shakhagati and koshtagati of doshas  7. Causes of health and diseases  8. Importance of prajnaaparadha  <b>III. Adhyaya sangraha</b></p>				
17	<p><b>Cha.Su.29- Dashapraanaayataneeya Adhyaya</b>  <b>I. Adhyaya parichaya</b>  <b>II. Siddhanta vivarana</b>  1. Enumeration of dasa pranaayatana  2. Terminology of praanaabhisara vaidya and rogaabhisara vaidya, chadmachara, yogya bhisak and karmakovida  <b>III. Adhyaya sangraha</b></p>	2		2	2
18	<p><b>Cha.Su.30- Arthedashamahamooleeya Adhyaya</b>  <b>I. Adhyaya parichaya</b>  <b>II. Siddhanta vivarana</b>  1. Importance of hridaya  2. Best factors for life (shreshtatama bhava)  3. Four types of Ayu  4. Shashwatatwa of Ayurveda  5. Quality of Learner of Ayurveda  6. Ashtaprashna  7. Dashaprakaran  8. Synonyms of tantra  <b>III. Adhyaya sangraha</b></p>	2		2	0
19	<p><b>Cha.Ni.01-Jwara nidana Adhyaya</b>  <b>I. Adhyaya parichaya</b>  <b>II. Siddhanta vivarana</b>  1. Description of nidanapanchaka  2. Nidanaparyaya  3. Vyadhiparyaya  4. Ashtavidha jwaranidana , samprapti and lakshana.  5. Jwarapurvarupa  6. Jwara mahaprabhava vivarana  7. Jwara samkshipta chikitsa sutra.  8. Importance of ghrutapaan in jeerna jwara.  <b>III. Adhyaya sangraha</b></p>	2	19	2	2
20	<p><b>Cha.Ni.02-Raktapitta nidana Adhyaya</b>  <b>I. Adhyaya parichaya</b>  <b>II. Siddhanta vivarana</b>  1. Raktapitta paryaya and nirukti.  2. Raktapitta nidana, purvarupa, upadrava</p>	2		2	2

	3. Raktapitta marga, dosha anubhandha and sadhyaasadyata. 4. Raktapitta chikitsa sutra <b>III. Adhyaya sangraha</b>			
21	<b>Cha.Ni.03-Gulma nidana Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sankhya samprapti 2. Gulma sthanas 3. Nidana, lakshana and samprapti of vata-pitta-kahpaja gulma 4. Shonita gulma 5. Gulma purvarupa 6. Sadhya asadhya 7. Chikitsa sutra <b>III. Adhyaya sangraha</b>	2	2	2
22	<b>Cha.Ni.04-Prameha nidana adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sankhyasamprapti (vimsatiprameha) 2. Sampraptighataka (doshavishesha and dushyavishesha) 3. Nidanapanchaka of doshaja prameha (vata, pitta and kapha) 4. Sadhyasadyata 5. Poorvarupa 6. Upadrava 7. Chikitsasutra <b>III. Adhyaya sangraha</b>	2	2	3
23	<b>Cha.Ni.05-Kushta nidana Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Saptadravya of kushta 2. Aneka rupa of kushta 3. Samanya nidana and samanya purvarupa 4. Sadhyasadyata 5. Sapta kushta lakshana 6. Upadrava <b>III. Adhyaya sangraha</b>	2	2	4
24	<b>Cha.Ni.06-Shosha nidana Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Vishesha nidana, samprapti and lakshana of shosha 2. Purvarupa 3. Ekadasa rupa 4. Sadhyasadyata <b>III. Adhyaya sangraha</b>	2	2	2



25	<b>Cha.Ni.07-Unmada nidana Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sankhya samprapti 2. Unmadaabhimukha karana (predisposing factors of unmada) 3. Unmada nirvacana (ashta vibhrama) 4. Purvarupa 5. Vata-pitta-kapha-sannipataj unmada lakshna 6. Role of prajnaparadha 7. Chikitsasutra of unmada 8. Agantuja unmada- nidana, purvarupa, lakshana, chikitsa sutra <b>III. Adhyaya sangraha</b>	2		2	4
26	<b>Cha.Ni.08-Apasmara nidana adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Definition of apasmara 2. Apasmaraabhimukakarana (predisposing factors of unmada) 3. Vishesha lakshana of apasmara 4. Cikitsasutra 5. Nidanarthakara roga 6. Vyadhisankara 7. Suddha-asuddha cikitsa 8. Sadhyasadhyata – nirvacana 9. Tiryaggatadosha - cikitsasutra <b>III. Adhyaya sangraha</b>	2		2	4
27	<b>Cha.Vi.01- Rasa vimana Adhyayam</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Importance and objective of vimanasthana 2. Prakrutisamasamaveta and vikrutivishamasamaveta siddhanta 3. Chaturvidha Prabhava (rasa-dravya-dosh-vikara prabhava) 4. Examples of dravyaprabhava- taila, ghruta and madhu. 5. Dravyas which are avoided for regular consumption 6. Satmyaparibhasha and types 7. Aharavidhi visheshayatana 8. Ahara vidhi vidhana and bhojyasaadgunyam <b>III. Adhyaya sangraha</b>	3	24	2	3
28	<b>Cha.Vi.02-Trividha kuksheeya Adhyayam</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Three divisions of amashaya for deciding aharamatraa 2. Matraavat ahaara lakshan	3		2	0

	<p>3. Amatravatva of ahara  4. Effects of heenamaatra and atimatra of ahara  5. Mental factors which affect the digestion of food  6. Two types of amadosha  7. Hetu-linga and aushasdhya of amadosha  8. Demarcation of amasaya  <b>III. Adhyaya sangraha</b></p>			
29	<p><b>Cha.Vi.03-Janapadodhwansaneeya Vimanam Adhyaya</b>  <b>I. Adhyaya parichaya</b>  <b>II. Siddhanta vivarana</b>  1. Importance of timely collection of medicines.  2. Janapadodhwamsakara samanya bhavas (four causes of epidemic diseases)  3. Lakshanas of vikrut vayu, jala, desha and kala.  4. Chikitsa siddhanta of janapadodhwamsakara vikaras  5. Role of adharma in janapadodhwamsa  6. Niyata and aniyata ayu  7. Daiva and purushakara  8. Examples of hetuviparita chikitsa in jwara  9. Apatarpana and its types  10. Description of desha  <b>III. Adhyaya sangraha</b></p>	3	2	2
30	<p><b>Cha.Vi.04-Trividha roga vishesha vijnyaneeya adhyaya</b>  <b>I. Adhyaya parichaya</b>  <b>II. Siddhanta vivarana</b>  1. Three methods of diagnosing diseases  2. Characteristics of aptopadesh, pratyaksha and anumana  3. Application of aptopadesha, pratyaksha and anumana in clinical examination  <b>III. Adhyaya sangraha</b></p>	3	2	3
31	<p><b>Cha.Vi. 05- Sroto vimana Adhyaya</b>  <b>I. Adhyaya parichaya</b>  <b>II. Siddhanta vivarana</b>  1. Srotas paribhasha  2. Types of srotas  3. Types of srotodushti  4. Hetu, lakshan and chikitsa of strotodushti  <b>III. Adhyaya sangraha</b></p>	3	2	2
32	<p><b>Cha.Vi. 06-Roganika vimana adhyaya</b>  <b>I. Adhyaya parichaya</b>  <b>II. Siddhanta vivarana</b>  1. Dvididha vyadhi bheda based on prabhava, bala, adhishtana, nimitta, ashaya bheda.  2. Vyadhi aparisamkheyatva  3. Relation between shareerika and manasika dosha.  4. Anubhandhy-anubandha roga  5. Agni bheda, prakruti bheda.</p>	3	2	2



	6. Vatala prakrutigata roga, their hetu and chikitsa, pitta prakrutigata roga, their hetu and chikitsa-kapha-prakrutigata roga, their hetu and chikitsa 7. Raja vaidya gunas <b>III. Adhyaya sangraha</b>				
33	<b>Cha.Vi. 07- Vyadhita rupeeya vimana Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Dvididha vyadhita purusha based on severity of disease and clinical presentation 2. Krimi bheda 3. Trividha chikitsa <b>III. Adhyaya sangraha</b>	3		2	2
34	<b>Cha.Vi. 08-Rogabhishagjiteeyam Adhyaayam.</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Shastra pareeksha 2. Means of learning shastra 3. Adhyayana and adhyapana vidhi 4. Sambhasaha vidhi- Types 5. Three types of parishat 6. Vadamarga padani 7. Methodology of Vada and its benefits 8. Dashavidha pareeksya bhava 9. Dashavidha atura pareeksha <b>III. Adhyaya sangraha</b>	3		5	11
35	<b>Cha.Sha.01-Katithapurushheeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sareera and sareerasthana 2. Purusha and its types 3. Manonirupanam 4. Atmalinga 5. Ashtaprakriti and shodasavikara 6. Srishtyutpatti and pralaya 7. Trividha dukhahetu 8. Prajnaparadha 9. Daiva 10. Naishtikichikitsa 11. Vedana and vedana adhishtana 12. Vedananasahetu 13. Moksha 14. Smriti hetus <b>III. Adhyaya sangraha</b>	2	13	2	3
36	<b>Cha.Sha.02-Atulyagothreeyam Adhyaaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b>	2		1	0



	1. Prerequisites of conception 2. Shodashadhatu in shareera 3. Sexual abnormalities 4. Sadyogriheeta garbhinee lakshana 5. Ativahikapurussha 6. Daiva & paurusha 7. Roganutpatti <b>III. Adhyaya sangraha</b>			
37	<b>Cha.Sha.03-Khuddika garbhavakranti Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Matrujadi bhavas in garbha 2. Beeja & beejabhaga <b>III. Adhyaya sangraha</b>	2	1	0
38	<b>Cha.Sha.04-Mahatee garbhavakranti Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Garbha & garbhaposhana 2. Garbhopaghatakara bhava 3. Congenital abnormalities 4. Trividhasatva bheda (manasaprakriti) <b>III. Adhyaya sangraha</b>	2	1	2
39	<b>Cha.Sha.05-Purushavichaya Shareera Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Lokapurushasamyā 2. Hetwadi panchaka 3. Satya buddhi <b>III. Adhyaya sangraha</b>	2	1	4
40	<b>Cha.Sha.06-Sareeravichaya adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Definition of sareera 2. Samanyavishesha sidhanta – applied aspect 3. Shareera dhatuguna 4. Shareeravriddhikarabhava 5. Balavriddhikarabhava 6. Aharaparinamakarabhava 7. Sareeraguna bheda 8. Kala-akala mrityu 9. Param ayu karanam <b>III. Adhyaya sangraha</b>	2	1	2
41	<b>Cha.Sha.07- Sareerasankhya sareera Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Paramanu bheda of shareera	2	1	2



	<b>III. Adhyaya sangraha</b>				
42	<b>Cha.Sha.08-Jathisutreeya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sutikagara 2. Garbhopaghatakara bhava <b>III. Adhyaya sangraha</b>	2		1	12
43	<b>Cha.In.1-Varnasvariya Indriya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Factors for assessing rishta 2. Six types of prakruti bheda 3. Rishtaadhikara kruta vikruti bheda 4. Prakruta and vaikarika varna 5. Varnavishayak arishta 6. Prakruta and vaikarika swara 7. Swara vishayak arishta <b>III. Adhyaya sangraha</b>	3	7	1	1
44	<b>Cha.In.2-Pushpitakam Indriya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Gandha vishayaka samgrah 2. Rasa vishayaka arishta <b>III. Adhyaya sangraha</b>	3		1	0
45	<b>Cha.In.3-Parimarshaneeyam Indriyam Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sparshagamy bhava (palpable signs) 2. Sparshavishayak arishta lakshana <b>III. Adhyaya sangraha</b>	3		1	0
46	<b>Cha.In.4-Indriyaneekam Indriya adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Indriya vishayaka arishta samanya niyama (general rule regarding involvement of indriya) <b>III. Adhyaya sangraha</b>	3		1	0
47	<b>Cha.In.5-Purvarupeeyam Indriyam Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Jvara rupa vishayaka poorvaroopiya rishta (rishta based on purvarupa of jvara) 2. Swapna bheda (types of swapna) <b>III. Adhyaya sangraha</b>	3		1	2
48	<b>Cha.In.6-Katamanisharireeyam Indriyam Adhyaya</b> <b>I. Adhyaya parichaya</b>	3		1	0

	<b>II. Sidhanta vivarana</b> 1. Rishta related to pureesha, mutra and swayathu <b>III. Adhyaya sangraha</b>			
49	<b>Cha.In.7-Pannarupiyam Indriyam Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Pratichaya vishayaka arishta 2. Chaya vikruti arishtas 3. Five types chaya bheda 4. Seven types prabha bheda <b>III. Adhyaya sangraha</b>	3	1	0
50	<b>Cha.In.8-Avakshiraseeyam Indriyam Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Adhyaya sangraha</b>	3	1	0
51	<b>Cha.In.9-Yasya shyavanimitiya Indriya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Ashtamaharogas <b>III. Adhyaya sangraha</b>	3	1	0
52	<b>Cha.In.10-Sadyomaraneeyam Indriya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Sadyo maraneeya arishtas <b>III. Adhyaya sangraha</b>	3	1	0
53	<b>Cha.In.11-Anujyotiyam Indriya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Definition of Arishta <b>III. Shloka sangraha</b>	3	1	0
54	<b>Cha.In.12-Gomayachurniyam Indriya Adhyaya</b> <b>I. Adhyaya parichaya</b> <b>II. Siddhanta vivarana</b> 1. Mumurshu lakshana, 2. Prashasta doota lakshana and mangalika dravya. 3. Arogya janaka bhava <b>III. Adhyaya sangraha</b>	3	1	17
<b>Total Marks</b>		<b>100</b>	<b>100 hr</b>	<b>140 hr</b>

**Table 3: Learning objectives (Theory) of Course**

Paper 1									
A3 Course outcome	B3 Learning Objective (At the end of the session, the students should be able to)	C3 Domain/sub	D3 Must to know / desirable to know / Nice to know	E3 Level Does/ Shows how/ Knows how/ Knows	F3 T-L method	G3 Assessment  (Refer abbreviations)	H3 Formative/ summative	I3 Term	J3 Integration
<b>Topic 1 Cha.Su.13- Sneha Adhyaya</b> (Lecture :3 hours, Non lecture: 1 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theory,VV-Viva	F&S	I	
CO2	Explain basic meaning and importance of key terms in the chapter such as sneha, snehayoni, caturvidhasneha, acchasnehapaana, sadyasneha and pravicharana.	CK	MK	K	L&G D,BS	QZ ,COM,TT-Theory,VV-Viva	F&S	I	
CO4,CO5	Enlist sthavara and jangam snehayoni Ch Su 13/9-11	CK	MK	K	L&G D,ML	M-POS,TT-Theory	F&S	I	
CO4,CO5	Justify why tila taila is the best among taila varga. Ch Su 13/12	CK	MK	KH	L,L& PPT, DA	T-EMI	F&S	I	
CO4,CO5	Explain qualities and mode of action of eranda taila Ch. Su 13/12	CK	DK	KH	L,L_ VC,D A	T-EMI	F&S	I	
CO4,CO5	Enlist four types of sneha and justify sarpi as the best (shreshta).	CC	MK	KH	L,DIS	PRN,TT-Theo	F&S	I	

	Ch .Su 13/13				,DA	ry,VV-Viva			
CO4,CO5	Explain snehapaan kaala and anupaan Ch .Su 18-22	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Define and enlist 24 types of pravicharana sneha and other types of sneha pravicharana. Ch Su 13/23, 24, 25, 27, 28	CC	MK	KH	L&G D	CL-PR,TT-Th eory,VV-Viva	F&S	I	
CO4,CO5	Explain acchasnehapaana and its importance Ch Su 13/26	CK	DK	KH	L&G D,RP, PL	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Enlist types of snehamatra Ch.Su 13/29-30	CC	MK	KH	L&G D,RE C	QZ ,TT-Theor y,VV-Viva	F&S	I	
CO4,CO5	Mention rule for duration of snehapaana Ch. Su 13/51	CC	MK	KH	L&G D,BS	PUZ,TT-Theo ry,VV-Viva	F&S	I	
CO4,CO5	Mention yogya and ayogya for snehana Ca Su 13/52-56.	CC	DK	KH	L,L& PPT,L &GD, CBL	TT-Theory,V V-Viva	F&S	I	V-PC
CO4,CO5	Summarize samyak snigdha lakshana, asnigdha lakshana and atisnigdha lakshana. Ch Su 13/57-59	CC	DK	KH	L&G D,D	P-ID,TT-Theo ry,VV-Viva	F&S	I	
CO2,CO4,CO5	Summarise snehavyapat karana, lakshana and chikitsa Ch Su 75-79	CAP	NK	KH	L&G D,PL	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Figure out importance of pathya and apathya in snehapaan.Ch Su 13/60-61-64	CK	DK	KH	L&G D,SD L	M-CHT,TT-T heory,VV- Viva	F&S	I	
CO4,CO5	Explain pathyaapathya to be followed during and after	CC	MK	KH	L&G	CHK,TT-Theo	F&S	I	

	snehapana. Ch Su 62-64				D,ED U	ry,VV-Viva			
CO4,CO5	Explain criteria's for assessing koshta. Ch Su 13/ 65-69.	CC	MK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	I	
CO4,CO5,CO 6	Illustrate types of koshta in patients undergoing snehapana	PSY- SET	NK	SH	CBL, CD,D _BED	P-ID,VV-Viva	F&S	I	
CO4,CO5	Mention some examples for recipes of vicharanasneha.Ch Su 13/82-94	CK	DK	K	L,L& PPT	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Interpret the role of agni in sadyasneha Ca Su 13/96-97	CK	DK	K	L,L& GD,I BL	TT-Theory,V V-Viva	F&S	I	
CO1,CO2	Recite sutra no. Ch Su 13/13-17, 22, 57-59.	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1,CO2	Summarize the chapter as per Ch Su 13/100.	CK	NK	K	SDL	P-VIVA	F&S	I	
CO4,CO5	Relate dravya classification mentioned in Ch Su 1 (trividha) with snehayoni	CAP	MK	KH	DIS	PRN	F	I	
<b>Topic 2 Cha.Su.14- Sveda Adhyaya</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1,CO2	Justify the position of the chapter in the samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	
CO2	Explain basic meaning and importance of key terms in the chapter such as agnisweda, niragnisweda, snigdhapurva, ruskhapurva and trayodasasweda	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO4,CO5	Explain the benefits of swedana. Ch Su 14/ 3-5	CC	MK	KH	L&G	TT-Theory,V	F&S	I	

					D,RL E	V-Viva			
CO4,CO5	Explain samyak swedana and ati swedana lakshana Ch Su 14/13-15	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Summarize the indications and contraindications for swedana Ch Su 14/ 16-24.	CC	DK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Differentiate pinda sweda, nadi sweda, avagah sweda and upanaha sweda with respect to the drugs used and procedure. Ch Su 14/25-37.	CC	DK	KH	L&G D,L_ VC,C BL	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Enlist 13 types of agni sweda. Ch Su 14/39-63	CC	MK	KH	L&PP T,L_ VC	QZ ,TT-Theor y,VV-Viva	F&S	I	
CO4,CO5	Enlist 10 types of niragnisweda Ch. Su 14/64.	CC	MK	KH	L,L& GD	O-QZ,TT-The ory,VV-Viva	F&S	I	
CO4,CO5	Enlist three classifications of dvividha sweda. Ch Su 14/66	CK	MK	KH	L&G D	M-CHT,TT-T heory,VV- Viva	F&S	I	
CO1,CO2	Recite sutras Ch Su 14/4,5,39,40,64.	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1,CO2	Summarize the chapter as per sutra Ch Su 14/68-71	CK	NK	K	SDL	P-VIVA	F&S	I	
<b>Topic 3 Cha.Su.15- Upakalpaneeya Adhyaya</b> (Lecture :2 hours, Non lecture: 3 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	



CO1,CO2	Explain basic meaning and importance of key terms in the chapter such as sambharan, aturaalaya, samsarjan krama.	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO4,CO5	Summarize the guidelines for Vaidyas before commencing chikitsa Ch Su 15/3-5.	CK	DK	KH	L&G D	M-CHT,TT-T heory,VV- Viva	F&S	I	
CO4,CO5	Enlist samshodhana upayogi dravya sangraha Ch Su 15/6	CK	MK	KH	L&G D	QZ ,TT-Theor y,VV-Viva	F&S	I	
CO4,CO5	Figure out the procedure of vamana karma. Ch Su 15/9-15	CC	DK	KH	L&G D,RP	CHK,TT-Theo ry,VV-Viva	F&S	I	
CO4,CO5	Explain samsarjana krama Ch Su 15/16	CC	MK	KH	L,L& GD	CL-PR,TT-Th eory,VV-Viva	F&S	I	
CO4,CO5	Identify merits of samsarjanakrama in patients	PSY- SET	NK	SH	BS,IB L,D_ BED	P-CASE,SP	F&S	I	
CO4,CO5	Outline procedure for virechana karma Ch Su 15/17-18	CC	DK	KH	L&G D,RP	CHK,TT-Theo ry,VV-Viva	F&S	I	
CO4,CO5	Explain benefits of samshodhana. Ch Su 15/22.	CC	MK	KH	L,L& GD	TT-Theory,V V-Viva	F&S	I	
CO5,CO7	Relate the structure of aturalaya (hospital) with the present scenario	CAP	DK	KH	DIS,B S,PrB L	DEB,M- MOD,INT	F	I	
CO1	Recite sutra Ch Su 15/22	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1	Summarize the chapter as per sutra Ch Su 15/2-25	CK	NK	K	SDL	P-VIVA	F&S	I	

Topic 4 Cha.Su.16- Chikitsaprabhritiya Adhyaya (Lecture :2 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance.	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	
CO2	Explain basic meaning and importance of key terms such as bahudosha lakshana, swabhaavoparamvaada, chikitsaprabhirta.	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO4,CO5	Summarize samyak virikta –avirikta – ativirikta lakshana. Ch Su 16/6-10	CC	DK	KH	L&G D,D	RS,TT-Theory ,VV-Viva	F&S	I	
CO4,CO5	Explain bahudosha lakshana Ch Su 16/13-16	CC	MK	KH	L&G D	PUZ,TT-Theo ry,VV-Viva	F&S	I	
CO3,CO6	Identify bahudoshalakshana in patients	PSY- SET	DK	SH	CBL, D_BE D	P-VIVA	F&S	I	
CO4,CO5	Explain benefits and importance of samshodhana. Ch .Su 16/16-21	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Explain swabhavoparama vada Ch Su 16/ 27-32	CC	MK	KH	L&G D,BS	DEB,TT-Theo ry,VV-Viva	F&S	I	
CO2,CO5	Outline chikitsa of ayoga, atiyoga of samsodhana	CAP	DK	KH	L_VC ,CBL, D	SP,TT-Theory ,VV-Viva	F&S	I	
CO4,CO5	Define chikitsa Ch Su 16/34-36	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO8	Appreciate benefits of chikitsa prabhrita bhishak. Ch Su. 16/37-38	CK	DK	KH	L&G D,D	TT-Theory,V V-Viva	F&S	I	
CO1	Recite sutras Ch Su 16/13-21,27,28,34-36	CK	MK	K	SDL,	P-REC	F&S	I	

					REC				
CO4,CO6,CO7	Relate swabhavoparama with concept of nidana parivarjana	CAP	MK	KH	DIS	PRN	F	I	
CO1	Summarize the chapter as per sutra Ch Su 16/39-41	CK	NK	K	SDL	P-VIVA	F&S	I	
<b>Topic 5 Cha.Su.17- Kiyantashiraseeya Adhyaya</b> (Lecture :3 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	
CO2	Explain basic meaning and importance of key terms in the chapter such as doshagati, doshavalpa, trayodasasannipata	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO2,CO3	Explain importance of shiras. Ch Su 17/12	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO3,CO4	Enlist types of siroroga, hridroga and vidradhi	CC	MK	KH	L&G D	SP,TT-Theory	F&S	I	
CO3,CO4	Figure out 62 types of permutation and combination of doshas Ch Su 17/41-44	CK	DK	K	L&G D,GB L	PUZ,TT-Theo ry,VV-Viva	F&S	I	
CO3,CO4	Figure out 12 types of vishama sannipata Ch Su 17/45-61	CK	DK	K	L&G D	M-POS	F&S	I	
CO3,CO4,CO6	Complement knowledge about kshayalaskhana of dosha-dhatu-mala to the existing understanding (additional important features mentioned in CS)	CK	DK	KH	DIS,F C	TT-Theory,V V-Viva	F&S	I	
CO3,CO4	Interpret dosha-vikalpa (combinations of doshas) in different conditions. Ch.Su. 17/45-61	CAP	MK	KH	IBL,C BL	P-PS,TT-Theo ry,VV-Viva	F&S	I	

CO3,CO7	Complement knowledge of Ojus to the existing understanding (additional important features mentioned in CS) Ch Su 17/73-77	CC	MK	K	DIS,FC	TT-Theory	F&S	I	H-RN
CO3,CO4,CO6	Outline the samprapti of madhumeha and importance of ojus. Ch Su 17/78-81	CAP	MK	KH	L&GD	TT-Theory	F&S	I	
CO2,CO3,CO4,CO7	Define the term “gati” and Classify and explain various kinds of gati. Ch.Su 17/112 - 118 Cakrapani	CK	MK	K	L&GD,RP	TT-Theory,V V-Viva	F&S	I	
CO2,CO4,CO6	Interpret asaya apakarsha-gati in relationship with dosha-gati. Ch.Su. 17/45-46	CC	DK	KH	L&GD	TT-Theory	F&S	I	
CO3,CO4,CO7	Explain kshayahetu Ch.Su. 17/ 76-77	CC	MK	KH	L&GD	TT-Theory,V V-Viva	F&S	I	
CO3,CO4,CO6	Illustrate dosha-gati in clinical conditions	CAP	MK	KH	CBL,D	P-RP,P-CASE	F&S	I	
CO3,CO4	Explain identification of dosha vriddhi, kshaya, samya Ch.Su. 17/ 62	CC	MK	KH	L	CL-PR,TT-Theory,VV-Viva	F&S	I	
CO1	Recite sutras Ch Su 17/12, 41-44, 62, 112-118	CK	MK	K	SDL,REC	P-REC	F&S	I	
CO1	Summarize the chapter as per sutra Ch Su 17/120-121	CK	NK	K	SDL	P-VIVA	F&S	I	
<b>Topic 6 Cha.Su.18-Trisotheeya Adhyaya</b> (Lecture :1 hours, Non lecture: 3 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&GD	INT,TT-Theory,VV-Viva	F&S	I	
CO2	Explain basic meaning and importance of key terms in the chapter such as trisotha, trividhabodhya sangraha and anukta roga	CC	MK	K	L&PP T	TT-Theory,V V-Viva	F&S	I	
CO5	Name and explain trividha-bodhya-sangraha (three-fold method	CC	MK	K	L&GD	TT-Theory,V	F&S	I	

	for understanding disease – vikara prakriti, samuthana and adhisthana) Ca.Su. 18/55, 46-47				D	V-Viva			
CO3,CO6	Illustrate use of trividha-bodhya-sangraha in anuktavyadhi Ch Su 18/44-45	CAP	DK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	I	
CO3,CO5	Outline pradesika sotha (local edema) Ch Su 18/19-36	CC	DK	K	L&G D,L_ VC	P-ID,TT-Theo ry,VV-Viva	F&S	I	
CO3,CO6	Explain aparisankhyeyatwa of diseases (innumerability) Ch Su 18/42	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO3	Complement tridosha-samanyakarma with additional details mentioned in CS	CC	MK	K	BS,IB L,FC	PRN,TT-Theo ry,VV-Viva	F&S	I	
CO1	Recite sutras Ch Su 42,43,44-47	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1	Summarize the chapter as per sutra Ch Su 18/54-56	CK	NK	K	SDL	P-VIVA	F&S	I	
<b>Topic 7 Cha.Su.19-Ashtodareeya Adhyaya</b> (Lecture :1 hours, Non lecture: 3 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	
CO2	Explain basic meaning and importance of key terms in the chapter such as nijavyadhi (intrinsic diseases), samanyaja-vyadhi (general diseases) and sankhyasamprapti (enumeration of types of diseases)	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO2,CO3	Outline the types of diseases (sankhyasamprapti) mentioned in the chapter	CK	DK	K	L&G D,GB L	QZ ,PUZ,TT- Theory,VV- Viva	F&S	I	

CO3,CO4	Illustrate the importance of tridosha in occurrence of diseases Ch Su 19/5	CC	MK	KH	DIS,S DL	TT-Theory,V V-Viva	F&S	I	
CO3,CO4	Explain the relationship between Nija and Agatu rogas (intrinsic and extrinsic diseases) Ch Su 19/6,7	CK	MK	K	L&G D,PL	TT-Theory,V V-Viva	F&S	I	
CO6,CO8	Classify diseases in Ayurveda using available online resources (Activity, ref: activity table)	CAP	DK	KH	DIS,B L	SA,TT-Theory ,VV-Viva	F	I	
CO1,CO2	Recite sutras Ch Su 19/5, 6	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1,CO2	Summarize the chapter as per sutra Ch Su 19/8,9	CK	NK	K	SDL	P-VIVA	F&S	I	
CO3,CO6,CO 7	Summarize different classifications of diseases mentioned in deerghanjeeviteeya, tisraishaneeya, ashtodareeya, maharoga and roganeeka	CC	MK	KH	DIS, W	P-POS	F	I	
<b>Topic 8 Cha.Su.20- Maharoga adhyaya</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	
CO2	Explain basic meaning and importance of key terms such as agantumukha, trividhaperana, samanyaja-vikara, nanatmaja-vikara and atmarupa	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO3,CO5	Explain the basis for the classification of diseases. Ch.Su. 20/3	CK	MK	K	L&G D,ML	M-CHT,TT-T heory,VV- Viva	F&S	I	
CO5	Define nija and agantuja vyadhi. Ch.Su. 20/7	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO5	Describe kaarana for nija and agantuja vyadhi. Ch.Su. 20/4-5	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	

CO3,CO5	Enlist nanatmajavyadhi of vata and relate guna, atmarupa, vikritakarma of vata and its upakrama. Ch.Su. 20/12,13	CAP	MK	K	L&G D	M-CHT,VV- Viva	F&S	I	
CO3,CO5	Enlist nanatmajavyadhi of pitta and relate guna, atmarupa, vikritakarma of pitta, and its upakrama Ch.Su. 20/14-16	CAP	MK	K	L&G D	M-CHT,VV- Viva	F&S	I	
CO3,CO5	Enlist nanatmajavyadhi of Kapha and Relate guna, atmarupa, vikritakarma of Kapha and its Upakrama. Ch.Su. 20/17-19	CAP	MK	K	L&G D	M-CHT,VV- Viva	F&S	I	
CO4,CO6,CO 8	Make monographs of nanatamaja-vikaras (Activity, see activity list)	CAP	DK	KH	TPW, BL	M-CHT,CR- W	F	I	
CO3,CO6,CO 7	Relate paribhasha of different terms in nanatamajavyadhi with descriptions available in Ashatanga sangraha Su 20/18	CC	DK	KH	DIS	T-OBT	F	I	
CO1,CO2	Recite sutras Ch. Su. 20/ 3, 4, 5, 11,14, 17, 20-22	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1,CO2	Summarize the chapter as per sutra Ch Su 20/ 23-25	CC	NK	K	SDL	P-VIVA	F&S	I	
<b>Topic 9 Cha.Su.21- Ashtauninditeeya adhyaya</b> (Lecture :3 hours, Non lecture: 3 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	
CO2	Explain basic meaning and importance of key terms such as ashtaninditapurusha, ashtadosha of atisthauya, prasastapurushalakshana	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO2	Enlist ashtaninditapurusha Ch Su 21/3	CK	MK	K	L&G D,RP	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Enlist ashtadosha of atisthoola purusha and justify its ashtadosha Ch.Su. 21/4	CAP	MK	K	L&G D,RP	P-SUR,CL- PR,VV-Viva	F&S	I	
CO4,CO5,CO	Outline the diagnostic features of atisthula. Ch.Su.21/9	CC	MK	K	L&G	TT-Theory,V	F&S	I	

7					D	V-Viva			
CO5,CO6,CO7	Outline hetu and samprapti of atisthaulya Ch.Su. 21/4-8	CAP	DK	K	L&PP T	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Describe chikistasutra for atisthula purusha and mention different formulations. Ch.Su. 21/20- 28	CAP	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO5,CO6	Describe hetu, dosha and lakshana for atikrusha purusha. Ch.Su. 21/11-15	CC	MK	K	L&PP T	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Describe chikistasutra for atikrusha purusha and mention different formulations Ch.Su. 21/20, 29-34	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	I	
CO6	Interpret why atisthula purusha is difficult to treat compared to krushapurusha Ch.Su. 21/16-17	CAP	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO5	Enlist the features of ideal physique in individuals (prashasta purusha lakshana) Ch.Su. 21/18-19	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO7	Define nidra and enlist its types Ch Su 21/35&58	CK	MK	K	L&PP T	TT-Theory,V V-Viva	F&S	I	
CO3,CO7	Determine significance of nidra as an etiological factor of sthaulya and karsya and its role in management of the same Ca.Su. 21/51	CAP	MK	KH	DIS,C BL,F C	CL-PR	F&S	I	
CO1,CO2	Recite sutras Ch Su 21/ 3,4,16, 18, 19, 35, 50, 58	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1,CO2	Summarize the chapter as per sutra Ch Su 21/60-62	CC	NK	K	SDL	P-VIVA	F&S	I	
<b>Topic 10 Cha.Su.22- Langhanabrimhaneeya Adhyaya</b> (Lecture :3 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	



CO2	Explain basic meaning and importance of key terms such as shadupakrama and dasavidhalanghana	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO2,CO4,CO 5	Enlist and define shadupakrama. Ch.Su. 22/4, 9-12	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO2,CO5,CO 7	Explain properties of dravyas used in shadupakrama with examples. Ch.Su. 22/12-17	CK	MK	K	L&PP T,PB L	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Enlist dasavidha-langhana and their indications Ch.Su. 22/19-23	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO2,CO4,CO 5	Relate gurvadi guna and samanya visesha sidhanta with shadupakrama Ch Su 22/12-17	CK	DK	KH	DIS,F C	T-EMI,VV- Viva	F&S	I	
CO4,CO5	Identify dasavidhalanghana in treatment guidelines mentioned for different diseases	CAP	NK	KH	IBL,C BL	T-OBT,VV- Viva	F&S	I	
CO4,CO5	Explain samyaklakshana of langhana, brimhana and sthambhana Ch Su 22/34,35,38,40	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Outline atiyoga and ayogalakshana of brimhana, langhana and sthambhana Ch Su 22/36-38	CK	DK	K	L&G D,CB L	M-CHT,TT-T heory,VV- Viva	F&S	I	
CO1,CO2	Recite sutras Ch Su 21/9-24	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1,CO2	Summarize chapter as per sutra Ch Su 22/44	CC	NK	K	SDL	P-VIVA	F&S	I	
<b>Topic 11 Cha.Su.23- Santarpaneeya Adhyaya</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	KH	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	

CO2	Explain basic meaning and importance of key terms such as santarpana and apatarpana	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO3,CO5	Enlist santarpanadravya Ch Su 23/3-5	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO3	Enlist santarpanajanyavyadhis Ch Su 23/5-7	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO3,CO6	Explain chikitsa-sutra for santarpana-janya-roga. Ch.Su. 23/ 8	CAP	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO3	Explain apatarpanajanya vyadhis Ch Su 23/26-29	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO3,CO6	Outline the management approach to apatarpana janya vyadhi Ch Su 23/30-32	CC	MK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	I	
CO1,CO2	Recite sutras Ch Su 23/ 5-7, 26-29	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO2	Summarize chapter as per sutra Ch Su 23/40	CC	NK	K	SDL	P-VIVA	F&S	I	
<b>Topic 12 Cha.Su.24- Vidhishoniteeya Adhyaya</b> (Lecture :3 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	
CO2	Explain basic meaning and importance of key terms such as sonitadushti and visuddharakta	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO3,CO4,CO 7	Explain causative factors for raktadushti Ch.Su. 24/ 5-10	CK	MK	K	L&G D	CHK	F&S	I	

CO4,CO6	Explain diagnostic criteria of raktadushti. Ca.Su. 24/17	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO6,CO 7	Enlist rakta-dushtijanya-roga. Ch.Su. 24/11-16, 28/11-13	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Explain treatment principles of rakta-dushti. Ch.Su. 24/18.	CC	MK	K	L&G D	INT,VV-Viva	F&S	I	
CO3,CO4,CO 7	Explain visudha-rakta lakshana Ch Su 23/22	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO3,CO4,CO 5	Explain visuddha-rakta-purusha lakshana Ch Su 23/24	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO3,CO6,CO 7	Relate the concept of raktadushti with similar references such as Ch.vi. 5/26	CC	MK	KH	DIS	T-OBT	F	I	
CO4,CO5,CO 7	Explain pathya in raktamoksha Ch Su 24/23	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO5,CO 6	Summarize the samprapti of mada, murchaya and sanyasa Ch Su 24/25-29	CAP	DK	KH	L&G D,IBL ,RP	PUZ,TT-Theo ry,VV-Viva	F&S	I	
CO1,CO2	Recite sutras Ch Su 24/ 14,18,20,21,22,24	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO2	Summarise the chapter as per sutra Ch Su 24/59-60	CC	NK	K	SDL	TT-Theory,V V-Viva	F&S	I	
<b>Topic 13 Cha.Su.25- Yajjapurusheeya Adhyaya</b> (Lecture :2 hours, Non lecture: 4 hours)									
CO1	Justify the position of the Yajjapurusheeya chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	

CO2	Explain basic meaning and importance of key terms in the chapter such as Hita, Ahita, Pathya and Apathya	CK	MK	K	L&G D,BS	QZ ,COM,TT-Theory,VV-Viva	F&S	I	
CO4,CO7	Justify the role of different factors responsible for formation of purusha Ch Su 25/3-29	CC	DK	KH	L&G D,ML	TT-Theory,V V-Viva	F&S	I	
CO1,CO8	Appreciate importance of sambhasha in bringing out scientific conclusions	AFT-REC	NK	KH	L&G D,RP, PL	SA,TT-Theory ,VV-Viva	F&S	I	
CO2,CO3	Differentiate factors related with ahara like Aharayoni, Prabhava, udarka, Upayoga, Rasa, Gurvadi Guna etc Ch Su 25/36	CK	MK	KH	L&G D,LS	T-OBT,TT-Theory,VV-Viva	F&S	I	
CO3,CO4,CO5	Enlist important agryas related with aushadha, anna and vihara Ch Su 25/38-40	CK	DK	K	L&G D,FC, GBL	T-OBT,TT-Theory,VV-Viva	F&S	I	H-DG ,H-RN
CO4,CO5,CO7	Define pathya and explain its importance Ch Su 25/45-47	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO7,CO8	Justify importance of hitahara and ahitahara (See activity list)	CAP	DK	KH	DIS,F C	INT,TT-Theory,VV-Viva	F&S	I	
CO5	Mention asavayonis Ch Su 25/49	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO1,CO2	Recite sutras Ch Su 25/ 29,31,33,45,46,47,50	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1	Summarize the chapter with shloka number Ch Su 25/51	CK	NK	K	SDL	TT-Theory,V V-Viva	F&S	I	
<b>Topic 14 Cha.Su.26- Atreyabhadraakaapyeeya Adhyaya</b> (Lecture :3 hours, Non lecture: 3 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its	CC	MK	K	L&G	INT,TT-Theory	F&S	I	

	importance				D	y,VV-Viva			
CO2	Explain basic meaning and importance of key terms such as dravyaprabhava, gunaprabhava, rasapanchaka and viruddha	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	I	
CO2,CO3,CO 5	Enlist gunas of parthivadi dravyas Ch Su 26/11	CK	DK	K	L&G D	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Differentiate dravyaprabhava and gunaprabhava with examples Ch Su 26/13	CK	MK	KH	L&G D	PUZ,TT-Theo ry,VV-Viva	F&S	I	H-DG
CO4,CO5	Explain dravyakarmukata siddhant with examples Ch Su 26/13	CK	MK	KH	L&G D,DA	TT-Theory,V V-Viva	F&S	I	H-DG
CO4,CO5,CO 6	Explain the importance of paradi gunas as chikitsopayogi gunas (in diagnosis and treatment). Ch Su 26/29-35 (see activity list, activity no.5)	CK	DK	KH	L&G D,FC, SDL	TT-Theory,V V-Viva	F&S	I	
CO2,CO5	Complement the existing knowledge of 'rasadi panchaka' with additions from Charakasamhita.	CK	DK	K	FC,S DL	T-OBT,TT-Th eory,VV-Viva	F&S	I	
CO2,CO5	Differentiate the properties of three types of 'Vipakas' Ch Su 26/58-63	CK	MK	K	DIS,F C	TT-Theory,V V-Viva	F&S	I	
CO4,CO5	Explain method of perception of rasa,veerya and vipaka of dravyas Ch Su 26/66	CC	MK	KH	L&G D,D	DEB,TT-Theo ry,VV-Viva	F&S	I	H-DG
CO2,CO4,CO 5	Enlist the examples of prabhava Ch Su 26/68-70	CK	MK	K	L&G D,ED U,SD L	TT-Theory,V V-Viva	F&S	I	H-DG
CO4,CO5,CO 7	Enlist the types of viruddhaahara and principles of management of diseases caused by viruddhaahara. Ch Su 26/86, 104-105	CK	MK	K	L&G D,BL,	P-PS,TT-Theo ry,VV-Viva	F&S	II	

					RLE				
CO4,CO5	Illustrate vichitra-pratyayarabdha with examples Ch Su 26/48-52	CAP	MK	KH	DIS,I BL	P-ID,TT-Theo ry,VV-Viva	F&S	II	
CO1,CO2	Recite the shlokas Ch Su 26/13,36,37,61,62,66,81,85	CK	MK	K	SDL, REC	P-REC	F&S	II	
CO4,CO5	Relate different sidhantas on dravya mentioned in Ch.Su1, Ch Su 4, Ch Su 27 and Ch Vi 1	CC	MK	KH	DIS,F C	CL-PR	F	I	
CO1,CO2	Summarize the chapter as per sutra Ch Su 26/107-113	CK	NK	K	SDL	TT-Theory,V V-Viva	F&S	II	
<b>Topic 15 Cha.Su.27- Annapaana vidhi Adhyaya</b> (Lecture :4 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	
CO2,CO5,CO 7	Enlist the characteristics of hitahara and examples of hitaahara and ahitaahara. Ch Vi 27/3	CK	MK	K	SDL	P-VIVA	F&S	I	
CO2,CO5,CO 7	Classify ahara into different vargas Ch Su 27/26	CK	MK	K	FC,S DL	P-VIVA	F&S	I	
CO4,CO5,CO 7	Illustrate ahara-dravya through exhibition (See activity list, activity no.7)	CS	DK	SH	PrBL, RLE	Log book,TR	F	I	
CO1,CO2	Summarise the chapter as per Ch Su 27/351-352	CC	NK	K	SDL	TT-Theory,V V-Viva	F&S	I	
<b>Topic 16 Cha.Su.28- Vividhashitapeeteeya Adhyaya</b> (Lecture :4 hours, Non lecture: 14 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	I	
CO2	Explain basic meaning of key terms in the chapter such as	CK	MK	K	L&G	QZ ,COM,TT-	F&S	I	

	chaturvidha ahara, vyadhisaha sareera, dhatu-upadhatu-mala-indriya-pradoshajavyadhi				D,BS	Theory,VV-Viva			
CO2,CO7	Enlist the four types of aahara Ch Su 28/3	CK	MK	K	L&G D,ML	M-CHT,VV-Viva	F&S	I	
CO2,CO7	Explain factors influencing susceptibility to diseases which modify the effects of pathya and apathya Ch Su 27/7	CK	MK	KH	L&G D,SD L	TT-Theory,V V-Viva	F&S	I	
CO3,CO7	Enlist the vyadhi- asaha shareera Ch Su 27/7	CK	MK	KH	L&G D,IBL	TT-Theory,V V-Viva	F&S	I	
CO3,CO4,CO5,CO7	Outline dhatu-upadhatu-mala-indriya pradoshaja vyadhi (diseases caused by doshas situated in different dhatus, upadhatu, malas and indriyas) explain their treatment principles Ch Su 27/9-30	CC	MK	KH	L&G D,IBL ,LS	T-OBT,M-CHT,TT-Theory,VV-Viva	F&S	I	
CO3,CO4,CO7	Explain mechanism koshtagati and sakhagati Ch Su 27/31-33	CC	MK	KH	L&G D,FC	TT-Theory,V V-Viva	F&S	I	
CO3,CO7	Emphasize the role of Prajnaparadha in causation of diseases Ch Su 27/39-40	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	I	
CO1,CO2	Recite sutras Ch Su 27/9-19,35-39, 45	CK	MK	K	SDL, REC	P-REC	F&S	I	
CO1,CO2	Summarize the chapter as per Ch Su 28/45-48	CK	NK	K	SDL	T-OBT,TT-Theory,VV-Viva	F&S	I	
CO3,CO6	Relate dhatupradoshaja vyadhi with explanations in other contexts such as Ch.vi. 5/ 10-22, Ch.Su. 28/ 09- 19, Ch.Vi. 5/8 and dhatugatha avastha described in Ashtangasangraha Sutasthana	CC	DK	KH	DIS,B S	CL-PR	F	I	

**Topic 17 Cha.Su.29- Dashapraanaayataneeya Adhyaya** (Lecture :2 hours, Non lecture: 2 hours)

CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as pranaayatan, praanabhisara, rogaabhisara, chadmachara, yogya chikitsak, karma kovidah.	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO2,CO3,CO 7	Enlist dasha praanayatanas. Ch Su 29/3,4	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO8	Enlist two types of bhishak. Ch Su 29/5	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO8	Explain the qualities of pranaabhisar, rogabhisara and bhishakchadmacahara Ch Su 29/7	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO8	Appreciate the social hazards caused due to quackery	AFT- REC	DK	KH	BS,S DL	CR-W,VV- Viva	F&S	II	
CO8	Enlist qualities of yogya chikitsak Ch Su 29/ 13.	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO8	Illustrate characteristics of different types of vaidya through skit (see activity no.8)	PSY- SET	DK	SH	RP,F V	PRN	F	II	
CO1,CO2	Recite sutras Ch Su 29/3,4,13.	CK	MK	K	SDL, REC	P-REC	F&S	II	
CO1,CO2	Summarize the chapter as per sutra Ch. Su 29/14	CK	MK	K	SDL	T-OBT,TT-Th eory,VV-Viva	F&S	II	
CO8	Relate different references related to good qualities of Vaidya from different chapters Ch Su 11/50-53	CC	MK	KH	FC	CL-PR,DEB	F	II	



<b>Topic 18 Cha.Su.30- Arthedashamahamooleeya Adhyaya</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as artha, mahamula, mahaphala, shashwatatva	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO4,CO 7	Explain the importance of hrudaya. Ch Su 30/3,4,5,6,7	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Relate concept of hridaya with details given in trimarmeeya, sareerasthana etc.	CK	MK	KH	L&G D,FC	T-OBT	F	II	
CO3,CO4,CO 7	Explain the importance of ojas and its sthana Ch Su 30/8-12.	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO4,CO 7	Define terms dhamani, srotas, sira. Ch Su 30/12	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO4,CO 7	Explain shresthatama bhava Ch Su 30/15	CK	NK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO5,CO 8	Explain Ayurvedavid lakshana and their method of understanding in the form of vakyashah, vakyarthashah, arthavayavashah Ch Su 30/16	CK	DK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO4,CO 7	Outline lakshana of sukhayu, asukhayu, hitayu and ahitayu Ch Su 30/24, 25	CK	DK	KH	L&G D,IBL	PUZ,TT-Theo ry,VV-Viva	F&S	II	
CO3,CO4	Define objective (prayojana) of Ayurveda Ch Su 30/26	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO5,CO 8	Appreciate eternity of Ayurveda Ch Su 30/27	CC	MK	KH	L&G D,BS	TT-Theory,V V-Viva	F&S	II	

CO3,CO4,CO7,CO8	Explain qualities of learner of Ayurveda and their objectives. Ch Su 30/29	CC	DK	K	L&GD	TT-Theory,VV-Viva	F&S	II	
CO3,CO4,CO7	Enlist dashaprakaran of tantraartha. Ch Su 30/32.	CK	MK	KH	L,L&GD	P-VIVA,TT-Theory,VV-Viva	F&S	II	
CO3,CO4	Outline the ashtasthanas of Charaka Samhita Ch Su 30/32	CK	MK	K	L&GD	TT-Theory,PP-Practical,VV-Viva	F&S	II	
CO3,CO4,CO6	Enlist paryayas of Ayurveda. Ch Su 30/31	CK	MK	K	L&GD	TT-Theory,PP-Practical,VV-Viva	F&S	II	
CO4,CO5	Explain characteristics of pallavagrahi bhishak or consequences of incomplete knowledge with examples Ch Su 30/72-81.	CK	DK	K	L&GD	TT-Theory,PP-Practical,VV-Viva	F&S	II	
CO3,CO5,CO8	Appreciate importance of Shastra jnana Ch Su 30/84-85	AFT-VAL	DK	KH	L&GD,BS	VV-Viva	F&S	II	
CO1,CO2	Explain importance of sangraha adhyayas	CC	DK	K	BL,SDL	VV-Viva	F&S	II	
CO1,CO2	Recite sutras Ch Su 30/3,410,11,12.	CK	MK	K	SDL,REC	P-REC	F&S	II	
CO1,CO2	Summarize the chapter as per sutras Ch Su 30/86-87	CK	NK	K	SDL	T-OBT,VV-Viva	F&S	II	
<b>Topic 19 Cha.Ni.01-Jwara nidana Adhyaya</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1	Describe the sthana adhikarana (objectives) of Nidanasthana Ch.Ni.1/15	CK	MK	K	L	P-VIVA,TT-Theory	F	II	

CO1	Justify the position of the chapter in the samhita and its importance	CK	MK	K	L	T-EMI	F	II	
CO2	Explain basic meaning and importance of key terms such as nidanapanchaka and jwara	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO4,CO6,CO 7	Explain nidanapanchaka with suitable examples. Ch.Ni.1/6-13	CK	MK	KH	L&G D,FC	P-VIVA,TT- Theory	F&S	II	
CO4,CO6	Differentiate vyadhibodhaka nidana and vyadhi janaka nidana Ch Ni 1/1 Cakrapani commentary	CAN	DK	KH	L&G D,TB L	VV-Viva	F	II	
CO2,CO4,CO 6	Enlist synonyms of nidana (causative factors) and roga (disease) Ch Ni 1/3,5	CK	MK	KH	L	TT-Theory,V V-Viva	F&S	II	
CO4,CO6	Explain the importance of nidanapanchaka Ch.Ni 1/13	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO6	Explain nidanapanchaka and elaborate nidana (causative factor), purvarupa (premonitory symptoms) lakshana/rupa (symptoms)	CK	MK	KH	L&G D	T- EW	F	II	
CO4,CO6,CO 7	Describe upashaya along with its types in detail Ch Ni 1/10	CC	MK	SH	L&G D,BS	TT-Theory,V V-Viva	F&S	II	
CO4,CO6	Interpret the classification of samprapti (pathogenesis) Ch Ni 1/12	CK	MK	KH	L&PP T,CB L	TT-Theory,V V-Viva	F&S	II	
CO4,CO6	Diffrentiate the samanya and vishesha samprapti of disease	CAP	MK	SH	L_ VC ,DIS	TT-Theory,V V-Viva	F&S	II	
CO3,CO4	Describe the vishesha nidana (specific factors of diseases) prakopa karana (causes of aggravation),samprapti (pathogenesis)	CAP	MK	KH	L&G D	TT-Theory,V V-Viva	F	II	

	and lakshana (symptoms) of jwara (fever)								
CO3,CO6	Outline vataja, pittaja, kaphaja, samsarga and sannipataja jwara Ch Ni 1/19-30	CC	MK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	II	
CO3,CO4,CO6	Describe agantuja jwara nidana (causes factor of exogenous fever) Ch Ni 1/30,31	CK	MK	KH	L	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO5	Differentiate nava and jeerna jwara chikitsa sutra (line of treatment) Ch Ni 1/36	CK	MK	K	L,L& GD	TT-Theory,V V-Viva	F&S	II	
CO1,CO2	Recite sutras Ch Ni/3,5,7-11,38-40	CK	MK	K	SDL, REC	P-REC	F	II	
CO1,CO2	Summarize the chapter as per sutras given at the end of the chapter Ch Ni 1/42-44	CK	NK	K	SDL	T-OBT	F&S	II	
<b>Topic 20 Cha.Ni.02-Raktapitta nidana Adhyaya</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as pratimargaharana, sadhyasadhyata, raktapitta	CK	MK	KH	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO2,CO4,CO6	Justify raktapitta paryaya and nirukti Ch Ni 2/5	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO6	Outline raktapitta nidana and samprapti (etiology and pathogenesis of raktapitta)	CC	DK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO4,CO6	Define raktapitta and outline raktapitta purvarupa (premonitory features of raktapitta) upadrava (complication of raktapitta) Ch Ni 2/6,7	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	

CO4,CO6	Relate concept of trividha gati (adha, urdhwa, tiryag) with samprapti of raktapitta Ch Ni 2/8	CAP	DK	KH	L&G D	T-EMI,TT-Theory,VV-Viva	F&S	II	
CO4,CO5,CO7	Explain concept of pratimargaharana in the context of raktapitta Ch Ni 2/9	CAP	MK	KH	L&G D,LS	TT-Theory,V V-Viva	F&S	II	
CO4,CO6	Illustrate sadhyasadyata of raktapitta Ch Ni 2/9,12-20	CAP	MK	KH	L&G D,PL	TT-Theory,V V-Viva	F&S	II	
CO4,CO6	Outline asadhya lakshana of raktapitta (features of incurable disease) Ch Ni 2/23-26	CC	DK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO1,CO2	Recite sutras Ch Ni/19,27	CK	MK	K	SDL, REC	P-REC	F&S	II	
CO2	Summarize the chapter as per sutra Ch Ni 2/28,29	CK	NK	K	SDL	T-OBT	F&S	II	
<b>Topic 21 Cha.Ni.03-Gulma nidana Adhyaya</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita	CC	MK	K	L&G D	INT,TT-Theory,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as gulma, panchagulma and raktagulma	CK	MK	K	L&G D,BS	QZ ,COM,TT-Theory,VV-Viva	F&S	II	
CO2,CO4,CO6	Demonstrate the prakruti samasamveta and vikruti vishama samaveta siddhanta in the context of gunma Ch.Ni 3/6	CAP	DK	KH	L&G D,IBL	INT,TT-Theory,VV-Viva	F	II	
CO3,CO6	Mention the importance of gulmasthana in samprapti Ch Ni 3/7	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO6	Outline the features of vataja-pittaja-kaphaja and raktaja gulma along with samprapti lakshana (pathogenesis and clinical features) Ch Ni 3/6-11	CC	DK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	

CO3,CO6	Describe raktaja gulma samprapti, lakshana (pathogenesis and clinical features) Ch Ni 3/13-14	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO4,CO6	Outline poorvarupa of gulma Ch Ni 3/15	CC	DK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO4,CO5	Outline treatment principle of gulma Ch Ni 2/16,17	CAP	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO1,CO2	Summarise the chapter as per sutra Ch Ni 3/18	CK	NK	K	SDL	T-OBT	F&S	II	
<b>Topic 22 Cha.Ni.04-Prameha nidana adhyaya</b> (Lecture :2 hours, Non lecture: 3 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	KH	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as kleda, vikaravighatakara bhava	CK	MK	KH	L&G D,BS	TT-Theory,V V-Viva	F&S	II	
CO3,CO4,CO 6	Describe the concept of kleda and its role in samprapti of prameha Ch Ni 4/6-8	CC	DK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	II	H-RN
CO4,CO6,CO 7	Summarise the sankhyasamprapti of prameha Ch Ni 4/11,25,39	CK	MK	K	L	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO 6	Enlist causative factors and samprapi ghatakas in prameha Ch Ni 4/7	CK	MK	K	L&G D,CB L	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO 6	Explore the sootra ‘eha khalu nidana-dosha-dooshya vishesaebhyo.....’ in the manifestation of diseases Ch Ni 4/4	CAP	MK	KH	L&G D,BS, CBL	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO 6	Relate nidana, dosha, dushya and samprapti of vataja, pittaja and kaphaja prameha Ch Ni 4/5,8,24,36,37	CC	MK	KH	L&G D,CB	TT-Theory,V V-Viva	F&S	II	

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CO2,CO3,CO6	Justify the role of samprapti ghatakas in diagnosed cases of prameha	PSY-SET	NK	SH	L&G D,CB L,D_ BED	P-PS,TT-Theo ry,VV-Viva	F&S	II	H-RN
CO2,CO4,CO5	Outline the chikitsas sutra of prameha Ch Ni 4/49	CC	DK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	II	H-RN
CO4,CO6	Explain sadhyasadhyata of prameha Ch Ni 4/11,27,38	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO4,CO6	Describe purvarupa and upadrava of prameha Ch Ni 4/47,48	CC	MK	K	L_VC ,CBL	TT-Theory,V V-Viva	F&S	II	H-RN
CO3,CO7	Relate predisposing factors of prameha with present day lifestyle	CAP	DK	KH	DIS,F C	VV-Viva	F&S	II	
CO1,CO2	Recite sutras Ch Ni 4/3,4,48,49	CK	MK	K	SDL, REC	P-REC	F&S	II	
CO1,CO2	Summarise the chapter as per sutra Ch Ni 4/53-55	CK	NK	K	SDL	T-OBT	F&S	II	
<b>Topic 23 Cha.Ni.05-Kushta nidana Adhyaya</b> (Lecture :2 hours, Non lecture: 4 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as saptadravya, saptakushta	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO4,CO6,CO7	Enlist and explain saptadravya of kushta Ch Ni 5/3	CC	MK	KH	L&G D,CB	TT-Theory,V V-Viva	F&S	II	

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CO2,CO3,CO6	Explain the role of 'kleda' in the manifestation of kushta Ch Ni 5/3	CC	DK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	II	H-RN
CO2,CO3,CO6	Outline anekarupa of kushta (multiplicity) based on vedana, varna, samsthana and prabhava Ch Ni 5/4	CC	DK	KH	L_VC ,CBL	TT-Theory,V V-Viva	F&S	II	H-RN
CO2,CO3,CO6	Enlist saptakushta with their dosha predominance Ch Ni 5/5	CK	MK	K	L&G D,BL	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO6	Outline samanyanidana of kushta Ch Ni 5/6	CC	DK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	II	
CO4,CO6	Enlist purvarupa of kushta Ch Ni 5/7	CC	MK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	II	H-RN
CO4,CO6	Outline upadrava of kushta Ch Ni 5/11	CC	DK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO6	Explain sadhyasadyata of kushta Ch Ni 5/9	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO1,CO2	Recite sutras Ch Ni 5/3,5	CK	MK	K	SDL, REC	P-REC	F&S	II	
CO1,CO2	Summarise the chapter as per sutra Ch Ni 5/16	CK	NK	K	SDL	T-OBT	F&S	II	
<b>Topic 24 Cha.Ni.06-Shosha nidana Adhyaya</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	



CO2	Explain basic meaning and importance of key terms such as chaturvidha ayatana and ekadasarupa	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO2,CO3,CO 6	Explain role of four aetiological factors (chaturvidha-ayatana) in samprapti of shosha. Ch Ni 6/4,6,7(1),8,10	CC	MK	KH	L&PP T,CB L	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO 6	Enlist ekadasarupa of shosha Ch Ni 6/14	CK	MK	K	L&G D,ML	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO 6	Outline the purvarupa of sosha Ch Ni 6/13	CC	DK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO 6	Explain sadhyasadyata of shosha Ch Ni 6/15,16	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO4,CO6,CO 7	Relate concept of dharaneeya adharaneeya vega to the context of shosha nidana	CAP	MK	KH	DIS	CL-PR	F	II	
CO3,CO4,CO 7	Justify the importance of ashtaahara vidhi visesha ayatana in the context of prevention of shosha	CAP	MK	KH	DIS,F C	CL-PR	F	II	
CO1,CO2	Recite sutras Ch Ni 6/3,5,7,9,11,14	CK	MK	K	SDL, REC	P-REC	F&S	II	
CO1,CO2	Summarise the chapter as per sutra Ch 6/17	CK	NK	K	SDL	T-OBT	F&S	II	
<b>Topic 25 Cha.Ni.07-Unmada nidana Adhyaya</b> (Lecture :2 hours, Non lecture: 4 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance`	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as ashtavibhrama, doshonmada and bhutonmada	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	

CO2,CO3,CO6	Define unmada and enlist ashtavibhrama Ch N 7/5	CK	MK	K	L&G D	QZ ,TT-Theor y,VV-Viva	F&S	II	
CO2,CO3,CO6	Illustrate ashtavibhrama in different types of unmada	CAP	NK	KH	L_VC ,CBL	TT-Theory,V V-Viva	F	II	
CO4,CO6,CO7	Explain sankhyasamprapti of unmada Ch Ni 7/3	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO4,CO6,CO7	Interpret unmada abhimukha karana (predisposing factors for unmada) in the contemporary scenario Ch Ni 7/3-4	CC	DK	KH	L_VC ,CBL	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO6	Interpret the role of prajnaparadha as an important etiological factor in the background of unmada Ca.Ni. 7/19-22	CC	DK	KH	L&G D,L_ VC	CR-RED,TT- Theory,VV- Viva	F&S	II	
CO4,CO6,CO7	Summarise different descriptions of concept of prajnaparadha as aetiological factor Ch Su 8, 11, Ch Vi Ch Sa 1, Ch Vi 3	CC	MK	KH	DIS,F C	PRN	F	II	
CO2,CO3,CO6	Outline the purvarupa of unmada Ch Ni 7/6	CC	DK	K	L_VC ,CBL	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO5	Explain chikitsasutra of unmada Ch Ni 7/8,9	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO4,CO6	Differentiate doshonamda and bhutonmada Ch Ni 7/10-11	CC	DK	KH	L&PP T	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO6	Summarize causes, features purpose (prayojana) and treatment of agantu unmada Ch Ni 7/12-17	CK	DK	K	L&PP T	TT-Theory,V V-Viva	F&S	II	
CO1,CO2	Recite sutras Ch Ni 7/ 3,5,19-22	CK	MK	K	SDL, REC	P-REC	F&S	II	
CO1,CO2	Summarise the chapter based on Sutra Ch Ni 7/24	CK	NK	K	SDL	T-OBT	F&S	II	

Topic 26 Cha.Ni.08-Apasmara nidana adhyaya (Lecture :2 hours, Non lecture: 4 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as nidanarthakara roga, vyadhisankara, tiryaggata dosha	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO2,CO4,CO 6	Define apasmara Ch Ni 8/5	CK	MK	K	L,L& PPT	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO 6	Explain apasmaraabhimukhakarana (predisposing factors of apasmara) Ch Ni 8/4	CK	MK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO 6	Outline visesha-lakshana of apasmara Ch Vi 8/8	CC	DK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO 6	Explain cikitsasutra of apasmara Ch Ni 8/10	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO 6	Explain nidanarthakara roga Ch Ni 8/16-19	CC	MK	KH	L&G D,L_ VC,C BL	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO 6	Explain vyadhisankara Ch Ni 8/21-22	CC	MK	KH	L&PP T,L_ VC,C BL	TT-Theory,V V-Viva	F&S	II	H-RN
CO2,CO4,CO 5	Differentiate sudha and asuddha chikitsa Ch Ni 8/23	CC	MK	KH	L&G D,BS, CBL	TT-Theory,V V-Viva	F&S	II	

CO2,CO4,CO6	Define and relate different types of sadhyasadyata Ch Ni 8/33-35	CC	MK	KH	DIS,P BL,C BL,P ER	TT-Theory,V V-Viva	F&S	II	H-RN
CO2,CO4,CO5	Describe tiryaggatadosha - cikitsasutra Ch Ni 8/36-39	CK	MK	K	L&G D	TT-Theory	F&S	II	
CO6,CO8	Document experiences of physicians on nidanarthakara roga (Activity no.9)	PSY- SET	DK	KH	DIS,T PW	C-INT	F	II	
CO4,CO6,CO7	Summarise the information gathered from Nidanasthana through Quiz (activity no.10)	CAP	DK	KH	FC,D	QZ	F	II	
CO1,CO2	Recite sutras Ch Ni 8/3, 5, 16-22, 33-35,36-39	CK	MK	K	SDL, REC	P-REC	F&S	II	
CO1,CO2	Summarise the chapter based on sutra 42-44	CK	NK	K	SDL	T-OBT	F&S	II	
<b>Topic 27 Cha.Vi.01- Rasa vimana Adhyayam</b> (Lecture :2 hours, Non lecture: 3 hours)									
CO1,CO2	Explain sthana adhikarana of (objectives) of Vimanasthana Ch Vi 1/3	CK	MK	K	L&G D,LS	CR-W,TT-The ory,VV-Viva	F&S	III	
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2,CO4	Explain basic meaning and importance of key terms such as prakritisama samaveta, vikirti vishama samaveta, ahara vidhi visesha ayatana, satmya	CK	MK	K	DIS,P rBL	TT-Theory,V V-Viva	F&S	III	
CO2,CO4	Explain the prakrutisamasamavet and vikrutivishamasamavet siddhanta with suitable examples. Ch Vi 1/9,10	CK	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	III	H-DG
CO2,CO4,CO5	Explain chaturvidha prabhava(rasa-dravya-dosh-vikara prabhava) with examples Ch Vi 1/12	CK	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	III	H-DG

CO2,CO4	Describe the dravyaprabhava in taila,ghrita and madhu with the help of 'samanya vishesha siddhanta' Ch Vi 1/14	CC	MK	KH	L&G D,BL	DEB,TT-Theo ry,VV-Viva	F&S	III	
CO2,CO5,CO 7	Explain the dravyas which should be avoided for regular consumption Ch Vi 1/15-19	CC	MK	KH	L&G D,RL E	M-CHT,TT-T heory,VV- Viva	F&S	III	
CO2,CO4,CO 7	Explain satmya and its types Ch Vi 1/20	CC	MK	KH	L&G D,BS	TT-Theory,V V-Viva	F&S	III	
CO2,CO7	Summarize ashta aharavidhivisheshayatana and its role in preservation of health. Ch Vi 1/20-23	CK	MK	K	L&G D,PS M	DEB,TT-Theo ry,VV-Viva	F&S	III	H-SW
CO2,CO4,CO 7	Relate concept of satmya with satmyapareeksha Ch.Vi 8	CC	MK	KH	DIS	CL-PR	F	III	
CO2,CO7	Explain aharavidhi vidhana and bhojya sadgunya Ch Vi 1/24,25	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	III	H-SW
CO3,CO7	Appreciate the importance of popularizing importance of dietary rules (see activity list)	CAP	DK	KH	PrBL	Log book	F	III	
CO4,CO5	Differentiate and apply samanagunadravya and samanagunabhuyishtadravya Ca Vi 1/7	CAP	NK	KH	DIS	CL-PR	F	III	
CO1,CO2	Recite sutras Ch Vi 1/9,10,20,24	CK	MK	K	SDL, REC	P-VIVA,TT- Theory	F&S	III	
CO1,CO2	Summarize the chapter based on sutra Ch Vi 1/27,28	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 28 Cha.Vi.02-Trividha kuksheeya Adhyayam</b> (Lecture :2 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	KH	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	

CO2	Explain basic meaning of key terms such as trividha kukshi, matra-amatra ahara, amadosha, amavisha	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	III	
CO2,CO4,CO 7	Explain aharamatra based on trividha kukshi Ch Vi 2/3	CC	MK	KH	L&G D,IBL	C-INT,TT-The ory,VV-Viva	F&S	III	
CO2,CO7	Explain the matrvat ahara (ideal quantity of food) and amatrvatwa of ahara with its types Ch Vi 2/6	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	III	
CO4,CO7	Justify effects of heenamatra and atimatra ahara Ch Vi 2/7	CAP	MK	KH	L&G D,PB L,FC	TT-Theory,V V-Viva	F&S	III	
CO2,CO7	Enlist and explain the mental factors affecting digestion of food Ch Vi 2/8	CC	MK	KH	L_VC ,EDU	TT-Theory,V V-Viva	F&S	III	
CO4,CO5	Outline hetu, linga and aushadha of two types of amadosha Ch Vi 2/10-13	CC	MK	KH	L&PP T,CB L,PE R	TT-Theory,V V-Viva	F&S	III	
CO2,CO7	Explain the concept of amavisha Ch Vi 2/12	CC	MK	KH	L&G D,CB L	TT-Theory,V V-Viva	F&S	III	
CO2,CO3,CO 4	Define amasaya with reference to its position Ch Vi 2/17	CK	MK	K	L&G D,D- M	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Recite sutras Ch Vi 2/9	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	III	
CO2	Summarize the chapter based on sutra Ch Vi 2/19	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	

Topic 29 Cha.Vi.03-Janapadodhwansaneeya Vimanam Adhyaya (Lecture :2 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2	Explain basic meaning and importance of key terms like janapadodhwamsa, daiva and purushakara	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	III	
CO2,CO5	Justify the importance of timely collection of medicines Ch Vi 3/4	CAP	DK	K	L&G D,BS	TT-Theory,V V-Viva	F&S	III	
CO2,CO7	Enlist the commomn causes of janapadodhwamsa Ch Vi 3/6	CC	MK	KH	L&G D,BS, FC	TT-Theory,V V-Viva	F&S	III	
CO2,CO7	Describe the lakshanas of dushti of vayu, jala, desha and kala. Ch Vi 3/7	CC	MK	KH	L_V C ,PBL, RP	TT-Theory,V V-Viva	F&S	III	
CO4,CO7	Interpret janapadodhwamsa in contemporary epidemiology (see also activity list)	CAP	NK	KH	DIS,B S,PBL ,FV	Log book,VV- Viva	F&S	III	
CO2,CO5	Summarize the treatment principles of janapadodhwamsakara vikaras Ch Vi 3/12-18	CK	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO7	Explain the role of adharma in janapadodhwamsa Ch Vi 3/20	CC	MK	KH	DIS,B S	DEB,TT- Theory	F&S	III	
CO2,CO7	Outline the concept of Niyat and Aniyat Ayu. Ch Vi 3/28-35	CC	DK	KH	L&G D,PB L	DEB,TT-Theo ry,VV-Viva	F&S	III	
CO3,CO4,CO	Relate concept of daiva and purushakara with references Ca Sha	CC	MK	KH	DIS,F	CL-PR	F	III	

7	2/44. Ca Sh 6/27.				C				
CO2,CO4,CO7	Differentiate daiva and purushakara Ch Vi 3/29-30	CC	MK	K	L&G D,BS	CR-W,TT-Theory, VV-Viva	F&S	III	
CO4,CO5	Explain hetuviparit chikitsa in jwara Ch Vi 3/39-40	CC	MK	KH	L&G D,CB L	INT,TT-Theory, VV-Viva	F&S	III	
CO4,CO5	Explain apatarpana and its types. Ch Vi 42-44	CC	MK	KH	L&G D,CB L	TT-Theory, V-Viva	F&S	III	
CO2,CO7	Explain concept of desha Ch Vi 3/47-48	CC	MK	K	L_VC ,DIS, FV	PA,TT-Theory, VV-Viva	F&S	III	
CO2,CO4,CO7	Summarise the term karma with reference to different contexts	CC	MK	KH	DIS,F C	PRN	F	III	
CO1,CO2	Recite sutras Ch Vi 3/6,10	CK	MK	K	SDL, REC	P-REC,TT-Theory	F&S	III	
CO1,CO2	Summarize the chapter based on sutra Ch Vi 3/49-52	CK	NK	K	SDL	T-OBT,VV-Viva	F&S	III	
<b>Topic 30 Cha.Vi.04-Trividha roga vishesha vijnyaneeya adhyaya</b> (Lecture :2 hours, Non lecture: 3 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	KH	L&G D	INT,TT-Theory, VV-Viva	F&S	III	
CO2	Explain basic meaning and importance of key terms such as trividha roga visesha vijnana	CK	MK	K	L&G D	QZ ,COM,TT-Theory, VV-Viva	F&S	III	
CO2,CO6	Explain the application of aptopadesha, pratyaksha and anumana	CC	MK	KH	L,CB	P-PS,TT-Theo	F&S	III	H-RN



	in clinical examination. Ch Vi 4/3-8				L	ry,VV-Viva			
CO2	Recite sutra Ch Vi 4/4,12	CK	MK	K	SDL, REC	P-VIVA,P- REC	F&S	III	
CO1,CO2	Summarise the chapter as per sutra no. Ch Vi. 4/13-14	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 31 Cha.Vi. 05- Sroto vimana Adhyaya</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	KH	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2	Explain basic meaning and importance of key terms such as srotas, srotodushti	CK	MK	K	L	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Explain importance of srotas Ch Vi 5/3-4	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	III	
CO2	Enlist the types of srotas Ch Vi 5/7	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO3	Explain types and general causative factors of srotodushti Ch Vi 5/23,24	CK	MK	K	L&G D	T-OBT,TT-Th eory,VV-Viva	F&S	III	H-RN
CO4,CO5	Explain hetu, lakshan and chikitsa of specific strotodushti Ch Vi 5/8, 10-22, 26-28	CK	MK	K	L&G D,CB L	TT-Theory,V V-Viva	F&S	III	H-RN
CO1,CO2	Recite sutras Ch Vi 5/3,4,7,9-27	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	III	
CO1,CO2	Summarize the chapter based on Ch Vi5/28-30	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	

<b>Topic 32 Cha.Vi. 06-Roganika vimana adhyaya</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2	Explain basic meaning and importance of key terms such as rogameeka, anubandhya, anubandhy	CK	MK	K	L	TT-Theory,V V-Viva	F&S	III	
CO1,CO3	Enlist the types of diseases based on prabhav, bala, adhishtana, nimmitta, ashay. Ch Vi 6/3	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	H-RN
CO2	Explain the rationale behind classification of diseases. Ch Vi 6/4	CC	MK	KH	L&G D,BS	INT,TT-Theor y,VV-Viva	F&S	III	
CO2,CO3	Enlist the diseases caused by shareera and manas doshas.Explain the relation between shareera and manasa doshas. Ch Vi 6/6-9	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO3	Explain anubandhya and anubandha doshas Ch.Vi6/11	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO3,CO 7	Explain four types of agni. Ch Vi 6/12	CK	MK	K	L&G D,PL	TT-Theory,V V-Viva	F&S	III	
CO2,CO7	Enlist types of shareera prakruti Ch Vi 6/13	CK	MK	K	L&G D	P-ID,TT-Theo ry,VV-Viva	F&S	III	
CO2,CO7	Summarize the treatment principles of Prakrutika doshas (Vatala ,Pittal,Shlemal Prakrutis) Ch Vi 6/14-18	CC	MK	KH	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2	Enlist qualities of Rajavaidya Ch Vi 6/19	CK	MK	K	L,RP	P-RP,VV- Viva	F&S	III	
CO1	Summarize the chapter based on sutras Ch Vi 6/42-44	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 33 Cha.Vi. 07- Vyadhita rupeeya vimana Adhyaya</b> (Lecture :2 hours, Non lecture: 2 hours)									

CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	KH	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2	Explain basic meaning and importance of key terms such as dviddah vyadhita prurusha	CK	MK	K	L	TT-Theory,V V-Viva	F&S	III	
CO2,CO3	Explain two types of vyadhita purusha (guru vyadhita and laghu vyadhita) Ch Vi 7/3,4	CC	MK	KH	L,RP	TT-Theory,V V-Viva	F&S	III	H-RN
CO2,CO8	Explain two types of vaidya (jnani and ajnani) Ch Vi 7/4	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO3,CO 4,CO5	Enlist the types of krimis (see activity list also) Ch Vi 7/9	CC	MK	KH	L&G D,FC, EDU	QZ ,PUZ,TT- Theory,VV- Viva	F&S	III	H-RN
CO4,CO5	Explain the trividha chikitsa Ch Vi 7/14	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2	Recite sutra Ch Vi 7/28	CK	MK	K	REC	VV-Viva	F&S	III	
CO1,CO2	Summarize the chapter with the help of Slokas 31 and 32	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 34 Cha.Vi. 08-Rogabhishagjiteeyam Adhyaayam.</b> (Lecture :5 hours, Non lecture: 11 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO1,CO2,CO 4	Explain the basic meaning and importance of sastrapareeksha, trividha upaya, tadvidyasambhasha, karya abhivritti ghataka, dasavidha pareekshyabhava, dasavidha atura pareeksha	CC	MK	K	L	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Explain shashtrapareeksha. Ch Vi 8/3	CC	MK	K	L&G D,BL	DEB,TT-Theo ry,VV-Viva	F&S	III	

CO2	Enlist the three means of knowledge (trividha upaya). Ch Vi 8/6	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2	Explain the adhyayan and adhyapana vidhi. (also see activity list) Ch Vi 8/7,8	CK	MK	K	L,W	SA,VV-Viva	F&S	III	
CO1,CO2	Outline sambhashavidhi C Vi 8/16-18	CK	DK	KH	L&G D,ED U	DEB,TT-Theo ry,VV-Viva	F&S	III	
CO1	Describe three types of parishat Ch Vi 8/19,20	CK	DK	K	L,RP, SDL	P-RP,VV- Viva	F&S	III	
CO1,CO2	Enlist vadamarga padani Ch Vi 8/27	CK	DK	K	L,FC	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Explain dashavidha pareekshya bhavas. Ch Vi 8/68-77, 84	CK	MK	K	L&G D,BL	QZ ,TT-Theor y,VV-Viva	F&S	III	
CO3,CO4,CO 6,CO7	Explain dhatusamya pareeksha Ch Vi 8/89	CC	MK	KH	L,DIS	CHK,TT-Theo ry,VV-Viva	F&S	III	
CO1,CO2,CO 6	Explain dashavidha aturapareeksha. Ch Vi 8/94 -123	CC	MK	KH	L&G D,CB L	PUZ,TT-Theo ry,VV-Viva	F&S	III	H-RN
CO1,CO2	Recite the sutras Ch Vi. 8/ 3,6 68-78.	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	III	
CO1,CO2	Summarize the chapter with the help of shlokas 52-56	CC	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 35 Cha.Sha.01-Katithapurushheeya Adhyaya</b> (Lecture :2 hours, Non lecture: 3 hours)									
CO1,CO2	Describe the sthana adhikarana (objectives) of sharirasthana Cha.Sha 8/69	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	

CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms purusha, mana, atma, yoga and moksha	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO2,CO4	Define ekadhatupurusha, shaddhatvatmak purush, chaturvimashataika purusha and rashi purusha, Ca Sha 1/16, 17, 35	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO 4	Explain lakshana, guna, vishaya and karma of manas and its role in jnanotpatti krama Ca Sha 1/ 18-24	CC	MK	K	L&G D,FC	TT-Theory,V V-Viva	F&S	II	
CO2,CO4	Enlist ashtaprakruti and shodasha vikara. Ca Sha 1/63-64	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4	Explain srustiutpatti krama and pralaya Ca Sha 1/ 66-69	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO 7	Identify atmalinga as basic features of living organism Ca Sha 1/70-74	CC	MK	K	DIS,F C	TT-Theory,V V-Viva	F&S	II	
CO2,CO5	Explain naishtiki chikitsa Ca Sha 1/86-94	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO7	Explain dukhahetavah (causes of misery) Ca Sha 1/98	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO 4,CO7	Outline asatmyendriyarthasamyoga as a cause of diseases Ca Sha 1/118-128.	CC	MK	KH	L&G D,FC	DEB,TT-Theo ry,VV-Viva	F&S	II	
CO2,CO4,CO	Define and explain prajnaaparadha, with terms dhivibhramsha,	CC	MK	KH	L&G	TT-Theory,V	F&S	II	

7	dhruti vibhramsha, smriti vibhramsha.Ca Sha 1/99-102.				D	V-Viva			
CO2,CO4,CO7	Describe vedana, vedana adhishtana and vedana nivrutti Ca Sha 1/134-137.	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO7	Define state of Yoga Ca Sha 1/138-141	CK	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4,CO7	Outline mokshaprapti upaya. Ca Sha 1/142-146	CC	DK	KH	L&G D,BS	P-VIVA,TT- Theory	F&S	II	
CO1,CO4,CO7	Explain lakshana of Prashaanta Bhutaatma. Ca Sha 1/155-156	CK	DK	K	L&G D	VV-Viva	F&S	II	
CO2,CO3,CO4,CO7	Enlist and explain smriti hetu Ch Sha 1/148-149	CC	MK	KH	L&PP T	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Relate smritihetus with process of learning	CAP	NK	KH	L_VC ,BS	VV-Viva	F	II	
CO3,CO8	Illustrate smritihetus through game (activity no.11)	PSY- SET	DK	SH	EDU, SDL, PSM, GBL	O-GAME	F	II	
CO1,CO2	Recite sutras Cha.Sha.16 -23, 28-30,36, 63, 64,70-74, 98,102,109,137-139, 148,149	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	II	
CO2	Summarize the chapter based on sutra Ca. Sha 1/ 156	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	II	
<b>Topic 36 Cha.Sha.02-Atulyagothreeyam Adhyaaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the Shareerasthana and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	

CO2	Explain basic meaning and importance of key terms in the chapter atulya-gotra, beeja, dwireta, kliba, prajnaparadha, pratikarma, daiva	CK	DK	K	L&G D,BS	QZ ,COM,TT-Theory,VV-Viva	F&S	II	
CO3,CO7	Enlist prerequisites for conception Ch Sha 2/4	CK	MK	K	L&G D	QZ ,TT-Theor y,VV-Viva	F&S	II	
CO3,CO7	Summarize the factors affecting conception, foetus Cha Sha 2/6-12	CK	DK	K	L&G D	QZ ,TT-Theor y,VV-Viva	F&S	II	
CO2,CO7	Enlist shodasa dhatu (16 factors) in the formation of fetus Ch Sha 2/32,33	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Outline features of multiple pregnancies, dwireta (hermaphroditism) and other types of sexual abnormalities Ca sh 2/12-14, 18-21	CK	DK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Explain lakshanas of sadyogruhit garbhini lakshana. Ca Sha 2/23-27	CK	DK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Explain ativahika purusha (factors carrying from previous birth to next birth). Ca Sha 2/31-32	CK	MK	K	L&G D,IBL	CR-W,TT-The ory,VV-Viva	F&S	II	
CO3,CO7	Differentiate daivakara and purushaakara Ca Sha 2/44.	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7,CO8	Explain niroga lakshana. Ca sha 1/46-47	CK	DK	K	L&G D,CB L	CHK,TT-Theo ry,VV-Viva	F	II	
CO1,CO2	Recite sutras Cha.Sha.2/26, 27, 35,44,45-47	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	II	
CO1,CO2	Summarize thechapter based on Ca Sha 2/48	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	II	

<b>Topic 37 Cha.Sha.03-Khuddika garbhavakranti Adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the Shareerasthana and its importance	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as matrija, pitrija, sattvaja, satmyaja, rasaja, atmaja bhavas, beeja and beejabhaga	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO3,CO7	Enlist factors responsible for the formation, growth of the embryo Cha Sha 3/3	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO1,CO3,CO 7	Outline the sambhasha parishat on garbha utpatti (formation of embryo) and factors contributed from different agents like satva, satmya etc. Ch Sha 3/4	CK	DK	K	L&G D	PRN,DEB	F&S	II	
CO3,CO7	Explain matruja, pitruja, atmaja, satmyaja, rasaja, satvaja bhavas of garbha Ch Sha 3/6-14	CK	DK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO3,CO 7	Explain role of beeja-beejabhaga dushti in congenital abnormalities Ch Sha 3/17	CAP	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2	Recite sutras no Ch Sha 3/17	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	II	
CO1	Summarize the chapter based on sutra Ch Sha 3/26-27.	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	II	
<b>Topic 38 Cha.Sha.04-Mahatee garbhavakranti Adhyaya</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Shareerasthana and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms such as garbhopaghatakar bhava, manas prakriti.	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	



CO3,CO7	Define garbha Ch. Sha 4/5	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Enlist components of shad dhatvaatmak purush Ca Sh 4/6	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Explain functions of atma in the formation of garbha. Ch sha 4/8	CK	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Outline maasanumasik garbha poshana Ch Sha 4/9-11,20-24	CK	DK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Explain garbhopaghatakara bhavas. Ch Sh 4/18	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO3,CO7	Summarize the causes of congenital abnormalities Ch Sha 4/30-32	CK	MK	K	L&G D	P-POS,TT- Theory	F&S	II	
CO3,CO7	Explain qualities of satva-raja-tama. Cha Sh 4/36	CK	MK	KH	L&G D	QZ ,TT-Theor y,VV-Viva	F&S	II	
CO3,CO7	Outline features of shodash manasa prakritis (sixteen types of mental constitution). Ch Sha 4/36-40	CK	DK	KH	L&G D,L_ VC,C BL	PM,TT-Theor y,VV-Viva	F&S	II	
CO3,CO6	Identify some important features of manasaprakriti in individuals (also see activity list)	PSY- SET	NK	SH	CBL, RP,D	P-RP,VV- Viva	F	II	
CO1,CO2	Recite sutras Ch Sha 4/6,36	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	II	
CO1,CO2	Summarize the chapter as per sutras given at the end of the chapter Ca Sha 4/42-45.	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	II	

**Topic 39 Cha.Sha.05-Purushavichaya Shareera Adhyaya** (Lecture :1 hours, Non lecture: 4 hours)

CO1,CO2	Justify the position of the chapter in the Samhita	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain the basic meaning and importance of key terms in the chapter such as lokapurushasamyata, hetwadi panchaka and satya buddhi	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO2,CO4,CO 7	Define loka purusha samya siddhanta Ch Sh. 4/13; 5/3	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4	Illustrate loka -purusha samya siddhanta with examples Ch Sha 5/5	CAP	DK	KH	DIS,B S,PER	TT-Theory,V V-Viva	F&S	II	
CO2,CO7	Define and describe satyabuddhi Ch Sh.5/7,16-19	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4	Enlist and describe hetvadi panchaka Ch Sh.5/8	CK	DK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO4,CO7	Illustrate pravritti-nivritti upaya (see activity list)	CAP	DK	KH	D	P-PS,TT-Theo ry,VV-Viva	F	II	
CO1,CO2	Recite sutras Ch Sha 5/ 3, 5, 8,16	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	II	
CO1,CO2	Summarize the chapter as per sutra Ch Sh 5/25,26	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	II	

**Topic 40 Cha.Sha.06-Sareeravichaya adhyaya** (Lecture :1 hours, Non lecture: 2 hours)

CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain the basic meaning and importance of key terms in the	CK	MK	K	L&G	QZ ,COM,TT-	F&S	II	

	chapter such as vriddhikara bhava, kala kaala mrityu and param ayu				D,BS	Theory,VV-Viva			
CO2	Define shareera Ch. Sh.6/4	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO4	Apply samanya visesha siddhanta in shareera Ch.Sh.6/11	CAP	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2	Describe shareera vruddhikara bhava Ch.Sh.6/12	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2	Describe bala vruddhikara bhava Ch.Sh.6/13	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2	Explain ahara parinamakara bhava Ch.Sh.6/14,15	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO7	Classify shareera-gunas into malarupa and prasadarupa Ch.Sh..6/16,17	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2	Explain the concept of kala and Akala Mrithyu Ch.Sh 6/28	CK	DK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2,CO7	Define parama ayu karanam Ch.Sh 6/30	CK	DK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO7	Analyse data related to akala-mrityu (see activity list)	CAP	DK	KH	DIS,I BL,E DU	M-CHT	F	II	
CO1,CO2	Recite the sutra Ch Sha 6/4, 5-11, 12,13, 17, 28, 30	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	II	
CO1,CO2	Summarize the chapter as per sutra Ch Sh 6/31-34	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	II	

<b>Topic 41 Cha.Sha.07- Sareerasankhya sareera Adhyaya</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain the basic meaning and importance of key terms in the chapter such as chetanaadishtana, pranayathana, koshtanga, pratyanga, anjali pramana etc.	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO2,CO3,CO 7	Explain paramanu bheda shariram Ch Sha 7/17	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO1,CO2	Recite sutra Ch Sha 7/17	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	II	
CO1,CO2	Summarize the chapter as per sutra Ch Sha 7/19, 20	CK	NK	K	SDL	T-OBT	F&S	II	
<b>Topic 42 Cha.Sha.08-Jathisutreeya Adhyaya</b> (Lecture :1 hours, Non lecture: 12 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	II	
CO2	Explain basic meaning and importance of key terms in the chapter such as jathi, pumsavana, sutikagara etc	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	II	
CO2	Enlist garbha upaghatakara bhava Ch.Su 8/21	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	II	
CO2	Describe the infrastructure of a sutikagaram Ch. Su 8/33	CK	NK	K	PrBL, SDL	M-MOD,TT- Theory	F&S	II	V-BL
CO3,CO8	Demonstrate garbhopghatakarakabhava through skit (see activity list)	PSY- SET	DK	KH	ML,R P	QZ ,CHK,VV- Viva	F	II	
CO1,CO2	Summarize the chapter as per the sutra Ch Sha 8/68,69	CK	NK	K	SDL	T-OBT,VV-	F&S	II	

						Viva			
<b>Topic 43 Cha.In.1-Varnasvariya Indriya Adhyaya</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO1,CO2	Describe sthana adhikarana (objectives) of Indriyasthana	CK	MK	KH	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	KH	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2	Explain basic meaning and importance of key terms such as arishta, vikritibheda, varna, swara etc. related to rishta	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	III	
CO2,CO6	Enlist factors for assessing rishta Ref: Ch. In 1/3	CK	MK	K	L&G D,BL	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Enlist six types of prakruti bheda. Ch In 1/5	CK	MK	K	L&G D,ED U	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Enlist vikritibheda (types of vikriti) in the context of rishta Ch In 1/6,7, 17-23	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Explain prakruta and vaikarika varna Ch In 1/8,9	CK	MK	K	L&G D,ML	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Summarize varnavishayak arishta (rishta related to varna) Ch In 1/9-13	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Explain prakruta and vaikarika swara (normal and abnormal voices) Ch In 1/14	CK	MK	K	L&G D,ED U	QZ ,TT-Theor y,VV-Viva	F&S	III	
CO2,CO6	Summarize swara vishayak arishta (arishta related to voice) Ch In 1/15,24,25	CC	DK	KH	L&G D	TT-Theory,V V-Viva	F&S	III	

CO1,CO2	Summarize the chapter Ch In 1/26	CC	NK	KH	SDL	T-OBT,VV-Viva	F&S	III	
<b>Topic 44 Cha.In.2-Pushpitakam Indriya Adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the sequence	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2	Explain basic meaning and importance of key terms such as niyatarishta, aniyatarishta	CK	MK	K	L&G D,BS	QZ ,COM,TT- Theory,VV- Viva	F&S	III	
CO6	Outline gandhavishayak arishta (prognostic signs identified through smell) Ch In 2/7-16	CK	DK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO3,CO 6	Summarize rasavishayak arishta (prognostic signs related to taste) Ch In 2/17-22	CK	DK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Summarise the chapter Ch In 3/23	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 45 Cha.In.3-Parimarshaneeyam Indriyam Adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2,CO6	Enlist Sparshagamy bhava (palpable signs) in arishta Ch In 3/4	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Explain Sparshavishayak Arishta lakshna (based on palpation) Ch In 3/5,6	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Summarise the chapter as per the sutras given at the end of the chapter Ch In 3/7	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 46 Cha.In.4-Indriyaneekam Indriya adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									

CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F	III	
CO2,CO6	Explain indriya vishayaka arishta samanya niyama (general rule regarding involvement of indriya) Ch In 4/3-6	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Summarise the chapter as per the sutras given at the end of the chapter Ch In 4/27	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 47 Cha.In.5-Purvarupeeyam Indriyam Adhyaya</b> (Lecture :1 hours, Non lecture: 2 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and its importance	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2,CO6	Enlist jvara rupa vishayaka poorvaroopiya rishta (rishta based on purvarupa of jvara) Ch In 5/3-5	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO3,CO 4	Define swapna Ch In 5/41-42	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Enlist and explain swapna bheda (types of swapna) Ch In 5/43	CC	MK	KH	L&G D	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Recite sutra Ch In 5/41-43	CK	MK	K	SDL, REC	P-REC,TT- Theory	F&S	III	
CO1,CO2	Summarise the chapter as per sutra Ch In 5/47	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 48 Cha.In.6-Katamanisharireeyam Indriyam Adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita and explain basic meaning and importance of key terms in the chapter	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2,CO3,CO 6	Outline arishta related to pureesha, mutra and swayathu Ch In 6/11-19	CC	DK	K	L&G D	TT-Theory,V V-Viva	F&S	III	

CO1,CO2	Summarise the chapter as per sutras given at the end of the chapter Ch In 6/25	CK	NK	K	SDL	T-OBT,VV-Viva	F&S	III	
<b>Topic 49 Cha.In.7-Pannarupiyam Indriyam Adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter in the Samhita	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2,CO3,CO 6	Explain basic meaning and importance of chaya, pratichaya and prabha	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Explain pratichaya vishayaka arishta. Ch In 7/4-6	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Explain chaya vikruti arishtas. Ch In 7/4-6	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Enlist five types chaya Ch In 7/10-13	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Enlist seven types of prabha Ch In 7/14-15	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO3,CO 6	Differentiate chaya and prabha Ch In 7/16-17	CC	MK	K	L_VC	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Summarise the chapter Ch In 7/32	CK	NK	K	SDL	T-OBT,VV-Viva	F&S	III	
<b>Topic 50 Cha.In.8-Avakshiraseeyam Indriyam Adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Justify position of the chapter in Samhita	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO1,CO2	Summarise the chapter as per sutra given at the end of the chapter	CK	NK	K	SDL	T-OBT,VV-Viva	F&S	III	



<b>Topic 51 Cha.In.9-Yasya shyavanimittiya Indriya Adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1	Justify position of the chapter in Samhita	CK	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2	Explain basic meaning and importance of key terms such as ashtamaharoga	CC	MK	K	L	TT-Theory,V V-Viva	F&S	III	
CO2,CO4,CO 6	Enlist ashtamaharogas Ch In 9/8-9	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Summarise the chapter as per the sutra given at the end of the chapter Ch In 9/23,24	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 52 Cha.In.10-Sadyomaraneeyam Indriya Adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Justify position of the chapter and key terms in the chapter	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2,CO6	Explain sadyomaraneeya arishtas Ch In 10/3-20	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Summarise the chapter as per the sutras given at the end of the chapter Ch In 10/21	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	
<b>Topic 53 Cha.In.11-Anujyotiyam Indriya Adhyaya</b> (Lecture :1 hours, Non lecture: 0 hours)									
CO1,CO2	Justify the position of the chapter and explain key terms such as arishta Ch In 11/29	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2,CO6	Define arishta Ch In 11/29	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Recite sutra Ch In 11/29	CK	MK	K	SDL	P-VIVA,TT- Theory	F&S	III	

<b>Topic 54 Cha.In.12-Gomayachurniyam Indriya Adhyaya</b> (Lecture :1 hours, Non lecture: 17 hours)									
CO1,CO2	Justify the posttion of the chapter and explain key terms such as mumurshu, prasasta duta and mangalika dravya	CC	MK	K	L&G D	INT,TT-Theor y,VV-Viva	F&S	III	
CO2,CO6	Summarize mumurshu lakshana Ch In 12/9-25	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO6	Outline prashasta doota lakshana and mangalika dravya Ch In 12/71-80	CK	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO2,CO4	Define arogya in the context of arishta Ch In 12/87	CC	MK	K	L&G D	TT-Theory,V V-Viva	F&S	III	
CO1,CO2	Summarise the chapter as per sutra given at the end of the chapter Ch In 12/89	CK	NK	K	SDL	T-OBT,VV- Viva	F&S	III	

**List of Practicals** (Term and Hours)

<b>PRACTICALS</b> (M (As a part of NLH))			
<b>S.No</b>	<b>List of Topics</b>	<b>Term</b>	<b>Hours</b>
1	SHLOKA PATHANA- 1	1	10
2	LEARNING THROUGH VYAKHYANA-1	1	3
3	OBSERVING THE PRACTICAL UTILITY OF SNEHANA AND SWEDANA	1	2
4	IDENTIFICATION OF BAHUDOSHA LAKSHANA IN PATIENTS	1	2
5	ASSESSMENT OF DISEASES BASED ON TRIVIDHA BODHYA SANGRAHA	1	2
6	IDENTIFICATION OF ASHTA DOSHA IN STHOULYA	1	2
7	CLINICAL OBSERVATIONS ON NIJA AGANTUJA RELATIONSHIP	1	2
8	CLINICAL OBSERVATION ON SHADUPAKRAMA	1	2
9	ASSESSMENT OF RAKTA DUSHTI KARANA IN SPECIFIC CLINICAL CONDITIONS	1	2
10	OBSERVATIONS ON USE OF AGRYA AUSHADHA IN CLINICAL PRACTICE	1	2
11	ASSESSMENT OF DHATU-UPADHATU-MALA PRADOSHAJA VIKARAS IN PATIENTS	1	3
12	SHLOKA PATHANA- 2	2	10
13	LEARNING THROUGH VYAKHYANA-2	2	3
14	CASE TAKING IN RELATION TO NIDANA PANCHAKA	2	12
15	DIFFERENTIAL DIAGNOSIS OF SKIN DISEASES BASED ON GUIDELINES ON KUSHTA	2	2
16	PRAMANA PARIKSHA	2	2
17	IDENTIFICATION OF VIKARAVIGHATA BHAVA ABHAVA IN PATIENTS	2	2
18	EXPLORATION OF LOKA PURUSHA SAMYA VADA IN THE BACK GROUND OF ONE HEALTH	2	2
19	SHLOKA PATHANA-3	3	10
20	LEARNING THROUGH VYAKHYANA-3	3	3
21	LEARNING THROUGH SAMBHASHA PARISHAD	3	6
22	SROTAS PROFORMA	3	2

23	LEARNING THROUGH TANTRA YUKTI	3	5
24	ASSESSMENT OF HEALTH THROUGH DHATU SAMYA PAREEKSHA	3	2
25	AGNI ASSESSMENT BASED ON APACHARA	3	2
26	TRIVIDHA ROGA VISHESHAVIJNANA IN DIAGNOSIS	3	3
27	ASSESSMENT OF UPASAYA AND ANUPASAYA IN PATIENTS	3	2

**Table 4: Learning objectives (Practical)**

<b>A4</b> Course outcome	<b>B4</b> Learning Objective (At the end of the session, the students should be able to)	<b>C4</b> Doma in/sub	<b>D4</b> Must to know / desirable to know / Nice to know	<b>E4</b> Level Does/ Show s how/ Know s how/ Know	<b>F4</b> T-L meth od	<b>G4</b> Assessment  (Refer abbreviations)	<b>H4</b> Form ative/ summ ative	<b>I4</b> Term	<b>K4</b> Integr ation
<b>Topic 1 SHLOKA PATHANA- 1</b>									
CO1,CO2	Recite the selected slokas in each chapter	CK	MK	K	REC	PP-Practical,V V-Viva	F&S	I	
CO1,CO2	Compile slokas selected for recitation	CK	MK	K	SDL	PP-Practical,V V-Viva	F&S	I	
<b>Topic 2 LEARNING THROUGH VYAKHYANA-1</b>									
CO1,CO2	Interpret selected sutras with the help of Ayurveda Deepika Vyakhyana of Carakasamhita	CC	MK	KH	L&G D,DIS ,TBL	PP-Practical,V V-Viva	F&S	I	
CO1,CO2	Prepare narrative summary of vyakhyana for the specified sutras	CAP	MK	KH	SDL	PP-Practical,V V-Viva	F&S	I	
CO1,CO2	Appreciate importance of Vyakhyana in learning Samhita	AFT- REC	MK	KH	D	P-VIVA	F&S	I	
<b>Topic 3 OBSERVING THE PRACTICAL UTILITY OF SNEHANA AND SWEDANA</b>									
CO4,CO5	Identify and compile experiences of people undergoing sneha-	CAP	MK	KH	SDL,	PP-Practical	F&S	I	V-PC

	sweda				RLE				
<b>Topic 4 IDENTIFICATION OF BAHUDOSHA LAKSHANA IN PATIENTS</b>									
CO3,CO4,CO6,CO7	Assess Bahudoshalakshana in patients	PSY-SET	MK	SH	CBL, PT	PP-Practical,V V-Viva	F&S	I	
CO3,CO4,CO6,CO7	Appreciate the role and importance of assessing bahudosha lakshana in clinical practice	AFT-REC	MK	SH	CBL, PRA	PP-Practical,V V-Viva	F&S	I	
<b>Topic 5 ASSESSMENT OF DISEASES BASED ON TRIVIDHA BODHYA SANGRAHA</b>									
CO3,CO4,CO6,CO7	Assess diseases based on trividha-bodhya-sangraha ie. vikaraprakriti(nature of disease), samuthana (causative factors) and adhishtana (site of disease)	PSY-SET	MK	SH	CBL, PRA	PP-Practical,V V-Viva	F&S	I	
CO3,CO4,CO6,CO7	Appreciate role and importance of trividhabodhyasangraha in clinical practice	AFT-REC	MK	SH	CBL, PRA	PP-Practical,V V-Viva	F&S	I	
<b>Topic 6 IDENTIFICATION OF ASHTA DOSHA IN STHOULYA</b>									
CO3,CO4,CO6,CO7	Assess ashtadosha of atisthoulya in subjects	PSY-SET	MK	SH	CBL, D	TT-Theory,V V-Viva	F&S	I	
CO3,CO4,CO6,CO7	Maintain good communication skills with patients	AFT-RES	MK	SH	CBL, D, PRA	TT-Theory,V V-Viva	F&S	I	
<b>Topic 7 CLINICAL OBSERVATIONS ON NIJA AGANTUJA RELATIONSHIP</b>									
CO3,CO4,CO6,CO8	Identify relationship between nija and agantu in clinical conditions	PSY-SET	MK	SH	CBL, PT,D	PP-Practical,V V-Viva	F&S	I	
CO4,CO8	Develop good rapport with patients	AFT-VAL	MK	SH	CBL, PT,D	P-VIVA,VV-Viva	F&S	I	

**Topic 8 CLINICAL OBSERVATION ON SHADUPAKRAMA**

CO3,CO4,CO5,CO8	Identify shadupakrama in treatment plans of different diseases	PSY-SET	MK	SH	CBL,PT,D	PP-Practical,V V-Viva	F&S	I	
CO5,CO8	Develop good communications skills in clinics	AFT-REC	MK	SH	CBL,PT,D	PP-Practical,V V-Viva	F&S	I	

**Topic 9 ASSESSMENT OF RAKTA DUSHTI KARANA IN SPECIFIC CLINICAL CONDITIONS**

CO3,CO4,CO6,CO7	Identify raktadushti karanas in patients affected by raktadushti, especially, skin diseases	PSY-SET	MK	SH	CBL,D,PR A	PP-Practical,V V-Viva	F&S	I	
CO3,CO4,CO6,CO7	Develop good communication skills with patients	AFT-REC	MK	SH	CBL,D,PR A	PP-Practical,V V-Viva	F&S	I	

**Topic 10 OBSERVATIONS ON USE OF AGRYA AUSHADHA IN CLINICAL PRACTICE**

CO1,CO4,CO5	Justify use of agraushadhas in common clinical conditions	PSY-MEC	MK	SH	PER	P-VIVA	F&S	I	
CO8	Develop good communication skills	AFT-REC	MK	SH	DIS,PER	P-VIVA	F&S	I	

**Topic 11 ASSESSMENT OF DHATU-UPADHATU-MALA PRADOSHAJA VIKARAS IN PATIENTS**

CO3,CO4,CO6,CO7	Identify dhatu-mala-upadahtu pradoshaja vikaras in patients	PSY-SET	MK	SH	CBL,PT,D_ BED	P-EXAM,VV- Viva	F&S	I	
CO3,CO4,CO8	Develop rapport with patients	AFT-REC	MK	SH	CBL,D_ BED	P-VIVA,VV- Viva	F&S	I	

<b>Topic 12 SHLOKA PATHANA- 2</b>									
CO2	Recite the selected slokas in each chapter	CK	MK	K	REC	P-VIVA	F&S	II	
CO2	Compile slokas selected for recitation	CK	MK	K	TBL, SDL	P-VIVA	F&S	II	
<b>Topic 13 LEARNING THROUGH VYAKHYANA-2</b>									
CO2	Interpret selected sutras with the help of Ayurveda Deepika Vyakhyana of Carakasamhita	CAP	MK	KH	L&G D,DIS ,TBL	P-VIVA	F&S	II	
CO2	Prepare narrative summary of vyakhyana for the specified sutras	CAP	MK	KH	DIS,S DL	P-VIVA	F&S	II	
CO1,CO2	Appreciate importance of Vyakhyana in learning Samhita	AFT- REC	MK	KH	D	P-VIVA	F&S	II	
<b>Topic 14 CASE TAKING IN RELATION TO NIDANA PANCHAKA</b>									
CO3,CO4,CO 6,CO7	Perform case taking based on nidana-panchaka	PSY- SET	MK	SH	CBL, D_BE D	P-VIVA	F&S	II	
CO8	Develop rapport with patients	AFT- REC	MK	SH	CBL, D_BE D	T-EMI,P- VIVA	F&S	II	
CO6,CO8	Develop clinical skills based on Ayurvedic clinical methods	PSY- SET	MK	SH	CBL, D_BE	PP-Practical	F&S	III	



					D				
<b>Topic 15 DIFFERENTIAL DIAGNOSIS OF SKIN DISEASES BASED ON GUIDELINES ON KUSHTA</b>									
CO4,CO6,CO8	Assess skin diseases based on Ayurvedic parameters	PSY-SET	MK	SH	CBL, D_BE D	PP-Practical	F&S	II	
CO6,CO8	Develop skills based on Ayurvedic clinical methods	AFT-REC	MK	SH	D_BE D	PP-Practical	F&S	II	
<b>Topic 16 PRAMANA PARIKSHA</b>									
CO3,CO4,CO6,CO7	Assess physiometry based on pramana-pareeksha mentioned in Ayurveda	PSY-SET	MK	SH	D	VV-Viva	F&S	II	
CO8	Appreciate importance of Ayurvedic methods of measurements	AFT-REC	MK	SH	D	VV-Viva	F&S	II	
<b>Topic 17 IDENTIFICATION OF VIKARAVIGHATA BHAVA ABHAVA IN PATIENTS</b>									
CO2,CO3,CO4,CO6,CO7	Apply the concept of "vikaravisatabhavabhavapractivisesha" in understanding diseases	CAP	MK	KH	CBL, CD	P-VIVA	F&S	II	
CO6	Perform case taking based on the concept of vikaravighata bhava abhava	PSY-SET	MK	SH	CD,D	P-VIVA	F&S	II	
<b>Topic 18 EXPLORATION OF LOKA PURUSHA SAMYA VADA IN THE BACK GROUND OF ONE HEALTH</b>									
CO4,CO7,CO8	Apply lokapurusha-samyasidhanta in contemporary life	CAP	MK	KH	DIS,BS,PrBL	VV-Viva	F&S	II	
<b>Topic 19 SHLOKA PATHANA-3</b>									
CO1,CO2	Recite the selected slokas in each chapter	CK	MK	K	REC	VV-Viva	F&S	III	

CO1,CO2	Compile slokas selected for recitation	CK	MK	K	SDL	VV-Viva	F&S	III	
<b>Topic 20 LEARNING THROUGH VYAKHYANA-3</b>									
CO1,CO2	Interpret selected sutras with the help of Ayurveda Deepika Vyakhyana of Carakasamhita	CAP	MK	KH	L,LS	VV-Viva	F&S	III	
CO1,CO2	Prepare narrative summary of vyakhyana for the specified sutras	CC	MK	KH	SDL	VV-Viva	F&S	III	
CO1,CO2	Appreciate importance of Vyakhyana in learning Samhita	AFT-REC	MK	KH	D	P-VIVA	F&S	III	
<b>Topic 21 LEARNING THROUGH SAMHASHA PARISHAD</b>									
CO1,CO2	Demonstrate Sambhasha parishat to discuss different topics	PSY-ADT	MK	SH	D	P-VIVA	F&S	III	
CO8	Appreciate the importance of collective thinking in learning Ayurveda	AFT-VAL	MK	SH	DIS,D	P-VIVA	F&S	III	
<b>Topic 22 SROTAS PROFORMA</b>									
CO4,CO6,CO8	Assess involvement of srotas in clinical conditions	PSY-SET	MK	SH	D_BE D	VV-Viva	F&S	III	
CO8	Develop clinical skills based on Ayurvedic clinical methods	AFT-REC	MK	SH	D_BE D	VV-Viva	F&S	III	
<b>Topic 23 LEARNING THROUGH TANTRA YUKTI</b>									
CO1,CO2,CO4	Apply tantrayukti and interpret the sutras	CAP	MK	KH	TBL, D	P-VIVA	F&S	III	
CO1	Appreciate the importance of Tantrayukti in interpreting Samhita	CAP	MK	KH	DIS,T BL	P-VIVA,VV-Viva	F&S	III	

<b>Topic 24 ASSESSMENT OF HEALTH THROUGH DHATU SAMYA PAREEKSHA</b>									
CO3,CO4,CO 6	Assess health of a person based through dhatu-samya-pareeksha	PSY- SET	MK	SH	CBL, D_BE D	P-VIVA	F&S	III	
CO8	Appreciate health of a person through interaction	AFT- RES	MK	SH	D_BE D	P-VIVA,VV- Viva	F&S	III	
<b>Topic 25 AGNI ASSESSMENT BASED ON APACHARA</b>									
CO3,CO4,CO 7	Assess agni based on apachara-visesha	PSY- SET	MK	SH	DIS,D _BED	P-VIVA	F&S	III	
CO8	Develop good rapport with patients	AFT- REC	MK	SH	CBL, D_BE D	P-VIVA	F&S	III	
<b>Topic 26 TRIVIDHA ROGA VISHESHAVIJNANA IN DIAGNOSIS</b>									
CO4,CO6,CO 7	Demonstrate trividha roga visesha vijnana in clinical methods	PSY- SET	MK	SH	DIS,C BL,D	P-VIVA	F&S	III	
CO8	Appreciate the importance of Ayurvedic parameters in clinical methods	AFT- VAL	DK	SH	DIS,C BL,D	P-VIVA	F&S	III	
<b>Topic 27 ASSESSMENT OF UPASAYA AND ANUPASAYA IN PATIENTS</b>									
CO3,CO5,CO 6	Identify upasaya-anupasaya in patients	PSY- SET	MK	SH	CBL, D_BE D	P-VIVA	F&S	III	
CO8	Appreciate wellness of patients	AFT- REC	DK	SH	D_BE D	P-VIVA	F&S	III	

**Table 4a: List of Practical** (As a part of NHL)

S.No	Name of practical	Term	Activity	Practical hrs
1	SHLOKA PATHANA- 1	1	<p><b>Purpose:</b> To by heart sutras selected from Charakasamhita</p> <p><b>Teacher's role:</b> Teachers should instruct the students to by heart the slokas when the respective portions are over. A log book may be kept by the teacher to mark the date and signature to note the satisfactory recitation of the slokas by the students. The performance of students can be considered for formative assessment. During summative assessment, sloka recitation will be a part of practical examination.</p> <p><b>Students role:</b> To by heart the selected slokas given below and to compile minimum 100 sutras (three terms)</p> <p><b>Sutras suggested:</b></p> <ol style="list-style-type: none"> <li>1. Cha.Su.13- Sneha Adhyaya- 13-17, 22, 57-59</li> <li>2. Cha.Su.14- Sveda Adhyaya- 4,5,39,40,64</li> <li>3. Cha.Su.15- Upakalpaneeya Adhyaya – 22</li> <li>4. Cha.Su.16- Chikitsaprabhritiya Adhyaya - 13-21,27,28,34-36</li> <li>5. Cha.Su.17- Kiyantashiraseeya Adhyaya- 12, 41-44, 62, 112-118</li> <li>6. Cha.Su.18-Trisotheeya Adhyaya- 42-43, 44-47</li> <li>7. Cha.Su.19-Ashtodareeya Adhyaya- 5,6</li> <li>8. Cha.Su.20- Maharoga adhyaya- 3, 4, 5, 11,14, 17, 20-22</li> <li>9. Cha.Su.21- Ashtauninditeeya adhyaya- 3,4,16, 18, 19, 35, 50, 58</li> <li>10. Cha.Su.22- Langhanabrimhaneeya Adhyaya- 9-24</li> <li>11. Cha.Su.23- Santarpaneeya Adhyaya- 5-7, 26-29</li> <li>12. Cha.Su.24- Vidhisoniteeya Adhyaya- 14,18,20,21,22,24</li> <li>13. Cha.Su.25- Yajjapuruseeya Adhyaya- 29,,31,33,45,46,47,50</li> <li>14. Cha.Su.26- Atreyabhadraakaapeeya Adhyaya- 13,36,37,61,62,66,81,85,86</li> <li>15. Cha.Su.27- Annapaanvidhi Adhyaya- 351-352</li> <li>16. Cha.Su.28- Vividhaasheetapeetiya Adhyaya- 9-19,35-39, 45</li> </ol>	10

2	LEARNING THROUGH VYAKHYANA-1	1	<p><b>Purpose:</b> To familiarize and expose the students to the relevant vyakhyana of Charaka Samhita. The following specific portions in the Vyakhyana are selected for this purpose.</p> <ol style="list-style-type: none"> <li>1. Cha.Su.20- Maharoga adhyaya - 11,16,19</li> <li>2. Cha.Su.26- Atreyabhadhrakaapyeya Adhyaya - 13,29</li> <li>3. Cha.Su.28- Vividhaasheetapeetiya Adhyaya - 7</li> </ol> <p><b>Teacher's role:</b> Teachers will teach those sutras along with the commentary and explain the importance of vyakhyana in better understanding of sutras.</p> <p><b>Students' role:</b> Students will prepare a narrative summary of all the proposed vyakhyanas to highlight their importance in interpreting the sutras. During viva students are asked to interpret the respective sutras along with its vyakhyana.</p>	3
3	OBSERVING THE PRACTICAL UTILITY OF SNEHANA AND SWEDANA	1	<p><b>Purpose:</b> To familiarize commonly available snehayogas and commonly undertaken swedaprayogas. (Ref: Ch Su 13,14)</p> <p><b>Teacher's role:</b> Make five or six groups and instruct them to enlist available ghruta and taila yoga in hospital pharmacy. Enlist the types of swedana followed in panchakarma theatre in the hospital.</p> <p><b>Student's role:</b> Student in groups should document the assigned work in a prescribed format and present to all in the class.</p>	2
4	IDENTIFICATION OF BAHUDOSHA LAKSHANA IN PATIENTS	1	<p><b>Purpose:</b> To assess bahudosha lakshana with the help of proforma in patients posted in hospital wards. (Ref: Ch Su 16/13-16)</p> <p><b>Teacher's role:</b> Teacher should introduce the proforma in the class and guide the students how to furnish the proforma. Teacher may identify patients exhibiting bahudosha lakshana from the ward, those who are posted for Shodhana. Collect the</p>	2

			<p>proformas duly filled by students and analyze the data and discuss with students.</p> <p><b>Students' role:</b> Student should interact with given patient and identify the Bahudosha lakshanas available in the patient and document in the proforma (minimum three cases).</p>	
5	ASSESSMENT OF DISEASES BASED ON TRIVIDHA BODHYA SANGRAHA	1	<p><b>Purpose:</b> To orient students on the use of trividha-bodhya-sangraha (i.e, vikaraprakriti, adhishtana, samuthana) in understanding diseases and thereby enabling them using the unique assessment protocol mentioned in Caraka samhita. (Ref: Ch Su 18/44-47 along with Chakrapani commentary)</p> <p><b>Teacher's role:</b> Introduce the concept of trividha bodhya sangraha, Introduce the case proforma in the class, demonstrate case taking based on trividha-bodhya-sangraha</p> <p><b>Students role:</b> Fill up the observations in the proforma during their routine clinical posting (minimum 3 cases).</p>	2
6	IDENTIFICATION OF ASHTA DOSHA IN STHOULYA	1	<p><b>Purpose:</b> To identify prevalence of ashtadosha of sthaulya in individuals (Ref: Ch Su 21/4)</p> <p><b>Teacher's role:</b> Explain ashtadosha in the class; Introduce the questionnaire to document ashtadosha in individuals; Demonstrate the questionnaire in obese individuals</p> <p><b>Students role:</b> Students will furnish the questionnaire among five people of different age groups and prepare a report based on the findings of the questionnaire survey.</p>	2
7	CLINICAL OBSERVATIONS ON NIJA AGANTUJA RELATIONSHIP	1	<p><b>Purpose:</b> To explore relationship between nija and agantu diseases (Ref: Ch Su 19/7)</p> <p><b>Teacher's role:</b> Teacher explains nija-agantu relationship with examples in the class; Demonstrate some cases where disease starts as agantu and advance to nija and vice versa.</p> <p><b>Students' role:</b> Observe minimum three</p>	2

			cases in OP/IP and make reports to establish the relationship between nija and agantu.	
8	CLINICAL OBSERVATION ON SHADUPAKRAMA	1	<p><b>Purpose:</b> To explore application of shadupakrama in therapeutics (Ref Ch Su 22)</p> <p><b>Teacher's role:</b> After teaching shadupakrama, teachers shall identify some cases in the hospital to demonstrate any one or more upakramas; Try to include cases with varieties of upakrama; Train students to see patients, explore the case sheets and hospital records to find out upakramas adopted to a particular patient.</p> <p><b>Students' role:</b> Observe minimum three cases from hospital and go through case sheets to identify types of upakrama adopted; Interact with interns, teachers to map the upakramas adopted in each patient; Make reports on type of upakrama, nature of medicines used and effects of upakramas based on the above observations; Document observations in three cases</p>	2
9	ASSESSMENT OF RAKTA DUSHTI KARANA IN SPECIFIC CLINICAL CONDITIONS	1	<p><b>Purpose:</b> To identify raktadushtikaranas in cases where raktadushti is suspected (Ref: Ch Su 24/5-10)</p> <p><b>Teacher's role:</b> Teach raktadushti karana; Select some cases where raktadushti is suspected; Demonstrate presence of raktadushti karanas in one or two cases; Assign cases to students to identify presence of raktadushtikarana</p> <p><b>Student's role:</b> Identify presence of raktadushti karanas in three cases with the help of questionnaire provided; Document the observations</p>	2
10	OBSERVATIONS ON USE OF AGRYA AUSHADHA IN CLINICAL PRACTICE	1	<p><b>Purpose:</b> To justify the importance of agryoushadha in clinical practice (Ref: Ch Su 25/38-40)</p> <p><b>Teacher's role:</b> Identify some important agryoushadhas from the list given in Annapanachatushka; Divide the whole class into five or six groups and assign</p>	2

			each group with two or three agrya aushadhas <b>Students role:</b> Make monographs of agryoushadha; Interact with practitioners and collect details of use of these aushadhas in routine practice; Document the observations in the record book.	
11	ASSESSMENT OF DHATU-UPADHATU-MALA PRADOSHAJA VIKARAS IN PATIENTS	1	<b>Purpose:</b> To identify dhatu-upadhatu-mala pradoshaja vikaras in selected cases. (Ref Ch Su 27/9-22) <b>Teacher's role:</b> Demonstrate the proforma in a few cases. <b>Students' role:</b> Make five case sheets reporting the findings of the assessment.	3
12	SHLOKA PATHANA- 2	2	See Practical.1 for instructions <b>Sutras suggested:</b> 1. Cha.Su.30- Arthedashamahamooleeyam Adhyaya - 3,4,10,11,12 2. Cha.Ni.01-Jwara nidana Adhyaya- 3,5,7,8,9,10,11,38-40 3. Cha.Ni.02-Raktapitta nidana Adhyaya- 19,27 4. Cha.Ni.04-Prameha nidana adhyaya- 3, 4, 48-49 5. Cha.Ni.05- Kushta nidana Adhyaya- 3,4,5,8 6. Cha.Ni.06-Shosha nidana Adhyaya- 3, 5,7,9,11,14 7. Cha.Ni.07- Unmada nidana Adhyaya- 5,19-22 8. Cha.Ni.08- Apasmara nidana adhyaya- 3,5,17-22, 33-35,37-39 9. Cha.Sha.1-Katithapurushheeya Adhyaya- 16-23, 28-30,36, 63, 64,70-74, 98,102,109,137-139, 148,149 10. Cha.Sha.02-Atulyagothreeyam Adhyaaya- 26, 27, 35,44,45-47 11. Cha.Sha.03-Khuddika garbhavakranti Adhyaya- 17 12. Cha.Sha.04-Mahatee garbhavakranti Adhyaya- 6,36 13. Cha.Sha.05-Purushavichaya Shareera Adhyaya- 3, 5, 8,16	10



			14. Cha.Sha.06-Sareeravichaya adhyaya-4, 5-11, 12,13, 17, 28, 30 15. Cha.Sha.07- Sareerasankhya sareera Adhyaya	
13	LEARNING THROUGH VYAKHYANA-2	2	See Practical No.2 for instructions <b>Suggested sutras:</b> 1. Cha.Ni. 4-Prameha nidana adhyaya -4 2. Cha.Sha.1-Katithapurushheeya Adhyaya-21 3. Cha.Sha. 6- Sareeravichaya adhyaya - 9-11	3
14	CASE TAKING IN RELATION TO NIDANA PANCHAKA	2	<b>Purpose:</b> To map the disease process through nidana-panchaka (Ref: Ch Ni 1) <b>Teacher's role:</b> Demonstrate the case proforma in patients; Assign five patients to students for documenting nidanapanchaka <b>Students role:</b> Furnish the case proforma in five patients	12
15	DIFFERENTIAL DIAGNOSIS OF SKIN DISEASES BASED ON GUIDELINES ONKUSHTA	2	<b>Purpose:</b> To familiarize differential diagnosis of kushta through Ayurvedic parameters (Ref: Ch Ni 5) <b>Teacher's role:</b> Demonstrate case taking in a few cases <b>Students role:</b> Furnish the case proforma for minimum three cases of skin diseases	2
16	PRAMANA PARIKSHA	2	<b>Purpose:</b> To familiarize Ayurvedic methods of physiometry (Ref: Ch Sha 7) <b>Teacher's role:</b> Preparing measurement methods based on anguleprmana and anjaleepramana as explained in Ayurveda; Demonstrating such methods in healthy individuals <b>Students role:</b> Assessing physiometry based on the guidelines given by the teacher in three individuals/peers and document the observations	2
17	IDENTIFICATION OF VIKARAVIGHATA BHAVA ABHAVA IN PATIENTS	2	<b>Purpose:</b> To explore concept of vikara- vighata-bhava-abhava in clinical scenario. (Ref: Ch Ni 4/3 along with Chakrapani commentary)	2

			<p><b>Teachers role:</b> Divide class into four or five groups and assign most commonly seen diseases to each group (Eg. Prameha); Conduct group discussions to identify risk factors / protective factors of respective diseases through literature review, interaction with peers and teachers; Sum up findings of group discussions and prepare check list for each disease</p> <p><b>Student's role:</b> Conduct group discussions to identify risk/protective factors of disease assigned to them; Prepare check list for each disease regarding probable risk/protective factors; Identify presence/absence of items in the check list in minimum of three cases of the respective disease</p>	
18	EXPLORATION OF LOKA PURUSHA SAMYA VADA IN THE BACK GROUND OF ONE HEALTH	2	<p><b>Purpose:</b> To explore loka-purusha-samya in the background of one health movement (Ref: Ch Sha 5)</p> <p><b>Teacher's role:</b> Conduct discussions in the class to identify how nature is related to human being; Explore this relationship in the background of concept of one health; conduct discussions</p> <p><b>Students role:</b> Conduct the discussions and prepare a summary report</p>	2
19	SHLOKA PATHANA-3	3	<p>Refer Practical No.1 for instructions</p> <p><b>Sutras suggested:</b></p> <ol style="list-style-type: none"> <li>1. Cha.Vi. 01- Rasa vimaana Adhyayam-10,24</li> <li>2. Cha.Vi. 02-Trividha kaksheeya Adhyayam-15-18</li> <li>3. Cha.Vi. 04-Trividha roga vishesha vijnyaneeya adhyaya-4,12</li> <li>4. Cha.Vi. 05- Sroto vimana Adhyaya-3,4,7,9-27</li> <li>5. Cha.Vi. 06-Roganika vimana adhyaya -19</li> <li>6. Cha.Vi. 07- Vyadhita rupeeya vimana Adhyaya-28</li> <li>7. Cha.Vi. 08-Rogabhishagjiteeyam Adhyaayam-3,6,68-78</li> <li>8. Cha.In.5-Purvarupeeyam Indriyam Adhyaya-43</li> <li>9. Cha.In.11-Anujyotiyam Indriya</li> </ol>	10

			Adhyaya-29	
20	LEARNING THROUGH VYAKHYANA-3	3	Refer Practical No.2 for instructions <b>Sutras suggested:</b> 1. Cha.Vi.01- Rasa vimaana Adhyayam -10 2. Cha.Vi.08- Rogabhishagjiteeyam Adhyaayam-68 -80	3
21	LEARNING THROUGH SAMBHASHA PARISHAD	3	<b>Purpose:</b> To familiarize the method of Sambhasha parishad in bringing out scientific discussions. (Ref: Ch Vi 8) <b>Teacher's role:</b> Prepare guidelines for conducting Sambhasha parishat as per descriptions in Vadamarga; Demonstrate parishat in the class either through a video demonstration or otherwise; Divide the class into four or five groups and assign one topic each for them; Evaluate the group presentations based on the guidelines <b>Student's role:</b> Each group will prepare and demonstrate a parishat in the subject concerned; Prepare summary of the parishat <b>Suggested topics:</b> 1. Relevance of Daivavyapasraya cikitsa 2. Rakta as fourth dosha 3. Relevance of food classification 4. Specific agrya related to vihara (Eg: vishado rogavardhananam) 5. Importance of naming of disease 6. Relevance of viruddha ahara	6
22	SROTAS PROFORMA	3	<b>Purpose:</b> To assess status of srotodushti in different clinical conditions (Ref: Ch Vi 5) <b>Teacher's role:</b> Demonstrate the proforma for assessment of srotas in clinical conditions <b>Students role:</b> Furnish the srotas proforma in at least three cases	2
23	LEARNING THROUGH TANTRA YUKTI	3	<b>Purpose:</b> Demonstrate use of tantrayukti in different sutras <b>Teachers role:</b> Identify and demonstrate application of tantrayukti in different sutras	5

**Student's role:** Identify tantrayukti and prepare summary on justifying importance of tantrayukti in selected sutras

**Suggested Tantrayuktis:**

1. Adhikaran - commonly seen in many sutras
2. Yoga - commonly seen in many sutras
3. Padartha - commonly seen in many sutras
4. Vakyasesha - commonly seen in many sutras
5. Upadesha - Ca. Su. 13/18-19, Ca. Su. 13/94
6. Niyoga - Ca. Su. 13/34, Ca. Ni. 3/17
7. Apadesha - Ca. Su. 13/13, Ca. Su. 18/44-46, Ca. Su. 26/41, Ca. Ni. 2/12-17
8. Samuchaya - Ca. Su. 13/23-25, Ca. Su. 20/8, Ca. Su. 23/5-7, Ca. Su. 23/27-30, Ca. Ni. 3/7
9. Nidarshana - Ca. Su. 13/96-97, Ca. Su. 17/75(1), Ca. Su. 14/5, Ca. Su. 19/5, Ca. Su. 30/5
10. Nirvachana - Ca. Su. 16/31-32, Ca. Su. 16/34, Ca. Su. 17/95, Ca. Su. 21/9, Ca. Su. 25/4, 11. Ca. Su. 29/4, Ca. Su. 30/5, Ca. Su. 30/12, Ca. Su. 30/24
12. Vidhana - Ca. Su. 15/11, Ca. Su. 15/16, Ca. Su. 16/27
13. Prasanga - Ca. Su. 17/113, Ca. Su. 20/8, Ca. Su. 25/4, Ca. Ni. 1/3, Ca. Sa. 1/118-126
14. Viparyaya - Ca. Su. 25/31, Ca. Sa. 6/6, Ca. Sa. 6/9, Ca. Ni. 3/7, Ca. Ni. 3/9, Ca. Ni. 3/11
15. Ekantika - Ca. Su. 15/5, Ca. Su. 20/22, Ca. Su. 21/20, Ca. Su. 25/31, Ca. Su. 30/25, Ca. Ni. 1/32
16. Atitaveksha - Ca. Su. 22/31, Ca. Su. 28/25-30
17. Anagataveksha - Ca. Su. 15/5, Ca. Su. 28/30, Ca. Vi. 8/93, Ca. Vi. 8/135, Ca. Vi. 8/136
18. Swasangya - Ca. Su. 30/3
19. Prayojana - Ca. Su. 30/26, Ca. Sa. 5/5
20. Anumata - Ca. Su. 26/64-65, Ca. Su. 16/28, Ca. Sa. 1/16
21. Vikalpa - Ca. Su. 26/105
22. Pradesha - Ca. Su. 27/329, Ca. Vi. 8/137

			<p>23. Sambhava - Ca. Su. 28/45  24. Hetwartha - Ca. Ni. 2/21, Ca. Ni. 4/4, Ca. Ni. 7/28, Ca. Vi. 3/40  25. Atidesha - Ca. Sa. 6/11  26. Apavarga - Ca. Su. 26/106  27. Uddhara - Ca. Su. 25/29  28. Anaikantika - Ca. Su. 15/4  29. Pratyutsara and Uddhara - Ca. Su. 25/10-28  30. Nirnaya - Ca. Su. 25/29  31. Apavarga - Ca. Vi. 1/10</p>	
24	ASSESSMENT OF HEALTH THROUGH DHATU SAMYA PAREEKSHA	3	<p><b>Purpose:</b> To assess health status of a person based on dhatusamya pareeksha. (Ref: Ch Vi 8/89)  <b>Teacher's role:</b> Demonstrate use of proforma in healthy subjects  <b>Students role:</b> Assess dhatusamya in ten individuals using the proforma</p>	2
25	AGNI ASSESSMENT BASED ON APACHARA	3	<p><b>Purpose:</b> To familiarise the assessment of agni based on apacara-visesha (Ref: Ch Vi 6/12)  <b>Teacher's role:</b> Explain the concept of agnipareeksha based on apacharavishesha; Demonstrate the questionnaire in a few subjects  <b>Students role:</b> Assess agni of ten individuals using the proforma</p>	2
26	TRIVIDHA ROGA VISHESHAVIJNANA IN DIAGNOSIS	3	<p><b>Purpose:</b> To justify the role of trividha-rogavishesha vijnana (pratyaksha, anumana and aptopadesa) in clinical methods. (Ref: Ch Vi 4)  <b>Teacher's role:</b> Demonstrate the use of pratyaksha, anumana and aptopadesa in case taking, stressing on use of sense organs (smell, touch, vision and sound), methods of inference and importance of aptopadesa (writing respective references relevant in a particular case); Assigning cases to demonstrate the above methods  <b>Students role:</b> Prepare reports on application of trividha visesha vijnana in three cases</p>	3

27	ASSESSMENT OF UPASAYA AND ANUPASAYA IN PATIENTS	3	<p><b>Purpose:</b> To justify importance of upasaya and anupasaya clinical examination (Ref: Ch Ni 1 with Chakrapani commentary)</p> <p><b>Teacher's role:</b> Demonstrate identification of upasaya and anupasaya in selected cases</p> <p><b>Students role:</b> Identify upasaya and anupasaya in a minimum of three cases and document it</p>	2
<b>Total Hr</b>				<b>100</b>

### Activity

CO	Topic name	Activity Details	Hours #
CO5,CO7	Cha.Su.15-Upakalpaneeya Adhyaya	<b>Expert Lecture on Aturalaya:</b> This activity will evoke an interest among students about planning for construction of Hospitals and Nursing homes. Topic: Standard guidelines to setup Ayurveda Clinics, Nursing Homes and Hospitals.	1
CO6,CO7,CO8	Cha.Su.19-Ashtodareeya Adhyaya	<b>Activity on Disease classification:</b> Teacher should give an insight to NAMASTE portal published by Ministry of AYUSH. Students should go through with every standardised Ayurveda terminologies related to disease classification and also National Ayurveda Morbidity codes.	2
CO4,CO6,CO8	Cha.Su.20- Maharoga adhyaya	<b>Compilation/ Making monograph on Nanatmaja vikara:</b> Steps (1) Teacher should make teams of 3-5 students.(2) An Editorial team for making monograph has to be made including experts of Roga Nidana. (3) Divide the 140 diseases into available number of teams. (4) Teacher should provide a format to collect data on each diseases which must include pictorial representation of disease and cross references. (5) The Editorial team will collect the data from all teams and edit in the form of a	3

		book. (6) The content should be reviewed by Experts and made as E-Monograph (PDF)/ Book.	
CO4,CO7	Cha.Su.21- Ashtauninditeeya adhyaya	<b>Video making on concept of Nidra:</b> Steps (1) Teacher should explain the content on which students should make video (2) The Minimum duration of Video should be 3 minutes. (3) Video can be in regional languages. (4) Teacher should select the best videos and can publish in social media after rectifying the content of the video.	1
CO4,CO5,CO7	Cha.Su.25- Yajjapurusheeya Adhyaya	<b>Justifying concept of Hita and Ahita ahara:</b> Steps (1) Students should be divided in to groups and assign some of the Hita and Ahita ahara dravya (2) Student should find and discuss the logical explanations on justifying the given dravya as Hita or Ahita	2
CO4,CO5,CO7	Cha.Su.26- Atreyabhadraakaapeeyya Adhyaya	<b>Application of paradi guna:</b> Steps (1) Any probable drug or treatment plan to be selected and assign to various groups (2) Students should view them through paradi guna and document it.	2
CO5,CO8	Cha.Su.27- Annapaanvidhi Adhyaya	<b>Collection of different dravya's:</b> Steps (1) Student should collect different dravya's available in their locality. (2) Student should exhibit the same and discuss with experts. (3) Document opinion given by experts.	2
CO4,CO8	Cha.Su.29- Dashapraanaayataneeya Adhyaya	<b>Skit on different types of vaidya in relation to medical ethics:</b> Steps (1) The class has to be divided into teams and they should be assigned to write a story for skit, considering different qualities of vaidya (2) They should perform the skit after Screening done by concerned teachers	2
CO4,CO6	Cha.Ni. 08- Apasmara nidana adhyaya	<b>Documentation of Nidanarthakara roga:</b> Student should discuss and document the experiences of practising physicians of their	2

		Hospital or outside about Nidanarthakara roga.	
CO3,CO4,CO6,CO7	Cha.Ni. 08- Apasmara nidana adhyaya	<b>Quiz on Nidana sthana:</b> Steps (1) Teacher should give a written test including important multiple choice questions of nidana sthana. (2) The highest scoring students should be selected and made into different teams as per the convenience. (3) The selected students should be conducted quiz with different rounds considering the content of the Nidana sthana.	2
CO3,CO4,CO7	Cha.Sha.1-Katithapurshaya Adhyaya.	<b>Game on Ashta smruti karana:</b> Steps (1) Plan the Memory check games by using Different materials such as Drugs, Books and instruments.(2) Students should be subjected for memory check sessions. (3) Later their experiences should be interpreted through Ashta smruti karana.	2
CO4,CO6,CO7	Cha.Sha. 04- Mahatee garbhavakranti Adhyaya	<b>Identify film/Tv serial characters having different qualities of Trividha satwa and their varieties:</b> Steps (1) Students has to be divided into teams and each team should be assigned some of the satwa. (2) The team should collect the video clips of those characters and has to present to all after getting scrutinized by teachers.	2
CO4,CO8	Cha.Sha. 05- Purushavichaya Adhyaya	<b>Adopting pravrutti and nivrutti upayas in present era:</b> Steps (1) Teacher should make teams and assign different pravrutti and nivrutti upayas.(2) Team should present the pravrutti and nivrutti upayas considering relevance in present era.	2
CO4,CO7,CO8	Cha.Sha. 06- Sareeravichaya adhyaya	<b>Analysing Data on causes of akala mrutyu:</b> Students should search and collect data from online sources published by Govt or Private Authorities about the causes of Akala mrutyu. Analyse and present the data and discuss on Akala mrutyu in the class.	2



CO4,CO7	Cha.Sha.08- Jathisutreeya Adhyaya	<b>Street play on awareness of garbhopaghatakara bhava:</b> Steps (1) Teacher should make teams and explain about the structure of street play (2) Student should create a narrative story to present the concept in public (3) Minimum duration of the play is 15 minutes	2
CO7,CO8	Cha.Vi.01- Rasa vimaana Adhyayam	<b>Digital Posters for public awareness on Ahara vidhi:</b> Steps (1) Teacher should assign the topic to the students individually or in group. (2) Student should make a digital posters or infographics with the help of various online tools such as CANVA etc.	2
CO4,CO7,CO8	Cha.Vi. 03- Janapadodhwansaneeya Vimanam Adhyaya	<b>Short Documentary on any of the Janapadodhwamsakara bhava:</b> Steps (1) Teacher should guide the students on Janapadodhwamsakara bhava (2) Students should be taught on what is documentaries and should fix the duration of video. (3) Teams should be made and they have to shoot and edit the videos on any of the janapadodhwamsakara bhava. (4) Present the documentaries and share experience.	2
CO4,CO8	Cha.Vi. 8-Rogabbishagjiteeyam Adhyaayam.	<b>Identifying Adhyayana vidhi:</b> Steps (1) Teacher should guide the students to identify and document different individual and group learning techniques. (2) Students should present and share experience on their learning techniques	2
CO3,CO4,CO7	Cha.In.5-Purvarupeeyam Indriyam Adhyaya	<b>Identifying types of swapna:</b> Steps (1) Teacher should assist to make a Proforma for different types of Swapna. (2) Student should assess the proforma with Healthy individuals or diseased and analyse the Data.	2
CO3,CO4,CO7,CO8	Cha.In.12-Gomayachurni yam Indriya Adhyaya	<b>Discussion on death signs:</b> Steps (1) Teacher should assign set of students to interact with	1

		concerned ICU Doctors/ Nurses or assistants. (2) Students should interact with them based on arishta lakshanas and document it.	
CO3,CO6,CO7	Cha.In.01-Varnaswareeya Adhyaya	<b>Use of various standard tools for assessing factors related to arishta :</b> Students are assigned with some of the standard tools to assess various factors relevant in arishta-vijnana available in the following source: <a href="https://www.carakasamhitaonline.com/mediawiki-1.32.1/index.php?title=Varnasvariyaam_Indriyam_Adhyaya#Assessment_of_complexion">https://www.carakasamhitaonline.com/mediawiki-1.32.1/index.php?title=Varnasvariyaam_Indriyam_Adhyaya#Assessment_of_complexion</a>	2

{# Hours indicated are included in calculations of Table 3 and 4 }

**Table 5- Teaching learning method**

Sr No	Teaching learning methods in the course	No of Activities
1	Lecture	30
2	Lecture with Power point presentation	17
3	Lecture & Group Discussion	364
4	Lecture with Video clips	20
5	Discussions	37
6	Brainstorming	58
7	Inquiry-Based Learning	14
8	PBL	6
9	CBL	48
10	Project-Based Learning	5
11	TBL	1
12	Team project work	2
13	Flipped classroom	29
14	Blended Learning	9
15	Edutainment	9
16	Mobile learning	7

17	Role plays	15
18	Self-directed learning	105
19	Problem solving method	2
20	Workshops	2
21	Game-Based Learning	4
22	Demo on Model	1
23	Library Session	4
24	Peer learning	6
25	Real life experience	4
26	Recitation	40
27	Presentations	3
28	Case diagnosis	1
29	Drug analysis	4
30	Demonstration	9
31	Demonstration bedside	4
32	Field visit	3

These are overall teaching learning methods listed in Table 3 and 4. Teachers can select the best possible method amongst the given methods as per objective, available time etc.

**Table 6: Assessment Summary: Assessment is subdivided in A to H points**

#### 6 A-Number of Papers and Marks Distribution

Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand Total
			Practical	Viva	Elective	IA	Sub Total	
AyUG-SA2	1	100	-	75	(Set SB)	15	100	200

#### 6 B - Scheme of Assessment (formative and Summative)

PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
	First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
Second	3 PA & First TT	3 PA & Second TT	3 PA & UE

**PA:** Periodical Assessment; **TT:** Term Test; **UE:** University Examinations.

⌈\*\* University Examination shall be on entire syllabus ⌋

## 6 C - Calculation Method for Internal assessment Marks

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/ 3)	Converted to 15 Marks (D/15*15)	Term Test (Marks converted to 15) (15 Marks)	Sub Total _/30 Marks	Term Ass essment (.../15)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks) (MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert total to 15 marks.							

## 6 D - Evaluation Methods for Periodical Assessment

S. No	Evaluation Methods
1	Activities Indicated in Table 3 - Column G3 as per Indicated I, II or III term in column I3

### Evaluation Methods in MSE

1. Practical / Clinical Performance
2. Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
3. Open Book Test (Problem Based)
4. Summary Writing (Research Papers/ Samhitas)
5. Class Presentations; Work Book Maintenance
6. Problem Based Assignment
7. Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)
8. Extra-curricular Activities, (Social Work, Public Awareness, Surveillance Activities, Sports or Other Activities which may be decided by the department).
9. Small Project etc.

## 6 E Question Paper Pattern

### II PROFESSIONAL BAMS EXAMINATIONS AyUG- SA2

#### PAPER-1

Time: 3 Hours Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

		<b>Number of Questions</b>	<b>Marks per question</b>	<b>Total Marks</b>
Q 1	MULTIPLE CHOICE QUESTIONS (MCQ)	20	1	20
Q 2	SHORT ANSWER QUESTIONS (SAQ)	8	5	40
Q 3	LONG ANSWER QUESTIONS (LAQ)	4	10	40
				100

**Similar for Paper II (If applicable).**

## 6 F Distribution of theory examination

Paper 1						
Sr. No	A List of Topics	B Term	C Marks	MCQ (1 Mark)	SAQ (5 Marks)	LAQ (10 Marks)
1	Cha.Su.13- Sneha Adhyaya	1	37	Yes	Yes	Yes
2	Cha.Su.14- Sveda Adhyaya	1		Yes	Yes	Yes
3	Cha.Su.15- Upakalpaneeya Adhyaya	1		Yes	Yes	Yes
4	Cha.Su.16- Chikitsaprabhritiya Adhyaya	1		Yes	Yes	Yes
5	Cha.Su.17- Kiyantashiraseeya Adhyaya	1		Yes	Yes	Yes
6	Cha.Su.18-Trisotheeya Adhyaya	1		Yes	Yes	Yes
7	Cha.Su.19-Ashtodareeya Adhyaya	1		Yes	Yes	No
8	Cha.Su.20- Maharoga adhyaya	1		Yes	Yes	No
9	Cha.Su.21- Ashtauninditeeya adhyaya	1		Yes	Yes	Yes
10	Cha.Su.22- Langhanabrimhaneeya Adhyaya	1		Yes	Yes	Yes
11	Cha.Su.23- Santarpaneeya Adhyaya	1		Yes	Yes	Yes
12	Cha.Su.24- Vidhishoniteeya Adhyaya	1		Yes	Yes	Yes
13	Cha.Su.25- Yajjapurushheeya Adhyaya	1		Yes	Yes	Yes
14	Cha.Su.26- Atreyabhadraakaapeeya Adhyaya	1		Yes	Yes	Yes
15	Cha.Su.27- Annapaana vidhi Adhyaya	1		Yes	Yes	No
16	Cha.Su.28- Vividhashitapeeteeya Adhyaya	1		Yes	Yes	Yes

17	<b>Cha.Su.29- Dashapraanaayataneeya Adhyaya</b>	2		Yes	Yes	No
18	<b>Cha.Su.30- Arthedashamahamooleeya Adhyaya</b>	2		Yes	Yes	Yes
19	<b>Cha.Ni.01-Jwara nidana Adhyaya</b>	2	19	Yes	Yes	Yes
20	<b>Cha.Ni.02-Raktapitta nidana Adhyaya</b>	2		Yes	Yes	Yes
21	<b>Cha.Ni.03-Gulma nidana Adhyaya</b>	2		Yes	Yes	No
22	<b>Cha.Ni.04-Prameha nidana adhyaya</b>	2		Yes	Yes	Yes
23	<b>Cha.Ni.05-Kushta nidana Adhyaya</b>	2		Yes	Yes	Yes
24	<b>Cha.Ni.06-Shosha nidana Adhyaya</b>	2		Yes	Yes	Yes
25	<b>Cha.Ni.07-Unmada nidana Adhyaya</b>	2		Yes	Yes	Yes
26	<b>Cha.Ni.08-Apasmara nidana adhyaya</b>	2		Yes	Yes	Yes
27	<b>Cha.Vi.01- Rasa vimana Adhyayam</b>	3	24	Yes	Yes	Yes
28	<b>Cha.Vi.02-Trividha kuksheeya Adhyayam</b>	3		Yes	Yes	Yes
29	<b>Cha.Vi.03-Janapadodhwansaneeya Vimanam Adhyaya</b>	3		Yes	Yes	Yes
30	<b>Cha.Vi.04-Trividha roga vishesha vijnyaneeya adhyaya</b>	3		Yes	Yes	Yes
31	<b>Cha.Vi. 05- Sroto vimana Adhyaya</b>	3		Yes	Yes	Yes
32	<b>Cha.Vi. 06-Roganika vimana adhyaya</b>	3		Yes	Yes	Yes
33	<b>Cha.Vi. 07- Vyadhita rupeeya vimana Adhyaya</b>	3		Yes	Yes	Yes



34	<b>Cha.Vi. 08-Rogabhishagjiteeyam Adhyaayam.</b>	3		Yes	Yes	Yes
35	<b>Cha.Sha.01-Katithapurushheeya Adhyaya</b>	2	13	Yes	Yes	No
36	<b>Cha.Sha.02-Atulyagothreeyam Adhyaaya</b>	2		Yes	Yes	No
37	<b>Cha.Sha.03-Khuddika garbhavakranti Adhyaya</b>	2		Yes	Yes	No
38	<b>Cha.Sha.04-Mahatee garbhavakranti Adhyaya</b>	2		Yes	Yes	Yes
39	<b>Cha.Sha.05-Purushavichaya Shareera Adhyaya</b>	2		Yes	Yes	No
40	<b>Cha.Sha.06-Sareeravichaya adhyaya</b>	2		Yes	Yes	No
41	<b>Cha.Sha.07- Sareerasankhya sareera Adhyaya</b>	2		Yes	Yes	No
42	<b>Cha.Sha.08-Jathisutreeya Adhyaya</b>	2		Yes	Yes	No
43	<b>Cha.In.1-Varnasvariya Indriya Adhyaya</b>	3	7	Yes	Yes	No
44	<b>Cha.In.2-Pushpitakam Indriya Adhyaya</b>	3		Yes	No	No
45	<b>Cha.In.3-Parimarshaneeyam Indriyam Adhyaya</b>	3		Yes	No	No
46	<b>Cha.In.4-Indriyaneekam Indriya adhyaya</b>	3		Yes	No	No
47	<b>Cha.In.5-Purvarupeeyam Indriyam Adhyaya</b>	3		Yes	Yes	No
48	<b>Cha.In.6-Katamanisharireeyam Indriyam Adhyaya</b>	3		Yes	No	No
49	<b>Cha.In.7-Pannarupiyam Indriyam Adhyaya</b>	3		Yes	Yes	No
50	<b>Cha.In.8-Avakshiraseeyam Indriyam</b>	3		Yes	No	No

	<b>Adhyaya</b>				
51	<b>Cha.In.9-Yasya shyavanimittiya Indriya Adhyaya</b>	3		Yes	No
52	<b>Cha.In.10-Sadyomaraneeyam Indriya Adhyaya</b>	3		Yes	No
53	<b>Cha.In.11-Anujyotiyam Indriya Adhyaya</b>	3		Yes	No
54	<b>Cha.In.12-Gomayachurniyam Indriya Adhyaya</b>	3		Yes	No
<b>Total Marks</b>			<b>100</b>		

6 G Blue print of paper I & II (if applicable)

Paper No:1		
Question No	Type of Question	Question Paper Format
Q1	<p><b>Multiple choice Questions</b>  <b>20 Questions</b>  <b>1 mark each</b>  <b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b>  <b>Desirable to know - 3 MCQ</b>  <b>Nice to know part - 2 MCQ</b></p>	<ol style="list-style-type: none"> <li>1. Cha.Su.13- Sneha Adhyaya / Cha.Su.14- Sveda Adhyaya</li> <li>2. Cha.Su.17- Kiyantashiraseeya Adhyaya / Cha.Su.15- Upakalpaneeya Adhyaya</li> <li>3. Cha.Su.20- Maharoga adhyaya / Cha.Su.18-Trisotheeya Adhyaya / Cha.Su.19-Ashtodareeya Adhyaya</li> <li>4. Cha.Su.22- Langhanabrimhaneeya Adhyaya / Cha.Su.21- Ashtauninditeeya adhyaya</li> <li>5. Cha.Su.23- Santarpaneeya Adhyaya / Cha.Su.24- Vidhishoniteeya Adhyaya</li> <li>6. Cha.Su.28- Vividhashitapeeteeya Adhyaya / Cha.Su.26- Atreyabhadraakaapeeya Adhyaya / Cha.Su.25- Yajjapurushheeya Adhyaya</li> <li>7. Cha.Su.30- Arthedashamahamooleeya Adhyaya / Cha.Su.29- Dashapraanaayataneeya Adhyaya</li> <li>8. Cha.Ni.02-Raktapitta nidana Adhyaya / Cha.Ni.01-Jwara nidana Adhyaya</li> <li>9. Cha.Ni.04-Prameha nidana adhyaya / Cha.Ni.03-Gulma nidana Adhyaya</li> <li>10. Cha.Ni.05-Kushta nidana Adhyaya / Cha.Ni.06-Shosha nidana Adhyaya</li> <li>11. Cha.Ni.08-Apasmara nidana adhyaya / Cha.Ni.07-Unmada nidana Adhyaya</li> <li>12. Cha.Vi.02-Trividha kuksheeya Adhyayam / Cha.Vi.03-Janapadodhwansaneeya Vimanam Adhyaya / Cha.Vi.01- Rasa vimana Adhyayam</li> <li>13. Cha.Vi.04-Trividha roga vishesha vijnyaneeya adhyaya / Cha.Vi. 05- Sroto vimana Adhyaya</li> <li>14. Cha.Vi. 06-Roganika vimana adhyaya / Cha.Vi. 07- Vyadhita rupeeeya vimana Adhyaya</li> <li>15. Cha.Vi. 08-Rogabhishagjiteeyam Adhyaayam.</li> <li>16. Cha.Sha.02-Atulyagothreeyam Adhyaaya / Cha.Sha.01-Katithapurushheeya Adhyaya</li> <li>17. Cha.Sha.04-Mahatee garbhavakranti Adhyaya / Cha.Sha.03-Khuddika garbhavakranti Adhyaya / Cha.Sha.05-Purushavichaya Shareera Adhyaya</li> <li>18. Cha.Sha.07- Sareerasankhya sareera Adhyaya</li> </ol>

		<p>/ Cha.Sha.06-Sareeravichaya adhyaya / Cha.Sha.08-Jathisutreeya Adhyaya</p> <p><b>19.</b> Cha.In.1-Varnasvariya Indriya Adhyaya / Cha.In.2-Pushpitakam Indriya Adhyaya / Cha.In.4-Indriyaneekam Indriya adhyaya / Cha.In.5-Purvarupeeyam Indriyam Adhyaya</p> <p><b>20.</b> Cha.In.9-Yasya shyavanimitiya Indriya Adhyaya / Cha.In.11-Anujyotiyam Indriya Adhyaya / Cha.In.8-Avakshiraseeyam Indriyam Adhyaya / Cha.In.12-Gomayachurniyam Indriya Adhyaya</p>
<p><b>Q2</b></p>	<p><b>Short answer Questions</b> <b>Eight Questions</b> <b>5 Marks Each</b> <b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b> <b>Desirable to know - 1 SAQ</b> <b>No questions on Nice to know</b></p>	<p><b>1.</b> Cha.Su.13- Sneha Adhyaya / Cha.Su.14- Sveda Adhyaya / Cha.Su.16- Chikitsaprabhritiya Adhyaya / Cha.Su.20- Maharoga adhyaya / Cha.Su.18-Trisotheeya Adhyaya / Cha.Su.17- Kiyantashiraseeya Adhyaya / Cha.Su.15- Upakalpaneeya Adhyaya / Cha.Su.19-Ashtodareeya Adhyaya</p> <p><b>2.</b> Cha.Su.28- Vividhashitapeeteeya Adhyaya / Cha.Su.26- Atreyabhadraakaapeeya Adhyaya / Cha.Su.25- Yajjapurushheeya Adhyaya / Cha.Su.22- Langhanabrimhaneeya Adhyaya / Cha.Su.23- Santarpaneeya Adhyaya / Cha.Su.24- Vidhishoniteeya Adhyaya / Cha.Su.21- Ashtauninditeeya adhyaya / Cha.Su.30- Arthedashamahamooleeya Adhyaya / Cha.Su.29- Dashapraanaayataneeya Adhyaya / Cha.Su.27- Annapaana vidhi Adhyaya</p> <p><b>3.</b> Cha.Ni.04-Prameha nidana adhyaya / Cha.Ni.05-Kushta nidana Adhyaya / Cha.Ni.03-Gulma nidana Adhyaya / Cha.Ni.08-Apasmara nidana adhyaya / Cha.Ni.02-Raktapitta nidana Adhyaya / Cha.Ni.06-Shosha nidana Adhyaya / Cha.Ni.01-Jwara nidana Adhyaya / Cha.Ni.07-Unmada nidana Adhyaya</p> <p><b>4.</b> Cha.Vi.04-Trividha roga vishesha vijnyaneeya adhyaya / Cha.Vi.02-Trividha kuksheeya Adhyayam / Cha.Vi.03-Janapadodhwansaneeya Vimanam Adhyaya / Cha.Vi.01- Rasa vimana Adhyayam</p> <p><b>5.</b> Cha.Vi. 08-Rogabhishagjiteeyam Adhyaayam. / Cha.Vi. 06-Roganika vimana adhyaya / Cha.Vi. 05- Sroto vimana Adhyaya / Cha.Vi. 07- Vyadhita rupeeeya vimana Adhyaya</p>

		<p>6. Cha.Sha.02-Atulyagothreeyam Adhyaaya / Cha.Sha.01-Katithapurushheeya Adhyaya / Cha.Sha.04-Mahatee garbhavakranti Adhyaya / Cha.Sha.03-Khuddika garbhavakranti Adhyaya</p> <p>7. Cha.Sha.07- Sareerasankhya sareera Adhyaya / Cha.Sha.06-Sareeravichaya adhyaya / Cha.Sha.08-Jathisutreeya Adhyaya / Cha.Sha.05-Purushavichaya Shareera Adhyaya</p> <p>8. Cha.In.11-Anujyotiyam Indriya Adhyaya / Cha.In.1-Varnasvariyaam Indriya Adhyaya / Cha.In.7-Pannarupiyam Indriyam Adhyaya / Cha.In.10-Sadyomaraneeyam Indriya Adhyaya / Cha.In.12-Gomayachurniyam Indriya Adhyaya / Cha.In.5-Purvarupeeyam Indriyam Adhyaya</p>
<p><b>Q3</b></p>	<p><b>Long answer Questions Four Questions 10 marks each All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable to know</b></p>	<p>1. Cha.Su.13- Sneha Adhyaya / Cha.Su.14-Sveda Adhyaya / Cha.Su.16-Chikitsaprabhritiya Adhyaya / Cha.Su.18-Trisotheeya Adhyaya / Cha.Su.17-Kiyantashiraseeya Adhyaya / Cha.Su.15-Upakalpaneeya Adhyaya</p> <p>2. Cha.Su.28- Vividhashitapeeteeya Adhyaya / Cha.Su.26- Atreyabhadrakaapeeeya Adhyaya / Cha.Su.25- Yajjapurushheeya Adhyaya / Cha.Su.22- Langhanabrimhaneeya Adhyaya / Cha.Su.23- Santarpaneeya Adhyaya / Cha.Su.24- Vidhishoniteeya Adhyaya / Cha.Su.21- Ashtauninditeeya adhyaya / Cha.Su.30- Arthedashamahamooleeya Adhyaya</p> <p>3. Cha.Ni.04-Prameha nidana adhyaya / Cha.Ni.05-Kushta nidana Adhyaya / Cha.Ni.08-Aspmara nidana adhyaya / Cha.Ni.02-Raktapitta nidana Adhyaya / Cha.Ni.06-Shosha nidana Adhyaya / Cha.Ni.01-Jwara nidana Adhyaya / Cha.Ni.07-Unmada nidana Adhyaya</p> <p>4. Cha.Vi.04-Trividha roga vishesha vijnyaneeya adhyaya / Cha.Vi.02-Trividha kuksheeya Adhyayam / Cha.Vi. 08-Rogabhishagjiteeyam Adhyaayam. / Cha.Vi. 06-Roganika vimana adhyaya / Cha.Vi.03-Janapadodhwansaneeya Vimanam Adhyaya / Cha.Vi. 05- Sroto vimana Adhyaya / Cha.Vi. 07- Vyadhita rupeeya vimana Adhyaya / Cha.Vi.01- Rasa</p>



## 6 H Distribution of Practical Exam

<b>S.No</b>	<b>Heads</b>	<b>Marks</b>
1	Viva on Practical record	10
2	Shloka recitation	10
3	Viva on vyakhyana	5
4	Viva on Sutrasthana	20
5	Viva on Nidanasthana	10
6	Viva on Vimanasthana	10
7	Viva on Shareerasthana	5
8	Viva on Indriyasthana	5
9	Electives <u>[(Set SB)]</u>	10
10	IA	15
<b>Total Marks</b>		<b>100</b>

## References Books/ Resources

S.No	Book	Resources
1	Charakasamhita with Cakrapani Commentary	Yadavji Trikamji, editor. Agnivesha. Charaka Samhita. Ayurveda Dipika. Chakrapanidatta (comm)(Sanskrit) Varanasi: Chaukambha Sanskrit Sansthan
2	Charak Samhita (English Commentary)	Ram Karan Sharma and Bhagawan Dash, editor. Charak Samhita (English Commentary): Varanasi: Chowkambha Sanskrit Series
3	Charak Samhita (Hindi commentary)	Harishchandra Singh Kushvaha, editor and translator. Charak Samhita (Hindi Commentary): Varanasi: Chaukambha Orientalia
4	Charak Samhita (Hindi commentary)	Jayadev Vidyalkar, editor. Charak Samhita (Hindi commentary): Motilal Banarsi Dass Publishers Pvt. Ltd
5	Charak Samhita (Hindi commentary): Vaidya Atridev Vidyalkar	Charak Samhita (Hindi commentary): Vaidya Atridev Vidyalkar
6	Charak Samhita (Hindi commentary)	Gorakhanath Chaturvedi and Kashinath Pandeya Shastri, editor. Charak Samhita (Hindi commentary): Varanasi: Chaukhambha Bharati Academy
7	Charak Samhita (Hindi commentary)	Brahmanand Tripathi, editor. Charak Samhita (Hindi commentary): Varanasi: Chaukhamba Surbharati Prakashan
8	Charak Samhita (Hindi commentary): Dr. Ravidatta Tripathi	Vidyadhar Shukla and Ravidatta Tripathi Charak Samhita (Hindi commentary): Varanasi: Chaukhamba Sanskrit Pratishtan
9	Charaka Samhita (Hindi commentary)	Banwari Lal Gaur, editor. Charaka Samhita (Hindi commentary): Rashtriya Ayurved Vishwavidyalaya
10	Legacy of Caraka	M S Valiathan, Legacy of Caraka (English): Hyderabad: Orient Longman
11	Charakasamhita	Charak e-Samhita –National Institute of Indian Medical Heritage – <a href="http://niimh.nic.in/ebooks/ecaraka">http://niimh.nic.in/ebooks/ecaraka</a>
12	Charakasamhita	Charakasamhitaonline.com - <a href="http://www.charakasamhitaonline.com">www.charakasamhitaonline.com</a>
13	Illustrated Carakasamhita, Dr. R Vidyant	R Vidyant, editor. Illustrated Carakasamhita (English Commentary): Varanasi Chaukhambha Prakashak
14	Namaste Portal	<a href="http://namaste-portal.ayush.gov.in">NAMASTE - Portal (ayush.gov.in)</a>
15	CCRAS Prakriti tool	CCRAS Prakriti Tool <a href="http://www.ccras.res.in/">http://www.ccras.res.in/</a>
16	Sanskrit English Dictionary	Monnier Williams. A Sanskrit English Dictionary. Delhi. Motilal Banarsidasspublishers Pvt Ltd.



17	Shabdakalpadruma	Raja Radha Kanta Deva, Shabda Kalpa Drum: Varanasi: Chowkhamba Sanskrit Series Office
18	Vaidyak Shabda Sindhu	Kaviraj Shri Nagendra Nath Sen Vaidya Shastri, Vaidyak Shabda Sindhu: Varanasi: Chowkhamba Orientalia

## Abbreviations

### Assessment

S.No	Short form	Discription
1	T-EMI	Theory extended matching item
2	T- EW	Theory Essay writing
3	T- MEQs	Theory MEQs
4	T-CRQs	Theory CRQs
5	T-CS	Theory case study
6	T-OBT	Theory open book test
7	P-VIVA	Practical Viva
8	P-REC	Practical Recitation
9	P-EXAM	Practical exam
10	PRN	Presentation
11	P-PRF	Practical Performance
12	P-SUR	Practical Survey
13	P-EN	Practical enact
14	P-RP	Practical Role play
15	P-MOD	Practical Model
16	P-POS	Practical Poster
17	P-CASE	Practical Case taking
18	P-ID	Practical identification
19	P-PS	Practical Problem solving
20	QZ	Quiz
21	PUZ	Puzzles
22	CL-PR	Class Presentation,
23	DEB	Debate
24	WP	Word puzzle
25	O-QZ	Online quiz

26	O-GAME	Online game-based assessment
27	M-MOD	Making of Model
28	M-CHT	Making of Charts
29	M-POS	Making of Posters
30	C-INT	Conducting interview
31	INT	Interactions
32	CR-RED	Critical reading papers
33	CR-W	Creativity Writing
34	C-VC	Clinical video cases,
35	SP	Simulated patients
36	PM	Patient management problems
37	CHK	Checklists
38	OSCE	OSCE
39	OSPE	OSPE,
40	Mini-CEX	Mini-CEX
41	DOPS	DOPS
42	CWS	CWS
43	RS	Rating scales
44	RK	Record keeping
45	COM	Compilations
46	Portfolios	Portfolios
47	Log book	Log book
48	TR	Trainers report
49	SA	Self-assessment
50	PA	Peer assessment
51	360D	360-degree evaluation
52	TT-Theory	Theory
53	PP-Practical	Practical
54	VV-Viva	Viva

## Domain

S.No	Short form	Discription
1	CK	Cognitive/Knowledge
2	CC	Cognitive/Comprehension
3	CAP	Cognitive/Application
4	CAN	Cognitive/Analysis
5	CS	Cognitive/Synthesis
6	CE	Cognitive/Evaluation
7	PSY-SET	Psychomotor/Set
8	PSY-GUD	Psychomotor/Guided response
9	PSY-MEC	Psychomotor/Mechanism
10	PSY-ADT	Psychomotor Adaptation
11	PSY-ORG	Psychomotor/Origination
12	AFT-REC	Affective/ Receiving
13	AFT-RES	Affective/Responding
14	AFT-VAL	Affective/Valuing
15	AFT-SET	Affective/Organization
16	AFT-CHR	Affective/ characterization

## T L method

S.No	Short form	Discription
1	L	Lecture
2	L&PPT	Lecture with Power point presentation
3	L&GD	Lecture & Group Discussion
4	L_VC	Lecture with Video clips
5	DIS	Discussions
6	BS	Brainstorming
7	IBL	Inquiry-Based Learning
8	PBL	PBL
9	CBL	CBL
10	PrBL	Project-Based Learning
11	TBL	TBL
12	TPW	Team project work
13	FC	Flipped classroom
14	BL	Blended Learning
15	EDU	Edutainment
16	ML	Mobile learning
17	ECE	ECE
18	SIM	Simulation
19	RP	Role plays
20	SDL	Self-directed learning
21	PSM	Problem solving method
22	KL	Kinesthetic Learning
23	W	Workshops
24	GBL	Game-Based Learning
25	D-M	Demo on Model

26	LS	Library Session
27	PL	Peer learning
28	RLE	Real life experience
29	REC	Recitation
30	SY	Symposium
31	TUT	Tutorial
32	PER	Presentations
33	PT	Practical
34	XRy	X ray identification
35	CD	Case diagnosis
36	LRI	Lab report interpretation
37	DA	Drug analysis
38	D	Demonstration
39	D_BED	Demonstration bedside
40	D_L	Demonstration Lab
41	DG	Demonstration Garden
42	FV	Field visit
43	PRA	Practical
44	VIVA	Viva
45	TH	Theory

॥ आयुषे सर्वलोकानाम् ॥



**Course curriculum for Second Professional BAMS (PRESCRIBED BY**

**NCISM)**

# **Swasthavritta evam Yoga**

**(SUBJECT CODE : AyUG-SW)**

**(Applicable from 2021-22 batch, from the academic year 2023-24 onwards for 5 years or until further notification by NCISM, whichever is earlier)**

**BOARD OF AYURVEDA**

**NATIONAL COMMISSION FOR INDIAN SYSTEM OF MEDICINE NEW DELHI-**

**110058**

## II Professional Ayurvedacharya (BAMS)

### Subject Code : AyUG-SW

#### Summary

Total number of Teaching hours: 400			
Lecture hours(LH)-Theory		150	150(LH)
Paper I	75		
Paper II	75		
Non Lecture hours(NLH)-Theory		250	250(NLH)
Paper I & II	75		
Non Lecture hours(NLH)-Practical			
Paper I & II	175		

Examination (Papers & Mark Distribution)					
Item	Theory Component Marks	Practical Component Marks			
		Practical	Viva	Elective	IA
Paper I	100	100	60	(Set SC) 10	30
Paper II	100				
Sub-Total	200	200			
Total marks	400				

**Important Note:-**The User Manual II BAMS is a valuable resource that provides comprehensive details about the curriculum file. It will help you understand and implement the curriculum. Please read the User Manual II before reading this curriculum file. The curriculum file has been thoroughly reviewed and verified for accuracy. However, if you find any discrepancies, please note that the contents related to the MSE should be considered authentic.

In case of difficulty and questions regarding curriculum write to [cur.imp@ncismindia.org](mailto:cur.imp@ncismindia.org)



## **PREFACE**

Health care, especially the preventive health care is coming to a fore front, most so during recent years due to pandemic situation. In fact, the preventive health care is indeed the strength of Ayurveda as its primary motto itself is 'Swasthasya swasthya rakshanam', Keep sustaining health of a healthy and nourishes it. The students of Ayurveda need to understand it better, who can carry this message and contribute for building a healthy India, may the entire world. Keeping this in mind any effort to sensitize the student community to understand the basics of Swasthavritta, the preventive health care of Ayurveda is laudable. Swasthavritta is an important subject of the BAMS program for the undergraduate students of Ayurveda. The term Swastha means healthy individual and Vritta means actions or regimen thus Swasthavritta denotes the actions or regimen which can be observed to maintain the health of a healthy individual and to prevent the diseases. This subject refers to the Preventive medicine and social medicine/ Community medicine of contemporary medical science.

Swasthavritta deals with the Vaiyaktika swasthavritta ( Individualized lifestyle including in terms of prevention, promotion & maintainance of health) incudes Dinacharya, Ritucharya, Sadvritta, Rasayana , Pathya-Apathya for both Swastha as well as disease condition. Samajika swasthavritta- Community health deals with Janapadodhwamsa, Environmental health, Occupational health, School health and National health programs etc, along with these topics Swasthavritta also deals Yoga and Naturopathy. Thus, Swasthavritta provides holistic health care to community.

New curriculum of Swasthavritta is designed considering cognitive, affective, and psychomotor domains. There are group discussions, workshops, field visits, health institutional visits, factory visits health surveys and activities beyond the textbook during the practical hours like preparation of charts, models, seminar presentations by students. Swasthavritta subject also deals with teaching learning methods like role play, flipped the classroom, etc. Some assessment methods like OSPE, PBL, DOPS, CBD, skill assessment, etc are incorporated.

This curriculum serves as a valuable resource for both educators and students, guiding them through the fascinating realm of swasthavritta. May the knwoledge gained from this curriculum empower students to make a positive impact in promoting health, preventing diseases and creating a healthier society. This curriculum epmowers the Ayurvedic graduates who capable of designing customized individualized lifestyle as well as community health measures as per Ayurvedic principles. This also makes graduates to become health educators, who will take part in national health programs, who can assess community needs and develop measures to counteract the health problems and make them to prepare competent community physicians.

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**Course Code and Name of Course**

<b>Course code</b>	<b>Name of Course</b>
AyUG-SW	Swasthavritta evam Yoga

**Table 1- Course learning outcomes and matched PO**

<b>SR1 CO No</b>	<b>A1 Course learning Outcomes (CO) AyUG-SW At the end of the course AyUG-SW, the students should be able to-</b>	<b>B1 Course learning Outcomes matched with program learning outcomes.</b>
CO1	Demonstrate application of principles of Swasthavritta in lifestyle modifications.	PO1,PO2,PO4,PO6
CO2	Assess the health status and advise preventive & promotive measures according to Ayurveda principles	PO3
CO3	Demonstrate and advise Yoga and Naturopathy as health promotive and disease preventive regimen	PO1,PO4
CO4	Understand and apply the principles and components of primary health care and health policies to achieve the goal of health for all	PO2,PO5
CO5	Advocate and propagate preventive principles of Ayurveda and contemporary sciences through Information, Education and Communication(IEC)	PO8
CO6	Conduct community surveys and apply epidemiological principles for the assessment of health & morbidity as a community physician	PO2,PO5
CO7	Understand and apply the principles of environmental health and its effects on public health with control measures	PO3,PO4
CO8	Demonstrate skills and research aptitude for the promotion of health and prevention of diseases	PO9

**Table 2 : Contents of Course**

<b>Paper 1 Principles of Swasthavritta, Yoga and Naturopathy</b>					
<b>Sr. No</b>	<b>A2 List of Topics</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non- Lecture hours</b>
1	<p><b>Swastha and Swasthya</b>            Definition of Swasthavritta and its objective.            Swasthalakshanas, Arogyalakshanas, Dhatusamyalakshanas.            Concept of Health &amp; Operational definition of health.            Importance of Shodhana in Swastha in relation to Sanchita &amp; Asanchitha Dosha &amp; Classification of Swastha purusha as Sanchita dosha and Asanchita Dosha. Dimensions of health -Physical, Mental and Social. Concept of well-being : objective component of well-being - standard of living and level of living and subjective component of well-being - Quality of Life. One health concept / Vasudhaiva Kutumbakam” or “One Earth · One Family- One Future”.</p>	1	6	3	0
2	<p><b>Healthy Life style -Dinacharya (Daily regimen)</b>            Concept of Primordial, Primary, Secondary and Tertiary Prevention along with examples in Ayurveda. Importance of Ahara and Vihara as the health promotive and disease preventive measures. Importance of <b>Niyata kala vihara</b> (Dinacharya, Ritucharya) and <b>Aniyata kalaVihara</b>(Vegadharana, Vegaudirana, Ritushodhana, Brumhana and Bhutadi asparshana ) for health promotion and disease prevention. Concept of waking up at 'Brahme muhurta' in the present scenario and the effect of early rise on health, sleep, alertness and memory. UshaJalapana' (Drinking water in early morning). Importance of Malatyaga in vata kaala - early morning (Good Bowel Habits.). Mukhaprakshalana and face washes used currently. Concept of Dantadhavana and modern-day brushing techniques and dentifrices. Concept of Jihwanirlekhana and the tools used in today's era and their benefits. Concept of Anjana as a health promotive measure. Kavala and gandusha for oral hygiene including mouthwashes available in the market. Abhyanga as as health promotive measure. Importance of the Tambula. Prayogika Dhoomapana ( Practicable &amp; non-practicable Dhoomapana- inhalation of herbal fumes/ herbal inhalers with their benefits and contraindications. Ill effects of tobacco smoking of various sorts viz. beedi, cigarette, hookah on health. Applied aspects of Sarvanga Abhyanga, Padabhyanga, Shiroabhyanga and their possible physiological effects. Application of Abhyanga according to different age groups and occupation/activity. Different snehas/oils to be used for daily abhyanga as per seasons and geographical variations. Concept of Vyayama and present-</p>	1	38	8	5

	<p>day practices such as aerobic exercises, muscle strengthening exercises etc. to be practiced as per prakriti, age and occupation. Ardhashakti lakshanas of vyayama and the consequences of ati vyayama. Udwartana, Utsadana Udgharshana . Snana- Types of different types of bath and Physiological effects of snana on body and mind. Importance and benefits of Anulepana. Merits and demerits of present-day applications like face powder, face pack, balm, lotions, lipsticks, deodorants and perfumes etc. Importance of proper clothing (Vastradharana) in social life.</p>				
3	<p><b>Ratricharya</b> Ratri bhojanvidhi and its relation to health. Ratri shayana vidhi in relation to the proper time of sleep. Relation between Nidra and health. Effects of Yukta &amp; Ayukta nidra. Effects of Ratri Jagarana, Diwaswapna, Anidra, Atinidra and Akala Nidra. Ahara and Vihara Causing sound sleep as well as disturbed sleep. Formulation of the duration of sleep according to age and Sleep in healthy and ailing persons. Various Aspects of Sleep like: a. Daytime Sleepiness and Alertness b. Sleep Deprivation c. Sleep and Host Defense d. Master Circadian Clock and Master Circadian Rhythm e. Human Circadian Timing System and Sleep-Wake Regulation f. Circadian Rhythms in Sleepiness, Alertness, and Performance g. Circadian Disorders of the Sleep-Wake Cycle. Sleep apnea , insomnia, narcolepsy and restless leg syndrome. Solutions to Asatmya jagarana (sleep disorders). Importance of observing brahmacharya and abrahmacharya in ratricharya in relation to health. Brahmacharya with special reference to lifestyle guidelines. Reproductive and sexual health according Ayurveda.</p>	1		6	1
4	<p><b>Ritucharya</b> Classification of kaala , Adana kala and visarga kala , identification of seasons based on the ritu lakshanas in different geographical areas. Sanchaya- Prakopa- Prashamana of Dosha with their gunas in each ritu. Relation of Agni , Bala and Ritu with its application. Ritu shodhana for the prevention of diseases. Pathya - Apathya in regards to Ahara -Vihara in all six ritus in present scenario. Importance of ahara and vihara in ritu sandhi and Yamadanshtra kala. Rituharitaki as a rasayana with research updates. Effects of Rituviparyaya on health and its relation to janapadaudhwamsa/maraka vyadhis with present day examples.</p>	1		5	2
5	<p><b>Roganutpadaniya</b> Concept of vegadharana and vega-udirana in relation to health and morbidity. Symptoms and management principles of adharaniya vega janya vyadhis from</p>	1	13	2	1

	bruhattrayee. Concept of vegaudirana (viz. Use of snuffing powder, forcible evacuation of bowels & bladder etc.). Importance of dharaniya vegas in promotion of mental health.				
6	<b>Sadvritta</b> Sadavritta measures for the maintenance of personal ,social and spiritual health. Observance of Sadvritta for the prevention of Adharma. Achara Rasayana" and its role in the prevention and control of diseases. Characteristics of a mentally healthy person, warning signals of poor mental health, types of mental illness and causes of mental ill-health. Mental health services and comprehensive mental health programme. Role of trigunas and satvavajaya in mental health promotion in present era. Digital health promotion	1		2	1
7	<b>Ahara</b> Significance of Ahara for health and well-being according to Ayurveda & Contemporary science. Classification of aharadravyas as per Ayurveda & Contemporary science. Ahara vidhividhana, Ahara sevanakala & Dwadasha ashanapravicharana . Applied aspect of Pathyahara, Apathyahara, Samashana, Adhyashana, Vishamashana. Ahara & vihara leading to Santarpanajanya evam Apararpanajanyavyadhi and importance of upavasa and concept of intermittent fasting. Benefits of Shadrasabhojana. Importance of Ashta aharavidhivishesha ayatanani in present era. Importance of Nityasevaniyadravyas in the maintenance of health. Properties (Guna& karmas) of Ahara dravyas in the following vargas with their nutritive value: Dhanyavarga – Shuka Dhanya (Cereals and Millets), Shami Dhanya (Pulses), Shaka and Haritavarga (Leafy and Non leafy vegetables), Kanda varga (roots and tubers), Phalavarga (Fruits), Taila varga (Fats and Oils), Ikshuvarga (Sugarcane Products) & Madyavarga (Alcoholic Beverages), Dugdhavarga (Milk and Milk products), Ahara Upayogi Varga (Spices & Condiments), Kritannavarga (Prepared Food), Mamsavarga (Meat types) and Jala Varga. Definition of Pro-biotics and Pre-biotics and their utility. Proximate principles of Food - Recommended Daily Allowance according to various conditions, Sources and deficiency diseases of Protein, Carbohydrate, Fats, Vitamins, and Minerals. Definition of Balanced diet and diet for an individual depending on age, body weight and physiological status and Social Aspects of Nutrition. Food hygiene, Sanitation of eating places, Preservation of food, Food handlers, Foodborne diseases, Food fortification, Food adulteration and Food toxicants. Milk Hygiene, Milk composition, Source of infection for Milk, Milk borne	1	20	20	15

	<p>diseases, Clean and Safe milk and Pasteurization of milk Meat Hygiene, Meat inspection, Slaughterhouse and Freshness of fish and egg. Safety and hygiene measures for Fruits and Vegetables. Formulation of Pathya-Apathya diet for prevention of lifestyle disorders such as Obesity, Diabetes mellitus, Cardiovascular diseases and Acid peptic diseases. Description of Food safety and standards regulation (Ayurveda Ahara Regulations), 2022 and Food safety and standards Act, 2006. Different Dietary Supplements and Ergogenic Aids. Impact of different dietary patterns: Mediterranean diet, Keto Diet, DASH diet, the MIND diet, Vegan diet, Ovo-lacto-vegetarian, Pesco- vegetarian, Plant-based diet, Intermittent diet, the Nordic diet, importance of organic foods, merits and demerits of genetically modified foods and inflammatory foods such as fried foods, cookies, hot dogs, red meat, refined grains, pizza, burger etc., and instant foods like Maggi etc.,. Concept of slow and fast foods and impact of cooking processes like boiling, steaming, sautéing, fermenting etc. (samskara) on health. Definition of Nutraceuticals, Nutrigenomics, Nutrigenetics. Concept of Viruddhaahara with classical and modern-day examples and the application of this in the prevention of diseases</p>				
8	<p><b>Rasayana for Swastha</b> Definition of Rasayana and benefits of Rasayana. Classification and types of Rasayana with examples. Urjaskara Rasayan as per age and occupations /Activities .Antioxidant &amp; immunomodulatory effects of Rasayana with reference to research articles. Importance of lifestyle counselling with its methods.</p>	1	5	2	2
9	<p><b>Yoga</b> Etymology/derivation of the word 'Yoga'. Definitions of Yoga according to Patanjali Yogasutras, Bhagavad Gita and Charaka Samhita. Difference between Rajayoga, Hathayoga and Karmayoga. Yogabhyasa Pratibhandhakas and Yoga Siddhikarabhavas. Mitahara and Pathya-apathyas during Yogabhyasa . Concept of Panchakosha theory. Description of Ashtangas of Yoga - Yama , Niyama , Asana .Pranayama , Pratyahara, Dharana, Dhyana and Samadhi. Suryanamaskara . Description of Shatkarmas - Dhauti, Basti, Neti, Trataka, Nauli, and Kapalabhati. Bandha - procedure and benefits of Mulabandha, Jalandharabandha and Uddiyanabandha. Mudras - Shanmukhi mudra and Jnana mudra. Shatchakras and their importance in Yoga practice. Description of Ida-Pingala-Sushumna nadis and their importance in yoga practice. Concept of Moksha according to Charaka , Muktatmalakshana and Moksha upayas. Importance of International Day of Yoga (IDY).</p>	2	18	22	6

	Adverse effects of improper Yoga practices			
10	<b>Naturopathy</b> Basic principles of Naturopathy. Concept of Panchabhutopasana. Therapeutic effects of Mud therapy. Therapeutic effects of Sun bath. Fasting therapy - its types and benefits. Hydrotherapy - types of water used based on the temperature and therapeutic effects of Hydrotherapy. Therapeutic effects of Massage	2	5	4
<b>Total Marks</b>			<b>100</b>	<b>75 hr</b>
			<b>37 hr</b>	

<b>Paper 2 Public health</b>					
<b>Sr. No</b>	<b>A2 List of Topics</b>	<b>B2 Term</b>	<b>C2 Marks</b>	<b>D2 Lecture hours</b>	<b>E2 Non-Lecture hours</b>
11	<b>Janapadodhwamsa / Maraka Vyadhi</b> Causes of Janapadodhwamsa/ maraka vyadhi. Manifestation and control measures of Janapadodhwamsa. Principles and uses of epidemiology. Dynamics of disease transmission. Theory of disease causation - epidemiological triad and natural history of disease. Concept of prevention, modes of intervention, risk factors, incidence and prevalence. Susceptible host and host defense. Immunizing Agents. Concept of vyadhikshamatwa. Investigation of an epidemic. Prevention and control of an epidemic. Sankramaka roga as per Ayurveda. Epidemiological determinants, brief pathology, transmission, incubation period, clinical features, diagnosis and preventive measures of 1. Droplet Infections such as Chicken Pox, Measles, Rubella, Diphtheria, Pertussis, Mumps, Tuberculosis, SARS, Influenza, Pneumonia, Covid-19 and Leprosy. 2. Water borne Infections / intestinal infections - Cholera, Polio, Viral Hepatitis, Typhoid. 3. Intestinal infestations – Ascariasis, Hook worm and Tape worm. 4. Emerging and re-emerging diseases. Explain Role of Ayurveda in Epidemics like COVID-19, Zika Virus, H1N1, H3N2, etc.,. 5. Sexually transmitted diseases (STDs) with prevention and control - HIV/ AIDS, Syphilis and Gonorrhoea. Role of Ayurveda in the prevention and control with recent research updates of Lifestyle diseases such as DM, Obesity, Coronary artery disease (CAD) and Cancer. Epidemic Diseases (Amendment) Ordinance Act, 2020 .,	2	10	37	10
12	<b>Environmental health</b> <b>Air:</b> Properties of Vayu and composition of air. Changes in	2	16	10	5



	<p>air of the occupied room. Comfort zone and indices of thermal comfort. Air pollution -causes, prevention and control. Effects of air pollution on health and social aspects .Effects of Global warming with recent updates. Definition of ventilation and types of Ventilation. Effects of high altitude and mountain air on health. <b>Water</b> : Safe and wholesome water and water requirements. Properties of water from different sources. Water pollution and health hazards. Contemporary and Ayurvedic methods of water purification. Hard Water - its effects on health and methods of removal of hardness. Quality of water stored in different vessels as per classics. Rain water harvesting - methods and its importance. <b>Soil</b> : Types of soil and relation between soil and health. Land pollution - its prevention and control. Land purification as per the classics. Social goals of Housing and Housing standards. The Building and other construction workers ( Regulation of employment and conditions of services) Act, 1996 Effects of housing on health. Overcrowding and its impact on health. <b>Light</b>: Good lighting, natural lighting and artificial lighting. Biological effects of lighting. <b>Noise</b> : Definition of noise and its sources, effects on health and control measures. <b>Radiation</b>: Radiation - sources and effects on health and control measures. <b>Waste disposal</b> : Types of solid waste, Storage and collection of refuse. Methods of disposal of solid waste (Rural &amp; urban). Excreta Disposal methods &amp; Sanitary Latrines. Modern Sewage disposal methods. Disposal methods of Excreta during camps, fairs, and festivals. Bio-medical waste management and Bio-medical waste management rules, 2016. Environment protection Act, 1986.</p>				
13	<p><b>Disaster management</b> Definition of disaster and disaster management. Effects of natural and man-made disasters. Epidemiologic surveillance and disease control measures.</p>	2		1	2
14	<p><b>Occupational Health</b> Definition of occupational health and Ergonomics. Occupational Hazards and Occupational diseases. Prevention and control of Occupational diseases . ESI Act ,1948 and The factories Act.1948. Role of Ayurveda in various Occupational health problems. The Merchant Shipping / Medical Examination Rules,2000</p>	2	20	3	3
15	<p><b>School health services</b> Health problems of school children. Aspects of school health services. Duties of school medical officers. Healthy environment in the school.</p>	2		2	3
16	<p><b>Disinfection</b></p>	2		2	3

	Definition of different term used in relation to disinfection. Types of disinfection. Natural agents, Physical agents and Chemical agents of disinfection. Recommended disinfection procedures of feces & urine, sputum, and room. Ayurvedic disinfection methods.				
17	<b>Primary health care</b> Definition of Primary Health Care. Principles and elements of primary health care. Levels of health care. Structure of Primary health care at village, sub-center, Primary health center (PHC), Community health center (CHC) and Rural hospital levels. Primary health care in Health insurance, Private agencies, Voluntary health agencies, NGOs and the AYUSH sector. Role of Ayurveda in Primary Health Care.	2	20	2	1
18	<b>Mother and Child health care</b> Objectives of Maternal and Child Care services. MCH problems & indicators of MCH care.	2		1	1
19	<b>Family welfare programme</b> Definition of Demography and sources of demographic statistics in India. Demographic cycle & definition of life expectancy. Definition of family planning, eligible couple and target couple. Objectives of family planning. Problems of population explosion . National population policy. Methods of Contraceptive (Fertility Regulating Methods).	2		2	2
20	<b>Preventive Geriatrics</b> Health problems of the aged and prevention and control measures. Relation between lifestyle and healthy aging. Role of Rasayana in preventive geriatrics.	2		1	1
21	<b>World Health Organization and International health agencies</b> Definition of World Health organization. Structure, regions, and works of the World Health Organization. Functions of various international health agencies - United Nations health agencies, Bilateral health agencies and Non- Governmental agencies. Contribution of the World health organization to the global acceptance of Ayurveda.	2		19	3
22	<b>Vital Statistics</b> Definition of Vital Statistics. Sources of Vital statistics. Fertility , Morbidity and Mortality rates. Registration of Birth and Death Act, 1969	2	1		1
23	<b>Health Administration</b> Health administration including AYUSH at the Central, State, District, and Village levels.	2	2		1
24	<b>National Health Programmes</b>	2	15	7	3

	National Health Programs : Leprosy(NLEP), AIDS (NACP), Blindness (NPCB), Polio , National TB Elimination program , Vector born disease control program, RCH program, ICDS program, Universal Immunization program, National mental health program , National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases & Stroke (NPCDCS) , Swachha Bharat mission, Ayushman Bharat Yojana, Ayushman Bharat Digital Mission, National health mission (NRHM&NUHM), National AYUSH Mission (NAM).National nutrition programs: National Iodine Deficiency Disorders Control program, National Iron Plus Initiative for Anemia Control, National Vitamin A prophylaxis program, Mid-Day Meal program & Balwadi nutrition program.			
25	<b>National Health Policy</b> National Health Policy (NHP) and the scope of Ayurveda in NHP.	2	1	1
<b>Total Marks</b>			<b>100</b>	<b>75 hr</b>
				<b>38 hr</b>

**Table 3: Learning objectives (Theory) of Course**

<b>Paper 1 Principles of Swasthavritta, Yoga and Naturopathy</b>									
<b>A3</b> Course outcome	<b>B3</b> Learning Objective (At the end of the session, the students should be able to)	<b>C3</b> Domain/sub	<b>D3</b> Must to know / desirable to know / Nice to know	<b>E3</b> Level Does/ Shows how/ Knows how/ Knows	<b>F3</b> T-L method	<b>G3</b> Assessment  (Refer abbreviations)	<b>H3</b> Formative/summative	<b>I3</b> Term	<b>J3</b> Integration
<b>Topic 1 Swastha and Swasthya</b> (Lecture :3 hours, Non lecture: 0 hours)									
CO1	Define Swasthavritta and describe its objective.	CK	MK	K	L	TT-Theory	S	I	
CO1	Describe and compare Swasthalakshanas Arogyalakshanas, Dhatusamyalakshanas. Describe Concept of Health & Operational definition of health.	CC	MK	K	L&PP T	TT-Theory	S	I	
CO1	Describe the Importance of Shodhana in Swastha in relation to Sanchita& Asanchitha Dosha & Classify Swastha purusha as Sanchita dosha and Asanchita Dosha.	CC	MK	KH	L	M-CHT	S	I	
CO1	Explain the Physical, Mental and Social dimensions of health.	CK	MK	KH	L&G D	T- EW	S	I	
CO1,CO2	Describe the objective component of well-being - standard of living and level of living and subjective component of well-being - Quality of Life.	CK	MK	KH	L	T- EW	S	I	
CO1,CO2,CO7	Explain one health concept / Vasudhaiva Kutumbakam” or “One Earth · One Family One Future”	CK	DK	K	L	T- EW	F	I	

Topic 2 Healthy Life style -Dinacharya (Daily regimen) (Lecture :8 hours, Non lecture: 5 hours)									
CO1,CO2	Explain the Primordial, Primary, Secondary, and Tertiary Preventive measures in the context of Ayurveda with examples	CK	MK	KH	L&PP T,SD L	TT-Theory	F&S	I	
CO1,CO2	Explain the importance of Ahara and Vihara as the health promotive and disease preventive measures.	CK	MK	KH	L&PP T	TT-Theory	S	I	
CO1,CO2	Describe the importance of <b>Niyata kala vihara</b> (Dinacharya, Ritucharya) and <b>Aniyata kala Vihara</b> (Vegadharana, Vegaudirana, Ritushodhana, Brumhana and Bhutadi asparshanaa ) for health promotion and disease prevention.	CAN	MK	KH	L&PP T	T- EW	S	I	
CO1,CO2	Explore and analyse the concept of waking up at 'Brahma muhurta' in the present scenario and the effect of early rise on health, sleep, alertness and memory	CAN	DK	KH	IBL	DEB	F	I	
CO1,CO2	Describe the time, quantity and benefits of 'Usha Jalapana' (Drinking water in early morning).	CC	MK	K	L&PP T	T- EW	S	I	
CO1,CO2	Explain the Importance of Malatyaga in vata kaala - early morning (Good Bowel Habits)	CK	MK	KH	L&PP T	TT-Theory	S	I	
CO1,CO2	Explain the procedure, dravyas and benefits of Mukhaprakshalana and face washes used currently.	CK	MK	KH	L&PP T	T- EW	F&S	I	
CO1,CO2	Describe the time, procedure, benefits, contraindications and herbs used as per rasa for dantadhavana and modern-day brushing techniques and dentifrices.	CC	MK	KH	L&PP T	T- EW	F&S	I	
CO1,CO2	Describe jihwanirlekhana, explain the tools used in today's era and their benefits.	CAP	MK	KH	SDL	TT-Theory	F&S	I	
CO1,CO2	Explain the Anjana dravyas for Swastha and their benefits	CK	MK	K	L	INT	F&S	I	V-

									SHL
CO1,CO2	Describe the occupation /activity in which Anjana can be used as a health promotive measure	CS	NK	KH	SDL	O-QZ	F	I	
CO1,CO2	Explain the dravyas used with their doses for Pratimarsha Nasya and their benefits.	CC	MK	KH	L&PP T	T- EW	F&S	I	V-PC
CO1,CO2	Describe the various kaal for administering Pratimarsha Nasya as per day and season (ritu)	CAP	MK	KH	L&PP T	P-VIVA	F&S	I	V-PC
CO1,CO2	Describe the occupation /activity in which Pratimarsha Nasya can be used as a health promotive measure.	CAP	MK	KH	L&G D	INT	F&S	I	V-PC
CO1,CO2	Describe the ingredients, procedure and benefits of kavala and gandusha for oral hygiene including mouthwashes available in the market	CAP	MK	KH	L&PP T	TT-Theory	F&S	I	
CO1,CO2	Mention different snehas/oils to be used for daily abhyanga as per seasons and geographical variations.	CK	MK	K	L&PP T	INT	F&S	I	
CO1,CO2	Justify the importance of the classical tambula by comparing it with the present-day betel chewing.	CE	DK	KH	TBL	TT-Theory	F	I	
CO1,CO2	Explain the practical application of Prayogika Dhoomapana (inhalation of herbal fumes/ herbal inhalers) with their benefits and contraindications	CAP	MK	SH	BL	TT-Theory	S	I	
CO1,CO2	Explain the ill effects of tobacco smoking of various sorts viz. beedi, cigarette, hookah on health	CAP	MK	KH	ECE	P-CASE	F&S	I	
CO1,CO2	Describe the applied aspects of Sarvanga Abhyanga, Padabhyanga, Shiroabhyanga and	CAP	MK	KH	DIS	T- EW	F&S	I	V-PC
CO1,CO2	Explain the application of Abhyanga according to different age groups and occupation/activity.	CAP	DK	KH	SDL	T-CS	F	I	V-PC

CO1,CO2	Explain the indications, contraindications and benefits of Vyayama.	CK	MK	KH	L&PP T	T- EW	F&S	I	
CO1,CO2	Describe the types & benefits of vyayama and present-day practices such as aerobic exercises, muscle strengthening exercises etc.to be practiced as per prakriti, age and occupation.	CAP	MK	KH	DIS	CR-RED	F&S	I	
CO1,CO2	Describe the assessment of ardhashakti lakshanas of vyayama and the consequences of ati vyayama.	CE	MK	KH	DIS	TT-Theory	F&S	I	
CO1,CO2	Describe and compare the dravyas, benefits, and application of Udvartana, Udgharshana and Utsadana.	CAN	MK	KH	L&PP T	M-CHT	F&S	I	V-KC
CO1,CO2	Explain the physiological effects of snana on body and mind and explain the reasons for contraindications of Snana.	CAN	MK	KH	L&PP T	CR-W	F&S	I	
CO1,CO2	Explain the importance and benefits of Anulepana.	CK	MK	KH	L&PP T	P-VIVA	F&S	I	
CO1,CO2	Describe the merits and demerits of present-day applications like face powder, face pack, balm, lotions, lipsticks, deodorants and perfumes.	CAP	NK	KH	PrBL	CL-PR	F	I	
CO1,CO2	Explain the importance of proper clothing (vastradharana) in social life.	CK	MK	KH	L&PP T	INT	F&S	I	
<b>Topic 3 Ratricharya</b> (Lecture :6 hours, Non lecture: 1 hours)									
CO1,CO2	Describe ratri bhojanvidhi and its relation to health.	CK	MK	KH	L&PP T	T- EW	F&S	I	
CO1,CO2	Describe ratri shayana vidhi in relation to the proper time of sleep.	CK	MK	KH	L&PP T	T- EW	F&S	I	
CO1,CO2	Explain the relation between Nidra and health.	CK	MK	KH	L&PP T	T- EW	F&S	I	

CO1,CO2	Describe effects of Yukta & Ayukta nidra.	CK	MK	KH	L&PP T	T- EW	F&S	I	
CO1,CO2	Explain the effects of Ratri Jagarana, Diwaswapna, Anidra, Atinidra and Akala Nidra.	CK	MK	K	L&PP T	T- EW	F&S	I	
CO1,CO2	Identify Ahara and Vihara Causing sound sleep as well as disturbed sleep.	CAN	DK	KH	SDL	INT	F	I	
CO1,CO2	Formulate the duration of sleep according to age, Sleep in healthy and ailing persons.	CE	DK	KH	SDL	INT	F	I	
CO1,CO2,CO 8	Explain various Aspects of Sleep like: a. Daytime Sleepiness and Alertness b. Sleep Deprivation c. Sleep and Host Defense d. Master Circadian Clock and Master Circadian Rhythm e. Human Circadian Timing System and Sleep-Wake Regulation f. Circadian Rhythms in Sleepiness, Alertness, and Performance g. Circadian Disorders of the Sleep-Wake Cycle	CK	DK	KH	L&PP T	C-INT	F	I	
CO1,CO2,CO 8	Explain Sleep apnoea , insomnia, narcolepsy and restless leg syndrome. Explain solutions to Asatmya jagarana (sleep disorders .)	CK	DK	KH	L&PP T	C-INT	F	I	
CO1	Explain the importance of observing brahmacharya and abrahmacharya in relation to health	CAP	MK	KH	L&G D	TT-Theory	F&S	I	
CO1	Describe Brahmacharya with specail reference to lifestyle guidelines	CAP	MK	KH	L&G D	TT-Theory	F&S	I	
CO1	Describe reproductive and sexual health according to Ayurveda	CAP	MK	KH	L&G D	TT-Theory	F&S	I	
<b>Topic 4 Ritucharya</b> (Lecture :5 hours, Non lecture: 2 hours)									



CO1	Explain classification of kaala , distinguish Adana kala and visarga kala , identification of seasons based on the ritu lakshanas in different geographical areas.	CAP	MK	K	L&PP T	M-CHT	F&S	I	
CO1	Analyse the Sanchaya- Prakopa- Prashamana of Dosha with their gunas in each ritu.	CAN	MK	K	L&PP T	PUZ	F&S	I	
CO1	Describe the Relation of Agni , Bala and Ritu with its application.	CAP	MK	K	L&PP T	CL-PR	F&S	I	
CO1	Explain ritu shodhana for the prevention of diseases.	CC	MK	KH	L	T- EW	F&S	I	
CO1	Analyse Pathya - Apathya in regards to Ahara -Vihara in all six ritus in present scenario.	CAN	MK	K	FC	CL-PR	F&S	I	
CO1	Explain the importance of ahara and vihara in ritu sandhi and yamadanshra kala.	CK	MK	KH	SDL	T- EW	F&S	I	
CO1	Describe rituharitaki as a rasayana with research updates.	CE	DK	K	SDL	CR-RED	F	I	
CO1	Explain the effects of Rituviparyaya on health and its relation to janapadaudhwansa/maraka vyadhis with present day examples.	CAP	MK	K	L&PP T	CL-PR	F&S	I	
<b>Topic 5 Roganutpadaniya</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1,CO2	Explain vegadharana and vega-udirana in relation to health and morbidity.	CK	MK	K	L&PP T	T- EW	F&S	I	
CO1,CO2	Compare the symptoms and management principles of adharaniya vega janya vyadhis from bruhattrayee.	CAN	MK	K	L&PP T	T- EW	F&S	I	
CO1,CO2	Explain with examples the concept of vega-udirana (viz. Use of snuffing powder, forcible evacuation of bowels & bladder etc.).	CK	MK	K	L&PP T	T- EW	F&S	I	
CO1,CO2	Explain the importance of dharaniya vegas in promotion of	CK	MK	K	L&PP	T- EW	F&S	I	

	mental health.				T				
<b>Topic 6 Sadvritta</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1	Describe digital health	CK	DK	KH	L&G D	TT-Theory	F&S	I	
CO1,CO2	Explain Promotion of Digital health	CAP	DK	KH	L&G D	TT-Theory	F&S	I	
CO1,CO2	Describe Digital health problems	CAP	DK	KH	DIS	PP-Practical	F&S	I	V- SHL
CO1,CO2	Understand and adopt the Sadavritta measures for the maintenance of personal ,social and spiritual health.	AFT- VAL	DK	D	RP	INT	F	I	
CO1,CO2	Explain how the observance of Sadvritta helps for the prevention of Adharma.	CC	MK	KH	DIS	T- EW	F&S	I	
CO1,CO2	Describe 'Achara Rasayana" and its role in the prevention and control of diseases.	CK	MK	K	L&PP T	TT-Theory	F&S	I	
CO1,CO2	Explain characteristics of a mentally healthy person, warning signals of poor mental health, types of mental illness and causes of mental ill-health.	CK	MK	K	L&PP T	TT-Theory	F&S	I	
CO1,CO2	Describe the mental health services and comprehensive mental health programme.	CK	MK	K	L&PP T	TT-Theory	F&S	I	
CO1,CO2	Explain the role of trigunas and satvavajaya in mental health promotion in present era.	CAP	DK	KH	CBL	INT	F	I	V-KC
<b>Topic 7 Ahara</b> (Lecture :20 hours, Non lecture: 15 hours)									
CO1	Explain significance of Ahara for health and well-being according to Ayurveda & Contemporary science Explain	CK	MK	K	L	T- EW	F&S	I	

	significance of Ahara for health and well-being according to Ayurveda & Contemporary science								
CO1	Classify aharadravyas as per Ayurveda & Contemporary science	CK	MK	K	L&PP T	T- EW	F&S	I	
CO1	Enumerate and explain the features of Ahara vidhividhana, Ahara sevanakala & Dwadashashanapravicharana .	CK	MK	K	L&PP T	T- EW	F&S	I	
CO1	Discuss the applied aspect of Pathyahara, Apathyahara, Samashana, Adhyashana, Vishamashana. Discuss the Ahara & vihara leading to Santarpanajanya evam Apatarpanajanyavyadhi and importance of upavasa and effects of practice of intermittant fasting on health	CAN	MK	KH	L&PP T	T- EW	F&S	I	
CO1	Explain the benefits of Shadrasabhojana	CAP	MK	KH	L&PP T	T- EW	F&S	I	
CO1	Enumerate and explain the importance of Ashtaharavidhivisheshayatanani in present era	CK	MK	KH	L&PP T	T- EW	F&S	I	
CO1	Explain the importance of Nityasevaniyadravyas in the maintenance of health	CAP	MK	KH	L&PP T	T- EW	F&S	I	H-DG
CO1	Explain the properties (Guna& karmas) of Ahara dravyas in the following vargas with their nutritive value: Dhanyavarga – Shuka Dhanya (Cereals and Millets), Shami Dhanya (Pulses), Shaka and Haritavarga (Leafy and Non leafy vegetables), Kanda varga (roots and tubers), Phalavarga (Fruits), Taila varga (Fats and Oils), Ikshuvarga (Sugarcane Products)&Madyavarga(Alcoholic Beverages), Dugdhavarga (Milk and Milk products), Ahara Upayogi Varga (Spices & Condiments), Kritannavarga(Prepared Food), Mamsavarga (Meat types) and Jala Varga	CC	MK	KH	L&PP T	T- EW	F&S	I	H-DG

CO1	Define Pro-biotics and Pre-biotics and explain their utility	CK	DK	KH	IBL	INT	F	I	
CO1	Explain the Proximate principles of Food, Recommended Daily Allowance according to various conditions, Sources, and deficiency diseases of Protein, Carbohydrate, Fats, Vitamins, and Minerals.	CC	MK	K	L_VC	COM	F&S	I	
CO1	Define Balanced diet and explain diet for an individual depending on age, body weight and physiological status and explain the Social Aspects of Nutrition	CK	MK	KH	L&G D	T- EW	F&S	I	
CO1	Explain Food hygiene, Sanitation of eating places, Preservation of food, Food handlers, Foodborne diseases, Food fortification, Food adulteration, and Food toxicants	CC	NK	KH	L&PP T,ML	P-REC,CHK	F	I	
CO1	Explain Milk Hygiene, Milk composition, Source of infection for Milk, Milk borne diseases, Clean and Safe milk and Pasteurization of milk	CC	DK	KH	L&PP T,ML	P-REC,CHK	F	I	
CO1	Explain Meat Hygiene, Meat inspection, Slaughterhouse and Freshness of fish and egg	CC	DK	KH	L&PP T,ML	P-REC,CHK	F	I	
CO1	Explain safety and hygiene measures for Fruits and Vegetables	CC	NK	K	ML	O-QZ	F	I	
CO1	Formulate a Pathya-Apathya diet for prevention of lifestyle disorders such as Obesity, Diabetes mellitus, Cardiovascular diseases and Acid peptic diseases	CAP	DK	D	SDL	P-REC,CHK	F	I	
CO1	Describe Food safety and standards regulation( Ayurveda Ahara Regulations), 2022 and Food safety and standards Act, 2006.	CK	NK	K	ML	INT	F	I	
CO1	Explain different Dietary Supplements and Ergogenic Aids	CK	NK	K	IBL	TT-Theory	F	I	
CO1	Explain the impact of different dietary patterns: Mediterranean	CC	NK	KH	L&G	INT	F	I	

	diet, Keto Diet, DASH diet, the MIND diet, Vegan diet, Ovo-lacto-vegetarian, pesco-vegetarian, plant-based diet, Intermittent diet, the Nordic diet, importance of organic foods, merits and demerits of genetically modified foods				D				
CO1	Describe the Slow and Fast foods . Explain the impact of cooking processes like boiling, steaming, sautéing, fermenting etc. (samskara) on health and effect of instant foods like Maggi etc,..	CC	NK	KH	DIS	TT-Theory	F	I	
CO1	Define Nutraceuticals, Nutrigenomics, Nutrigenetics	CK	DK	K	L&PP T	T- EW	F	I	
CO1	Explain the concept of Viruddhaahara with classical and modern-day examples and the application of this in the prevention of diseases	CK	MK	KH	ECE	T- EW	F&S	I	H-AT
<b>Topic 8 Rasayana for Swastha</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO1	Explain the importance of lifestyle counselling with its methods	CC	NK	K	L&G D	TT-Theory	F&S	I	
CO1	Define Rasayana and mention the benefits of Rasayana	CK	MK	K	L&PP T	T- EW	F&S	I	
CO1	Classify the types of Rasayana with examples	CK	MK	K	L&PP T	T- EW	F&S	I	
CO1	Explain Urjaskara Rasayanas as per age and occupations /Activities	CAP	MK	K	L&G D	T-CS	F&S	I	
CO1	Explain the antioxidant&immunomodulatory effects of Rasayana with reference to research articles	CC	NK	K	L&G D	CR-RED	F	I	
<b>Topic 9 Yoga</b> (Lecture :22 hours, Non lecture: 6 hours)									
CO1	Describe adverse effects of improper Yoga practices	CK	DK	KH	L&G	TT-Theory	F&S	II	

					D				
CO3	Describe Global importance of International Day of Yoga (IDY)	CK	NK	K	L&PP T	INT	F	II	
CO3	Explain the etymology / derivation of the word 'Yoga' .	CK	MK	K	L&PP T	T- EW	F&S	II	
CO3	Define Yoga according to Patanjali Yogasutras, Bhagavad Gita and Charaka Samhita.	CK	MK	K	L&PP T	TT-Theory	F&S	II	
CO3	Distinguish between Rajayoga, Hathayoga and Karmayoga.	CAN	MK	KH	L&PP T	M-CHT	S	II	
CO3	Explain Yogabhyasa Pratibhandhakas and Yoga Siddhikarabhavas.	CK	MK	K	L&PP T	T- EW	F&S	II	
CO3	Describe Mitahara and Pathya-apathyas during Yogabhyasa.	CC	MK	KH	L&PP T	T- EW	F&S	II	
CO3	Explain Panchakosha theory.	CC	MK	KH	L&PP T	M-POS	F&S	II	
CO3	List out the Ashtangas of Yoga.	CK	MK	K	L&PP T	T- EW	F&S	II	
CO3	Describe Yama and Niyama with meaning according to Yogasutras and Hathayogapradipika.	CC	MK	K	L&PP T	T- EW	F&S	II	
CO3	Define Asana and explain the importance of asana. Distinguish between asana and physical exercise.	CK	MK	K	L&PP T	TT-Theory	F&S	II	
CO3	Describe the procedure, benefits, indications, and contraindications of Standing Yoga Postures such as Ardhakatichakrasana, Padahasthasana, Ardhakachakrasana, and Trikonasana.	CC	MK	KH	L_VC	PRN	F&S	II	

CO3	Describe the procedure, benefits, indications and contraindications of Sitting Yoga postures such as Swasthikasana, Gomukhasana, Padmasana, Vajrasana, Bhadrasana, Shashankasana, Ushtrasana, Pashchimottanasana, Suptavajrasana, Ardhamatsyendrasana, and Siddhasana.	CC	MK	KH	L_VC	PRN	F&S	II	
CO3	Describe the procedure, benefits, indications and contra indications of Supine Yoga postures such as Pavanamuktasana, Sarvangasana, Matsyasana, Halasana, Chakrasana, Shavasana and Setubandhasana.	CC	MK	KH	L_VC	PRN	S	II	
CO3	Describe the procedure, benefits, indications, and contraindications of Prone Yoga postures such as Bhujangasana, Shalabhasana, Dhanurasana, and Makarasana.	CC	MK	KH	L_VC	PRN	F&S	II	
CO3	Describe the procedure, benefits and contraindications of Suryanamaskara.	CC	MK	KH	L_VC	PRN	S	II	
CO3	Define pranayama and explain its types, benefits, time of practice, and avara-pravara-madhyamalakshanas.	CC	MK	KH	L&PP T	T- EW	F&S	II	
CO3	Describe the procedure of Nadishudhi Pranayama, its benefits, and Nadishudhilakshana.	CC	MK	KH	L_VC	PRN	S	II	
CO3	Enumerate the Kumbhakabhedas.	CK	MK	K	L&PP T	TT-Theory	S	II	
CO3	Describe the procedure and benefits of Suryabhedana, Ujjayi, Sheetal, Sitkari, Bhastrika, Bhramari, Murcha, and Plavini.	CC	MK	KH	L_VC	PRN	F&S	II	
CO3	Enlist Shatkarmas of Yoga , indications and their importance.	CK	MK	K	L&PP T	TT-Theory	S	II	
CO3	Describe the procedure, benefits, indications, contraindications, and precautions of Dhauti, Basti, Neti, Trataka, Nauli, and	CC	MK	KH	L_VC	T- EW	S	II	

	Kapalabhati.								
CO3	Explain the term bandha & Describe the procedure and benefits of Mulabandha, Jalandharabandha, and Uddiyanabandha.	CC	MK	KH	L_VC	T- EW	S	II	
CO3	Describe Mudras and explain the benefits of Shanmukhi mudra and Jnana mudra .	CC	DK	KH	L_VC	T- EW	F	II	
CO3	Describe Shatchakras and explain their importance in Yoga practice.	CAP	DK	KH	L&PP T	T-OBT	F	II	
CO3	Describe Ida-pingala-sushumna nadis and their importance in yoga practice.	CAP	NK	K	L&PP T	T- EW	F	II	
CO3	Define Pratyahara and explain its importance in Yoga practice.	CAP	MK	KH	L&PP T	TT-Theory	S	II	
CO3	Define Dharana and explain its importance in Yoga practice.	CAP	MK	KH	L&PP T	TT-Theory	S	II	
CO3	Define Dhyana and explain its importance in Yoga practice.	CAP	MK	KH	L&PP T	TT-Theory	S	II	
CO3	Describe Cyclic Meditation and Mindfulness meditation and their benefits.	CAP	DK	KH	L&PP T,L_ VC	CL-PR	F	II	
CO3	Define Samadhi and explain its types and importance.	CK	MK	K	L&PP T	TT-Theory	S	II	
CO3	Define Moksha according to Charaka and explain Muktatmalakshana and Moksha upayas.	CK	DK	K	L&G D	INT	F	II	
<b>Topic 10 Naturopathy</b> (Lecture :5 hours, Non lecture: 4 hours)									
CO3	Explain the basic principles of Naturopathy.	CK	DK	K	L&PP	INT	F&S	II	



					T				
CO3	Describe the concept of Panchabhutopasana.	CK	DK	KH	L&PP T	INT	F&S	II	
CO3	Explain the procedure and therapeutic effects of Mud therapy.	CAP	MK	KH	L_VC	TT-Theory	F&S	II	
CO3	Explain the procedure and therapeutic benefits of Sun bath.	CAP	MK	KH	L_VC	TT-Theory	F&S	II	
CO3	Explain Fasting therapy and its types and benefits.	CK	MK	KH	L&PP T	TT-Theory	F&S	II	
CO3	Explain hydrotherapy, types of water used based on the temperature and therapeutic effects of Hydrotherapy.	CAP	MK	KH	L_VC	TT-Theory	F&S	II	
CO3	Describe types, methods and benefits of massage.	CAP	MK	KH	L_VC	TT-Theory	F&S	II	

### Paper 2 Public health

<b>A3</b> Course outcome	<b>B3</b> Learning Objective (At the end of the session, the students should be able to)	<b>C3</b> Domain/sub	<b>D3</b> Must to know / desirable to know / Nice to know	<b>E3</b> Level Does/ Shows how/ Knows how/ Knows	<b>F3</b> T-L method	<b>G3</b> Assessment  (Refer abbreviations)	<b>H3</b> Formative/ summative	<b>I3</b> Term	<b>J3</b> Integration
<b>Topic 1 Janapadodhwamsa / Maraka Vyadhi</b> (Lecture :37 hours, Non lecture: 10 hours)									
CO1	Understanding the Epidemic Diseases (Amendment) Ordinance	CK	MK	KH	L&G	TT-Theory	F&S	II	

	Act,2020 ..				D				
CO1	Explain the causes of Janapadodhwamsa/ maraka vyadhi State the manifestation and control measures of Jnapadodhwamsa Explain the importance of Panchakarma and Rasayana in preventing Janapadodhwamsa	CK	MK	KH	L&PP T	T- EW	F&S	I	
CO1	Define Epidemiology, enumerate and describe the principles and uses of epidemiology.	CK	MK	KH	L&G D	T- EW	S	I	
CO3	Describe the basic terms of epidemiology.Explain and discuss the dynamics of disease transmission.Explain the theory of disease causation, epidemiological triad and natural history of disease.	CK	MK	KH	L&PP T	T- EW	S	II	
CO2	Explain the concept of prevention, modes of intervention, risk factors, incidence and prevalence.	CK	MK	KH	L&PP T	T-EMI	S	II	
CO2	Explain Susceptible host and host defense.Describe Immunizing Agents.Explain the concept of vyadhikshamatwa.Enlist methods to improve Vyadhikshamatwa.Classify Bala, enlist factors of Bala vriddhikara bhava.	CK	MK	KH	L&PP T	T- EW	F&S	II	
CO2	Explain the investigation of an epidemic. Explain prevention and control of an epidemic.	CK	MK	KH	L&PP T	T- EW	F&S	II	
CO1	Explain Sankramaka roga as per Ayurveda.	CK	MK	K	L&PP T	T- EW	S	II	
CO2	Explain Epidemiological determinants, brief pathology ,transmission, incubation period , clinical features, diagnosis and preventive measures of 1.Droplet Infections such as Chicken Pox, Measles, Rubella, Diphtheria, Pertussis, Mumps, Tuberculosis, SARS, Influenza, Pneumonia, Covid-19 and Leprosy	CK	MK	KH	L&PP T,ED U,D_ BED	T- EW	F&S	II	

CO2	2. Water borne Infections / intestinal infections - Cholera, Polio, Viral Hepatitis, Typhoid	CK	MK	K	L&PP T,D_ BED	T- EW	S	II	V-KC
CO2	3. Intestinal infestations – Ascariasis, Hook worm, Tape worm 4. Emerging and re-emerging diseases. Explain Role of Ayurveda in Epidemics like COVID-19, Zika Virus, H1N1, H3N2, etc	CK	MK	KH	L&G D,D_ BED	T- EW	S	II	
CO2	5. Sexually transmitted diseases (STDs) with prevention and control - HIV/ AIDS, Syphilis and Gonorrhoea.	CK	MK	KH	L&G D,D_ BED	T- EW	S	II	
CO2	Explain the role of Ayurveda in the prevention and control with recent research updates of Lifestyle diseases such as DM, Obesity, Coronary artery disease (CAD) and Cancer	CK	MK	KH	L&PP T,D_ BED	T- EW	S	II	
<b>Topic 2 Environmental health</b> (Lecture :10 hours, Non lecture: 5 hours)									
CO1	Understanding the Environment protection Act, 1986	CK	MK	KH	L&G D	TT-Theory	F&S	II	
CO1	Describe the properties of Vayu and state the composition of air.	CK	DK	KH	L	INT	F	II	
CO1	Specify the changes in air of the occupied room.	CK	DK	KH	L	INT	F	II	
CO1	Explain comfort zone and indices of thermal comfort.	CK	DK	KH	L	INT	F	II	
CO2	Comprehend the causes, prevention and control of air pollution. Discuss the effects of air pollution on health and social aspects	CC	DK	KH	L	DEB	F	II	
CO2	Elaborate the effects of Global warming with recent updates	CAP	DK	KH	L&G D	CR-RED	F	II	
CO2	Define ventilation and illustrate its types.	CAP	DK	KH	L&G D	DEB	F	II	

CO2	Explain the effects of high altitude and mountain air on health.	CAP	DK	KH	L&G D	DEB	F	II	
CO1	Explain safe and wholesome water and state water requirements.	CK	MK	KH	L&PP T	TT-Theory,V V-Viva	F&S	II	
CO1	Explain the properties of water from different sources.	CK	MK	KH	L&PP T	TT-Theory,V V-Viva	F&S	II	
CO1,CO6	Explain water pollution and health hazards.	CAP	MK	KH	L&PP T,DIS	CL-PR	F&S	II	
CO1,CO6	Describe the contemporary methods of water purification along with Ayurvedic methods.	CAP	MK	KH	L&PP T,DIS	CL-PR	F&S	II	
CO1,CO6	Elucidate the effects of Hard Water on health and methods of removal of hardness.	CAP	MK	KH	L&PP T,DIS	CL-PR	F&S	II	
CO7	Describe the quality of water stored in different vessels as per classics.	CAP	DK	SH	L	DEB	F	II	
CO7	Explain the rain water harvesting methods and its importance	CAN	NK	SH	L	DEB	F	II	
CO7	Enlist the types of soil.	CK	DK	KH	L&PP T	INT	F	II	
CO7	Interpret the relation between soil and health.	CK	DK	KH	L&PP T	INT	F	II	
CO7	Explain Land pollution and its prevention and control	CK	DK	KH	L&PP T	INT	F	II	
CO7	Explain land purification as per the classics.	CAN	NK	KH	L&G D	T-OBT	F	II	
CO7	Explain the Social goals of Housing and Housing	CE	DK	KH	L&G	T- EW	F	II	

	standards. Understanding of The building and other construction workers Act,1996				D				
CO7	Analyze the effects of housing on health.	CE	DK	KH	L&G D	T- EW	F	II	
CO7	Explain overcrowding and its impact on health	CE	DK	KH	L&G D	TT-Theory	F	II	
CO7	Explain good lighting, natural lighting and artificial lighting	CK	DK	KH	L&PP T	M-POS	F	II	
CO7	Explain the biological effects of lighting.	CK	DK	KH	L&PP T	M-POS	F	II	
CO7	Define noise. Illustrate its sources, effects on health and control measures.	CK	DK	KH	L&PP T	PRN	F	II	
CO7	Enlist the sources of Radiation and explain its effects on health and describe control measures.	CK	DK	KH	L	PRN	F	II	
CO7	Enlist Different types of solid waste and Explain the Storage and collection of refuse.	CK	MK	KH	L,D- M	TT-Theory	S	II	
CO7	Explain the Methods of disposal of solid waste (Rural & urban)	CK	MK	KH	D-M	M-MOD	S	II	
CO7	Describe Bio-medical waste management and Bio-Medical waste management rules, 2016	CK	MK	KH	D-M	TT-Theory	S	II	
CO7	Enlist excreta Disposal methods and explain Sanitary Latrines	CAN	DK	KH	D-M	DEB	F	II	
CO7	Explain the Modern Sewage disposal method	CAN	DK	KH	D-M	DEB	F	II	
CO7	Describe the disposal methods of Excreta during camps, fairs, and festivals	CAN	DK	KH	D-M	DEB	F	II	

**Topic 3 Disaster management** (Lecture :1 hours, Non lecture: 2 hours)

CO5	Define disaster and explain disaster management	CK	DK	KH	L&G D	PRN	F	II	
CO5	Explain effects of natural and man-made disasters	CK	DK	KH	L&G D	PRN	F	II	
CO2	Explain epidemiologic surveillance and identify disease control measures	CAP	DK	KH	L&G D	PRN	F	II	

**Topic 4 Occupational Health** (Lecture :3 hours, Non lecture: 3 hours)

CO1	Understand the Merchant Shipping / Medical Examination Rules, 2000	CK	DK	KH	L&G D	TT-Theory	F	II	
CO7,CO8	Define Occupational Health and Ergonomics.	CK	MK	K	L&G D	TT-Theory	F&S	II	
CO7,CO8	Explain occupational Hazards.	CK	MK	K	L&G D	T- EW	F&S	II	
CO7,CO8	Enlist occupational diseases and explain their prevention & control.	CK	MK	K	L&G D	T- EW	F&S	II	
CO1	Explain ESI Act, 1948 and The factories Act,1948	CK	MK	K	L&PP T	T- EW	S	II	
CO1	Describe the role of Ayurveda in various Occupational health problems.	CK	MK	KH	L&G D	TT-Theory	S	II	

**Topic 5 School health services** (Lecture :2 hours, Non lecture: 3 hours)

CO2	State the Health problems of school children.	CC	MK	KH	L&PP T	T- EW	F&S	II	

CO2	Mention the aspects of school health services.	CC	MK	KH	L&PP T	T- EW	F&S	II	
CO2	Mention the duties of school medical officers.	CC	MK	KH	FV	T- EW	F&S	II	
CO2	Explain how to Maintain a healthy environment in the school.	CC	MK	KH	FV	T- EW	F&S	II	
<b>Topic 6 Disinfection</b> (Lecture :2 hours, Non lecture: 3 hours)									
CO1,CO2,CO 6,CO7	Define the term disinfection	CK	MK	K	L	TT-Theory	F&S	II	
CO1,CO2,CO 6,CO7	Enlist and explain the types of disinfection.	CK	MK	K	L&PP T	P-VIVA,P-PS	F&S	II	
CO1,CO2,CO 6,CO7	Describe the Natural agents, Physical agents, and chemical agents of disinfection	CK	MK	K	L&PP T	T- EW	F&S	II	
CO1,CO2,CO 6,CO7	Demonstrate the recommended disinfection procedures of feces & urine, sputum, and room.	PSY- MEC	DK	KH	L_VC	P-VIVA,QZ	F	II	
CO1,CO2,CO 6,CO7	Explain Ayurvedic disinfection methods.	CK	DK	K	L&PP T	QZ	F	II	
<b>Topic 7 Primary health care</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO1,CO2,CO 3,CO4,CO5,C O8	Define Primary Health Care.	CK	MK	K	L	TT-Theory	S	II	
CO1,CO2,CO 3,CO4,CO5,C O8	Describe the principles and elements of primary health care and the levels of health care.	CK	MK	K	L&PP T	T- EW	F&S	II	
CO1,CO2,CO 3,CO4,CO5,C	Describe the Structure at village, sub-centre, PHC, CHC, Rural hospital levels	CK	MK	K	L&PP T	T- EW	F&S	II	

O8									
CO1,CO2,CO3,CO4,CO5,CO8	Describe primary health care in Health insurance, Private agencies, Voluntary health agencies, NGOs, and the AYUSH sector	CK	DK	K	L&PP T	T-OBT	F	II	
CO1,CO2,CO3,CO4,CO5,CO8	Describe the role of Ayurveda in Primary Health Care.	CK	MK	K	L&PP T	TT-Theory	F&S	II	
<b>Topic 8 Mother and Child health care</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO2,CO3,CO8	Describe the objectives of Maternal and Child Care services.	CK	MK	K	L	T- EW	F&S	II	
CO2,CO3,CO8	Explain the MCH problems & enlist the indicators of MCH care	CC	MK	K	L&PP T	T- EW	F&S	II	
<b>Topic 9 Family welfare programme</b> (Lecture :2 hours, Non lecture: 2 hours)									
CO4,CO5,CO6	Define demography and enlist the sources of demographic statistics in India.	CK	MK	K	L&PP T	TT-Theory	F&S	II	
CO4,CO5,CO6	Describe the demographic cycle & define life expectancy.	CK	MK	K	L&PP T	CL-PR	F&S	II	
CO2,CO4,CO5	Define family planning, eligible couple and target couple.Enlist & explain the objectives of family planning.	CK	MK	K	L&PP T	TT-Theory	F&S	II	
CO2,CO4,CO5	Explain the problems of population explosion and describe national population policy.	CK	MK	K	DIS	TT-Theory	F&S	II	
CO2,CO4,CO5	Classify and describe the Contraceptive methods (Fertility Regulating Methods).	CK	MK	K	L_VC	M-CHT	F&S	II	
<b>Topic 10 Preventive Geriatrics</b> (Lecture :1 hours, Non lecture: 1 hours)									



CO8	Enlist the health problems of the aged and explain their prevention and control measures	CK	MK	K	DIS	INT	F&S	II	
CO8	Explain the relation between lifestyle and healthy aging.	CC	MK	K	DIS	INT	F&S	II	
CO8	Describe the role of rasayana in preventive geriatrics.	CC	MK	K	L&PP T,W	INT	F&S	II	
<b>Topic 11 World Health Organization and International health agencies</b> (Lecture :3 hours, Non lecture: 1 hours)									
CO4	Define and describe the structure, regions, and works of the World Health Organization	CK	MK	KH	L&G D	T- EW,P- VIVA	F&S	III	
CO4	Describe the functions of various international health agencies - United Nations health agencies, bilateral health agencies, and Non- Governmental agencies	CK	MK	KH	L&G D	T- EW,P- VIVA	F&S	III	
CO4	Describe the contribution of the world health organization to the global acceptance of Ayurveda	CK	MK	KH	L&G D	T- EW,P- VIVA	F&S	III	
<b>Topic 12 Vital Statistics</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO1	Understanding of Registration of Birth and Death Act, 1969	CK	MK	KH	L&G D	TT-Theory	F&S	II	
CO4,CO8	Define Vital Statistics.  Enumerate the sources ofVital statistics	AFT- RES	MK	SH	DIS	T- EW,P- VIVA	F&S	III	
CO4,CO8	Describe Fertility , Morbidity and Mortality rates	AFT- RES	MK	SH	L&G D	T- EW,P- VIVA	F&S	III	

<b>Topic 13 Health Administration</b> (Lecture :2 hours, Non lecture: 1 hours)									
CO4,CO8	Describe the health administration including AYUSH at the Central, State, District, and Village levels	CK	DK	KH	L&G D	T- EW,P- VIVA	S	III	
<b>Topic 14 National Health Programmes</b> (Lecture :7 hours, Non lecture: 3 hours)									
CO4,CO8	<p>State the vision/objective and outline the goals, strategies and plan of action of National Health Programs - Leprosy(NLEP), AIDS (NACP), Blindness (NPCB), Polio , National TB Elimination Program , Vector born disease control program, RCH program, ICDS program, Universal Immunization Program, National mental health program , National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases &amp; Stroke (NPCDCS) , Swachha Bharat mission, Ayushman Bharat Yojana, Ayushman Bharat Digital Mission, National health mission (NRHM&amp;NUHM), National AYUSH Mission (NAM).</p> <p>National nutrition programs- National Iodine Deficiency Disorders Control program, National Iron Plus Initiative for Anemia Control, National Vitamin A prophylaxis program, Mid-Day Meal program &amp; Balwadi nutrition program.</p>	CK	MK	KH	L&PP T,DIS ,FV	T- EW,P- VIVA	F&S	III	
<b>Topic 15 National Health Policy</b> (Lecture :1 hours, Non lecture: 1 hours)									
CO4	Describe the National Health Policy (NHP) and the scope of Ayurveda in NHP.	CK	MK	KH	L,L& PPT	T- EW,P- VIVA	F&S	III	

**List of Practicals** (Term and Hours)

<b>PRACTICALS (Marks-100)</b>			
<b>S.No</b>	<b>List of Topics</b>	<b>Term</b>	<b>Hours</b>
1	Dinacharya	1	25
2	Disinfectants	1	2
3	Ahara	1	30
4	Health Education (IEC)	2	10
5	Yoga performance	2	35
6	Community survey	3	20
7	Local Health Educational Visits	3	36
8	Visit to Observe National Health Programs and Ayurveda Centre	3	12
9	Monitoring of health and hygiene	1	5

**Table 4: Learning objectives (Practical)**

A4 Course outcome	B4 Learning Objective (At the end of the session, the students should be able to)	C4 Doma in/sub	D4 Must to know / desirable to know / Nice to know	E4 Level Does/ Show s how/ Know s how/ Know	F4 T-L meth od	G4 Assessment  (Refer abbreviations)	H4 Form ative/ summ ative	I4 Term	K4 Integr ation
<b>Topic 1 Dinacharya</b>									
CO1	Collect and Compare different Dantadhawana Churnas/ Tooth pastes available in the market and choose/ advise the appropriate one based on the need.	PSY-ADT	DK	D	PrBL	PRN	F	I	
CO1	Collect and Compare different JiwhaNirlekhana Yantra(Tongue cleaners) available in the local area/ market and choose/advise the appropriate one for swastha	PSY-ADT	DK	D	PrBL	PRN	F	I	
CO1	Collect different dravya/kashaya/mouthwashes available in the market for kavala and gandusha; demonstrate the procedure of kavala and gandusha with appropriate liquids /dravyas for swastha	PSY-ADT	MK	D	PrBL, D,PR A	PRN	F&S	I	
CO1	Collect different types of Anjana (Collyriums) available in the market, Demonstrate Anjana procedure as per local traditions and	PSY-ADT	MK	D	PrBL, PT,D	PRN	F&S	I	

	advise different types of Anjana for swastha.								
CO1	Demonstrate Pratimarsha Nasya with Anutaila/ Sesame oil and prescribe the appropriate taila for Pratimarsha Nasya for swastha.	PSY-ADT	MK	D	PrBL, PT,D	DOPS	F&S	I	
CO1	Demonstrate Prayogika Dhoomapana and advise prayogika dhoomapana dravya for swastha.	PSY-ADT	MK	D	PrBL, PT,D	DOPS	F&S	I	
CO1	Demonstrate the procedure of Abhyanga techniques for full body abhyanga, padabhyanga and shiroabhyanga and prescribe suitable taila for Abhyana for Swatha.	PSY-ADT	MK	D	PrBL, PT,D	DOPS	F&S	I	
CO1	Demonstrate the procedure of Udwartana techniques and prescribe suitable dravya for Udwartana for Swatha.	PSY-ADT	MK	D	PrBL, PT,D	DOPS	F&S	I	
CO2	Prescribe appropriate dinacharya module regarding ahara and vihara as per age and occupation /activity.	CE	MK	SH	PrBL	P-CASE	F&S	I	
CO2	Advise /counsel people regarding healthy lifestyle based on the Ayurvedic principles ( one student should counsel at least five person and should be documented).	CE	MK	SH	PrBL	P-CASE	F&S	I	
<b>Topic 2 Disinfectants</b>									
CO7	Identify and demonstrate the suitability, dose, dilution, and contact period of the following disinfectants: Bleaching powder, Dettol, Lysol, Savlon.	PSY-ADT	MK	SH	CBL	PP-Practical	S	II	
CO7	Observe the procedure of fumigation of the operation theatre.	AFT-REC	NK	D	D	P-VIVA	F	II	
CO7	Write the mode of working and uses of an autoclave.	CK	DK	KH	SDL	T- EW	F	II	

Topic 3 Ahara									
CO8	Collect and compile different regional staple food articles.	PSY-SET	MK	D	SDL	COM	F	I	H-DG
CO8	Mention the nutritive value of the following preparations per 100gm and calculate the food portions/serving size of the following recipes: a. Yusha b. Yavagu c. Odana d. Krushara e. Peya f. Panaka g. Takra h. Manda i. Vilepi	CE	MK	D	PT	P-EN	F&S	I	
CO8	Plan a dietary Menu according to different Prakriti (preparation of diet chart considering all ahara vargas for eka doshaja , dvidoshaja prakriti)	PSY-GUD	MK	SH	TBL	P-MOD,P-POS	F	I	
CO8	Plan the dietary menu for different occupations / Activities, Age groups, and physiological conditions. ( diet chart for 1-5 years child, 6-18 years, 18& above till 60 years, above 60 years, sedentary, sedentary intellectuals, night shifts , drivers, standing professionals. physiological conditions like Garbhini, Sutika, Kshirapa, Ksheerada, Ksheerannada, Annada etc,..)	PSY-GUD	MK	D	CBL	P-CASE	F&S	I	
CO8	Plan Ahara-Vihara based on the different Ritus(preparation of diet and lifestyle charts for each ritu)	PSY-GUD	MK	D	PrBL	M-CHT	F	I	
CO8	Plan a dietary menu for any one individual according to prakriti, agni, Sara, satva, age, sex, occupation/ activity, and season based on the regional food habits with serving sizes with different food exchange/options.	PSY-GUD	MK	D	IBL	P-CASE	F	I	
CO8	Document the maintenance of various equipment and appliances used in the kitchen/ diet section of the hospital such as cooking gas, pressure cooker, mixer-grinder, microwave oven, refrigerator	AFT-RES	NK	D	PL	PP-Practical	F	I	

CO8	Assess various Anthropometric variables like Weight, height, and BMI ( including differentiation between Sara )and Mid-arm Circumference in order to assess the state of nutrition.	AFT-RES	MK	D	PSM	PP-Practical	F	I	
<b>Topic 4 Health Education (IEC)</b>									
CO5	Demonstrate communication methods for health education.	PSY-SET	MK	SH	DIS, W	P-RP,M-POS,OSPE ,DOPS	F&S	II	
CO5	Demonstrate/present different health education materials (dinacharya practices, sadvritta practices,family planning methods, breast feeding techniques, environmental hygiene, preventive and control measures of communicable and non - communicable diseases etc.) to the target population in the community.	AFT-RES	MK	SH	DIS,T PW,R P	DOPS,Log book	F&S	II	
<b>Topic 5 Yoga performance</b>									
CO3	Perform four Standing Postures namely - Ardhakatichakrasana, Padahastasana, Ardihakrasana, and Trikonasana step by step with Sthiti, main procedure, and vishrama.	PSY-ADT	MK	SH	KL	DOPS	S	II	
CO3	Perform eleven Sitting Postures namely - Swasthikasana, Gomukhasana, Padmasana, Vajrasana, Bhadrasana, Shashankasana, Ushtrasana, Pashchimottanasana, Suptavajrasana, Ardhamatsyendrasana, and Siddhasana step by step with Sthiti, main procedure, and vishrama.	PSY-ADT	MK	SH	KL	DOPS	S	II	
CO3	Perform seven Supine Postures namely - Pavanamuktasana, Sarvangasana, Matsyasana, Halasana, Chakrasana, Shavasana, and Setubandhasana step by step with Sthiti, main procedure and visrama	PSY-ADT	MK	SH	KL	DOPS	S	II	
CO3	Perform four Prone Postures namely - Bhujangasana,	PSY-	MK	SH	KL	DOPS	S	II	

	Shalabhasana, Dhanurasana, and Makarasana step by step with Sthiti, main procedure and vishrama.	ADT							
CO3	Perform Nadishuddhi Pranayama with inhalation-retention-exhalation in the ratio of 1:4:2 in a comfortable sitting posture.	PSY-ADT	MK	SH	KL	DOPS	S	II	
CO3	Perform Kumbhakabhedas namely - Suryabhedana, Ujjayi, Sitkari, Sheetali, Bhastrika and Bhramari.	PSY-ADT	MK	SH	KL	DOPS	S	II	
CO3	Perform Jalaneti, Kapalabhati and Trataka.	PSY-ADT	MK	SH	KL	DOPS	S	II	
CO3	Demonstrate and instruct Common Yoga Protocol of IDY (International Day of Yoga).	PSY-ADT	DK	SH	EDU	DOPS	F	II	
<b>Topic 6 Community survey</b>									
CO6	Conduct minimum 05 Family surveys using structured questionnaire in specific rural populations and report the survey finding and discuss possible solutions to the family	PSY-SET	MK	D	ECE	DOPS	F&S	III	
CO6	Conduct minimum 05 Family surveys using structured questionnaire in specific urban populations and report the survey finding and discuss possible solutions to the family.	PSY-SET	MK	D	ECE	DOPS	F&S	III	
<b>Topic 7 Local Health Educational Visits</b>									
CO2	Report the functioning of milk dairy such as methods of processing and preservation of milk, testing of milk before and after pasteurization and the standards of milk & milk products.	PSY-SET	MK	KH	EDU, FV	P-VIVA,RK	F&S	III	
CO2,CO7	Report and explain the various process involved in large-scale water purification.	PSY-MEC	MK	KH	D-M,FV	P-VIVA,RK	F&S	III	
CO2,CO7	Explain and Report the processes involved in modern sewage treatment.	PSY-MEC	MK	KH	D-M,FV	P-EXAM,RK	F&S	III	



CO1,CO2,CO5,CO6,CO8	Explain and report the various measures adopted in the industry for the prevention and control of occupational diseases.	CC	MK	KH	TPW, FV	P-VIVA,RK	F&S	III	
CO1,CO2,CO8	Explain and Report the food safety standards and methods of food processing techniques.	CC	MK	K	PrBL, RLE, FV	P-VIVA,RK	F&S	III	
CO3,CO6	Report and explain various naturopathic treatment methods.	CC	MK	KH	L_VC, EDU, FV	P-EXAM,RK	F&S	III	
<b>Topic 8 Visit to Observe National Health Programs and Ayurveda Centre</b>									
CO4,CO8	Report the functioning of National Health Programs at Primary health centers/Community health centers/District hospitals and Govt. Ayurveda Dispensary	PSY-SET	MK	SH	L_VC, IBL, FV	T- EW,P-VIVA,RK	F&S	III	V-KC
CO4	Report the functioning of a Primary Health Centre/ Community Health Centre/ Rural Hospital/ District Hospital with regards to the implementation of different National Health Programmes viz. infectious disease control, immunization, ANC, Family planning etc.	AFT-RES	DK	D	FV	Log book	F	III	
CO4	Report the structure and functioning of an Ayurvedic Dispensary/ Taluk Hospital/ District Hospital available in the district.	AFT-RES	DK	D	FV	Log book	F	III	
<b>Topic 9 Monitoring of health and hygiene</b>									
CO2,CO6,CO7,CO8	Collect the demographic profile of allotted 2 subjects/Individuals ( one from the community and one from employees of the college/hospital ) and conduct clinical examination (Assess Prakriti, Sattva, Saara, etc.)	AFT-RES	MK	D	IBL	P-CASE,RK	F&S	I	
CO2,CO6,CO7,CO8	Conduct periodic check-ups for allotted individual/employer (2) health status / occupational health status and if any treatment	AFT-RES	MK	D	PT	P-CASE,OSCE	F	I	

	is prescribed then coordinate the treatment under the overall guidance of the Mentor								
CO2,CO6,CO7,CO8	Counsel the adopted individuals/employer (2) and analyze the health trajectory( individual following the prescribed regimen ) of the adopted individual/employer under the overall guidance of the mentor	AFT-RES	MK	D	PT	P-SUR,RK	F	II	
CO2,CO6,CO7,CO8	Document the maintenance of water sanitation, waste disposal, food hygiene, etc., in the hospital canteen/ pathya section/cafeteria	CE	MK	KH	PrBL	RK	F	I	

**Table 4a: List of Practical**

<b>S.No</b>	<b>Name of practical</b>	<b>Term</b>	<b>Activity</b>	<b>Practical hrs</b>
1	Dinacharya	1	<ol style="list-style-type: none"><li>1. Analyze the composition of different Dantadhawana Churnas/ Tooth pastes and tooth brushes available in the market</li><li>2. Analyze different Jivwa Nirlekhana Yantra(Tongue cleaners) available in the local area/ market</li><li>3. Demonstrate the procedure of kavala and gandusha with appropriate liquids /dravyas for swastha</li><li>4. Demonstrate Anjana procedure as per local traditions and advise different types of Anjana for swastha.</li><li>5. Demonstrate Pratimarsha Nasya with Anutaila/ Sesame oil and prescribe the appropriate taila for Pratimarsha Nasya for swastha.</li><li>6. Demonstrate Prayogika Dhoomapana (Practicable and Non- practicable Dhoomapana )and advise prayogika dhoomapana dravya for swastha.</li><li>7. Demonstrate the procedure of Abhyanga techniques for full body abhyanga, padabhyanga and shiroabhyanga and prescribe suitable Taila for Abhyana for Swatha.</li><li>8. Demonstrate the procedure of Udwartana techniques and prescribe suitable dravya for Udwartana for Swatha.</li><li>9. Prescribe appropriate dinacharya module regarding ahara and vihara as per age and occupation /activity.</li><li>10. Advise /counsel people regarding healthy lifestyle based on the Ayurvedic principles ( one student should counsel at least five person and should be documented).</li></ol>	25
2	Disinfectants	1	Identify and demonstrate the suitability, dose, dilution, and contact period of the following disinfectants : Bleaching powder, Dettol, Lysol, Savlon . Observe the procedure of fumigation of the operation theatre. Write the mode of working and uses of an autoclave.	2

3	Ahara	1	<p>Collect, compile and document region wise different varieties of Ahara Varga (Millets, cereals, pulses, vegetables, varieties of milk/oil/honey/ available in the market). Demonstrate the therapeutic indication and nutritive values of Pathya kalpanas a. Manda b. Peya c. Vilepi d. Yavagu e. Odana f. Krishara g. Yusha h. Takra .</p> <p>Prepare the dietary regime according to different Prakriti. Prepare/Prescribe the dietary regime for different occupations / activities, age groups, and physiological conditions. Prepare/Prescribe the diet and lifestyle regimen (pathya- apathya) with reference to Ahara and Vihara for each ritu. Conduct diet counselling according to prakriti, agni, sara, satva, age, sex, occupation/ activity, and prevailing season based on the regional food habits with serving sizes with different food exchange/options for 5 persons. Assess various anthropometric variables like weight, height, and BMI and mid-arm circumference etc., in order to assess the state of nutrition of five individuals.</p>	30
4	Health Education (IEC)	2	<p>Demonstrate communication methods for health education. Demonstrate/ Present different health education materials (dinacharya practices, Sadvritta practices, family planning methods, breastfeeding techniques, etc. ) patients and general public .</p>	10
5	Yoga performance	2	<p>Perform four Standing Postures namely - Ardhakatichakrasana, Padahasthasana, Ardhabhujanghasana, and Trikonasana step by step with sthiti, main procedure and vishrama.</p> <p>Perform eleven Sitting Postures namely - Swasthikasana, Gomukhasana, Padmasana, Vajrasana, Bhadrasana, Shashankasana, Ushtrasana, Pashchimottanasana, Suptavajrasana, Ardhamatsyendrasana, and Siddhasana step by step with sthiti, main procedure and vishrama.</p> <p>Perform seven Supine Postures namely - Pavanamuktasana, Sarvangasana,</p>	35

			<p>Matsyasana, Halasana, Chakrasana, Shavasana, and Setubandhasana step by step with sthiti, main procedure and visrama</p> <p>Perform four Prone Postures namely - Bhujangasana, Shalabhasana, Dhanurasana, and Makarasana step by step with Sthiti, main procedure and vishrama. Perform Jalaneti and kapalbhati . Perform Anuloma – Viloma Pranayama in a comfortable sitting posture. Perform Nadishuddhi Pranayama with inhalation-retention-exhalation in the ratio of 1:4:2 in a comfortable sitting posture. Perform Kumbhakabhedas namely - Suryabhedana, Ujjayi, Sitkari, Sheetali, Bhastrika and Bhramari.</p> <p>Demonstrate and instruct Common Yoga Protocol of IDY (International Day of Yoga).</p>	
6	Community survey	3	<p>Conduct minimum 05 Family surveys using a structured questionnaire in specific rural populations and report the survey findings and discuss possible solutions to the family.</p> <p>Conduct minimum 05 family surveys using a structured questionnaire in specific urban populations and report the survey findings and discuss possible solutions to the family.</p>	20
7	Local Health Educational Visits	3	<p>Report the functioning of milk dairies such as methods of processing and preservation of milk, testing of milk before and after pasteurization, and the standards of milk &amp; milk products. Report the various process involved in water purification plant. Report the processes involved in modern sewage treatment plant. Report the various measures adopted for the prevention and control of occupational diseases in any industry. Report the food safety standards and methods of food processing techniques adopted in any food industry. Report the various treatment modalities adopted in Naturopathy and Yoga canthers.</p> <p>Note : Swasthavritta, Agada Tantra.</p>	36

			Dravyaguna & Rasashastra - Combined out campus visits can be palled wherever feasible.	
8	Visit to Observe National Health Programs and Ayurveda Centre	3	Report the functioning of a Primary health centre/Community health centre/Rural hospital/District hospital with regards to the implementation of different National Health Programmes viz. infectious disease control, immunization, ANC, Family planning etc. Report the structure and functioning of a Ayurveda Dispensary/ Taluk Hospital /District Hospital available in the district.	12
9	Monitoring of health and hygiene	1	Conduct periodic check-ups , collect demographic profile and clinical examination of allotted 2 subjects/Individuals - Assess Prakriti, Satva, Sara, etc.)for their health status / occupational health status and if any treatment is prescribed then coordinate the treatment under the overall guidance of the teacher/Mentor. Counsel and advice the allotted 2 subjects a healthy regime prescription and analyze their health status after following the healthy regime under the overall guidance of the teacher/mentor. Document the maintenance of water sanitation, waste disposal including biomedical waste in the hospital.	5
<b>Total Hr</b>				<b>175</b>

### Activity

CO	Topic name	Activity Details	Hours #
CO1	Dinacharya	Demonstration, Making posters, Real-life experiences , Roleplay , We- based activities	5

		Example - Collection and analyze of different tooth paste/tooth brushes, mouth washes and collyriums available in the market including GMP pharmacies	
CO1	Ratricharya	Chart preparation and real-life experiences of Ratri bhojana and Sleep principles	1
CO1	Ritucharya	Assessment of changes happening in the human body in particular ritu Poster preparation of food recipes in different ritus	2
CO1	Sadvritta	Role play	1
CO1	Ahara	Listing of Ahitakara (Junk) food habits, Gathering information of Organic farming and Organic food items , Application of Ashtaahara vidhivesha ayatana in real life - Team base project, Roleplay , Presentation & Collection of Research updates in the field of Ayurvedic food	15
CO1	Roganutpadaniya	Survey and documentation on effect of Adharaneeya vega on different occupations	1
CO1	Rasayana for swastha	Poster making and Library work	2
CO1	Nidra	Survey on sleep and awakening patterns among the staff and students	1
CO7	Yoga	Participation in International day of Yoga , Poster presentation of Yogic practices as per diseases , Preparation of Short videos on Yoga and Conducting Quiz	7
CO2,CO5	Disaster management	Group discussion	2
CO1	Janapadodwamsa	Assignment , Symposiums and Problem-based learning	10
CO1,CO5	Environmental health	Seminars, Quiz andm PBL	5
CO3	Disinfection	PBL	3
CO2	Family welfare programe	Roleplay , Web-based learning and Discussion	2

CO7,CO8	Mother and child health care	PBL	1
CO8	Preventive geriatrics	Group discussion and Seminar	1
CO4,CO8	National health programs	Web-based learning , Assignments and Participating in celebration of health related days	3
CO3	School health services	Role play and Presentations	2
CO7,CO8	Occupational health	Poster making , PBL and Group discussion	3
CO2,CO3,CO4,CO5,CO8	<b>Primary health care</b>	Group discussions	2
CO3	Naturopathy	Web-based learning , Tutorials and Group disussions	4
CO4	World health organizations and International health agencies	Web-based learning and Quiz	1
CO8	Health Statistics	Presentations and Seminars	1

# Hours indicated are included in calculations of Table 3 and 4

**Table 5- Teaching learning method**

Sr No	Teaching learning methods in the course	No of Activities
1	Lecture	14
2	Lecture with Power point presentation	61
3	Lecture & Group Discussion	16
4	Lecture with Video clips	15



5	Discussions	6
6	Inquiry-Based Learning	1
7	Project-Based Learning	1
8	TBL	1
9	Flipped classroom	1
10	Blended Learning	1
11	ECE	1
12	Self-directed learning	8
13	Demo on Model	6

These are overall teaching learning methods listed in Table 3 and 4. Teachers can select the best possible method amongst the given methods as per objective, available time etc.

**Table 6: Assessment Summary: Assessment is subdivided in A to H points**

#### 6 A-Number of Papers and Marks Distribution

Subject Code	Papers	Theory	Practical/Clinical Assessment					Grand Total
			Practical	Viva	Elective	IA	Sub Total	
AyUG-SW	2	200	100	60	10	30	200	400

#### 6 B - Scheme of Assessment (formative and Summative)

PROFESSIONAL COURSE	DURATION OF PROFESSIONAL COURSE		
	First Term (1-6 Months)	Second Term (7-12 Months)	Third Term (13-18 Months)
Second	3 PA & First TT	3 PA & Second TT	3 PA & UE**

**PA:** Periodical Assessment; **TT:** Term Test; **UE:** University Examinations.

\*\* University Examination shall be on entire syllabus

## 6 C - Calculation Method for Internal assessment Marks

TERM	PERIODICAL ASSESSMENT*					TERM TEST**	TERM ASSESSMENT	
	A 6	B	C	D	E	F	G	H
	1 (15 Marks)	2 (15 Marks)	3 (15 Marks)	Average (A+B+C/3)	Converted to 30 Marks (D/15*30)	Term Test (Marks converted to 30)	Sub Total _/60 Marks	Term Assessment (.../30)
FIRST							E+F	(E+F)/2
SECOND							E+F	(E+F)/2
THIRD						NIL		E
<b>Final IA</b>	Average of Three Term Assessment Marks as Shown in 'H' Column.							
	Maximum Marks in Parentheses *Select an Evaluation Method which is appropriate for the objectives of Topics from the Table 6 D for Periodic assessment. Conduct 15 marks assessment and enter marks in A, B, and C. ** Conduct Theory (100 Marks)(MCQ(20*1 Marks), SAQ(8*5), LAQ(4*10)) and Practical (100 Marks) Then convert to 30 marks.							

## 6 D - Evaluation Methods for Periodical Assessment

S. No	Evaluation Methods
1	Activities Indicated in Table 3 - Column G3 as per Indicated I, II or III term in column I3

Evaluation Methods in MSE

1. Practical / Clinical Performance
2. Viva Voce, MCQs, MEQ (Modified Essay Questions/Structured Questions)
3. Open Book Test (Problem Based)
4. Summary Writing (Research Papers/ Samhitas)
5. Class Presentations; Work Book Maintenance
6. Problem Based Assignment
7. Objective Structured Clinical Examination (OSCE), Objective Structured Practical Examination (OPSE), Mini Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedures (DOP), Case Based Discussion (CBD)

## 6 E Question Paper Pattern

### II PROFESSIONAL BAMS EXAMINATIONS AyUG-SW

#### PAPER-1

Time: 3 Hours Maximum Marks: 100

INSTRUCTIONS: All questions compulsory

		<b>Number of Questions</b>	<b>Marks per question</b>	<b>Total Marks</b>
Q 1	MULTIPLE CHOICE QUESTIONS (MCQ)	20	1	20
Q 2	SHORT ANSWER QUESTIONS (SAQ)	8	5	40
Q 3	LONG ANSWER QUESTIONS (LAQ)	4	10	40
				100

Similar for Paper II (If

## 6 F Distribution of theory examination

<b>Paper 1 Principles of Swasthavritta, Yoga and Naturopathy</b>						
<b>Sr. No</b>	<b>A List of Topics</b>	<b>B Term</b>	<b>C Marks</b>	<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
1	Swastha and Swasthya	1	6	Yes	Yes	No
2	Healthy Life style -Dinacharya (Daily regimen)	1	38	Yes	Yes	Yes
3	Ratricharya	1		Yes	Yes	No
4	Ritucharya	1		Yes	Yes	Yes
5	Roganutpadaniya	1	13	Yes	Yes	No
6	Sadvritta	1		Yes	Yes	No
7	Ahara	1	20	Yes	Yes	Yes
8	Rasayana for Swastha	1	5	Yes	Yes	No
9	Yoga	2	18	Yes	Yes	Yes
10	Naturopathy	2		Yes	Yes	No
<b>Total Marks</b>			<b>100</b>			

<b>Paper 2 Public health</b>						
<b>Sr. No</b>	<b>A List of Topics</b>	<b>B Term</b>	<b>C Marks</b>	<b>MCQ (1 Mark)</b>	<b>SAQ (5 Marks)</b>	<b>LAQ (10 Marks)</b>
11	Janapadodhwamsa / Maraka Vyadhi	2	10	Yes	Yes	Yes
12	Environmental health	2	16	Yes	Yes	Yes

13	<b>Disaster management</b>	2		Yes	Yes	No
14	<b>Occupational Health</b>	2	20	Yes	Yes	No
15	<b>School health services</b>	2		Yes	Yes	No
16	<b>Disinfection</b>	2		Yes	Yes	No
17	<b>Primary health care</b>	2	20	Yes	Yes	Yes
18	<b>Mother and Child health care</b>	2		Yes	Yes	No
19	<b>Family welfare programme</b>	2		Yes	Yes	No
20	<b>Preventive Geriatrics</b>	2		Yes	Yes	No
21	<b>World Health Organization and International health agencies</b>	2	19	Yes	Yes	No
22	<b>Vital Statistics</b>	2		Yes	Yes	No
23	<b>Health Administration</b>	2		Yes	Yes	No
24	<b>National Health Programmes</b>	2	15	Yes	No	Yes
25	<b>National Health Policy</b>	2		Yes	Yes	No
<b>Total Marks</b>			<b>100</b>			

<b>Paper No:1</b>		
<b>Question No</b>	<b>Type of Question</b>	<b>Question Paper Format</b>
<b>Q1</b>	<p><b>Multiple choice Questions</b>  <b>20 Questions</b>  <b>1 mark each</b>  <b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b>  <b>Desirable to know - 3 MCQ</b>  <b>Nice to know part - 2 MCQ</b></p>	<ol style="list-style-type: none"> <li>1. Swastha and Swasthya</li> <li>2. Healthy Life style -Dinacharya (Daily regimen)</li> <li>3. Ratricharya</li> <li>4. Ritucharya</li> <li>5. Roganutpadaniya</li> <li>6. Ahara</li> <li>7. Sadvritta</li> <li>8. Rasayana for Swastha</li> <li>9. Yoga</li> <li>10. Naturopathy</li> <li>11. Swastha and Swasthya</li> <li>12. Healthy Life style -Dinacharya (Daily regimen)</li> <li>13. Ritucharya</li> <li>14. Ratricharya</li> <li>15. Roganutpadaniya</li> <li>16. Sadvritta</li> <li>17. Ahara</li> <li>18. Rasayana for Swastha</li> <li>19. Yoga</li> <li>20. Naturopathy</li> </ol>
<b>Q2</b>	<p><b>Short answer Questions</b>  <b>Eight Questions</b>  <b>5 Marks Each</b>  <b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b>  <b>Desirable to know - 1 SAQ</b>  <b>No questions on Nice to know</b></p>	<ol style="list-style-type: none"> <li>1. Swastha and Swasthya</li> <li>2. Healthy Life style -Dinacharya (Daily regimen)</li> <li>3. Ratricharya</li> <li>4. Ritucharya</li> <li>5. Roganutpadaniya</li> <li>6. Sadvritta</li> <li>7. Naturopathy / Yoga</li> <li>8. Ahara</li> </ol>
<b>Q3</b>	<p><b>Long answer Questions</b>  <b>Four Questions</b>  <b>10 marks each</b>  <b>All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable</b></p>	<ol style="list-style-type: none"> <li>1. Healthy Life style -Dinacharya (Daily regimen)</li> <li>2. Ritucharya</li> <li>3. Ahara</li> <li>4. Yoga</li> </ol>

	to know	
<b>Paper No:2</b>		
<b>Question No</b>	<b>Type of Question</b>	<b>Question Paper Format</b>
<b>Q1</b>	<p><b>Multiple choice Questions</b>  <b>20 Questions</b>  <b>1 mark each</b>  <b>All compulsory</b></p> <p><b>Must know part - 15 MCQ</b>  <b>Desirable to know - 3 MCQ</b>  <b>Nice to know part - 2 MCQ</b></p>	<ol style="list-style-type: none"> <li>1. Janapadodhwamsa / Maraka Vyadhi</li> <li>2. Environmental health</li> <li>3. Disaster management</li> <li>4. Occupational Health</li> <li>5. School health services</li> <li>6. Disinfection</li> <li>7. Primary health care</li> <li>8. Mother and Child health care</li> <li>9. Family welfare programme</li> <li>10. Preventive Geriatrics</li> <li>11. World Health Organization and International health agencies</li> <li>12. Vital Statistics</li> <li>13. Health Administration</li> <li>14. National Health Policy</li> <li>15. National Health Programmes</li> <li>16. Janapadodhwamsa / Maraka Vyadhi</li> <li>17. Environmental health</li> <li>18. Occupational Health</li> <li>19. National Health Programmes</li> <li>20. Family welfare programme</li> </ol>
<b>Q2</b>	<p><b>Short answer Questions</b>  <b>Eight Questions</b>  <b>5 Marks Each</b>  <b>All compulsory</b></p> <p><b>Must know - 7 SAQ</b>  <b>Desirable to know - 1 SAQ</b>  <b>No questions on Nice to know</b></p>	<ol style="list-style-type: none"> <li>1. Janapadodhwamsa / Maraka Vyadhi</li> <li>2. Disaster management</li> <li>3. Environmental health</li> <li>4. School health services</li> <li>5. Occupational Health</li> <li>6. Mother and Child health care</li> <li>7. Family welfare programme</li> <li>8. Preventive Geriatrics</li> </ol>
<b>Q3</b>	<p><b>Long answer Questions</b>  <b>Four Questions</b>  <b>10 marks each</b>  <b>All compulsory</b></p> <p><b>All questions on must know. No Questions on Nice to know and Desirable</b></p>	<ol style="list-style-type: none"> <li>1. Janapadodhwamsa / Maraka Vyadhi</li> <li>2. Environmental health</li> <li>3. Primary health care</li> <li>4. National Health Programmes</li> </ol>

	to know	
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## 6 H Distribution of Practical Exam

S.No	Heads	Marks
1	Yoga - Demonstration of 4 Asanas and 1 Pranyama or Shatkarma procedure Any four asanas from following list for demonstration- Trikonasana, Ardhakatichakrasana, Gomukhasana, Bhadrasana, Pavanamuktasana, Sarvangasana, Bhujangasana and Shalabhasana. Each asana will carry 4 marks x 4 = 16 Procedure -1 mark, Final posture Holding time - 1, Breathing pattern-1 mark and On site viva - 1 mark Any one Pranayama among Nadishuddhi, Suryabhedana, Seetali, Seetkari , Bhramari or any one shatkarma among Neti and Kapalabhati Each pranayama or Shatkarma will carry 4 marks	20
2	Diet and Lifestyle advice case sheet A. Advise on Diet case - 25 Marks - Scenario will be given and asking student to prescribe diet as per the age, prakriti, occupation, agni bala etc,.. B. Advise on Lifestyle - 15 Marks - Scenario will be given and asking student advise lifestyle modifications such as Brahme muhurta uthishteth, Vyayama, Kavala- gandusha, Abhyanga, Udwartana ,Pratimarsha nasya etc,.. ,	40
3	Problem-based evaluation - Disinfection, Communicable diseases Environmental health, & Non- Communicable including deficiency diseases ,  A. Disinfection ( identification, dose, suitsbility , dilution and contact period), Communicable diseases ( giving scenarios and identifying diseases and mentioning preventive measures) and Environmental health ( giving scenarios related environmental health issues and asking students to mention preventive and control measures) - 15 Marks  B. Non- Communicable diseases ( creating scenarios and asking to identify the diseases with preventive and control methods) and deficiency diseases ( creating scenarios and asking students to indentify the deficiency conditions and asking the students to recommend the nutrients with nutritional profile etc,. - 15 Marks	30
4	Practical Records	10
5	Viva  Viva on Project work ( Activity based) - 10 Marks	60

Viva on I Paper - 25 Marks

A. Definition of Swastha , Swasthya, Swasthavritta and Health, dimensions of health, objective and subjective components of well-being- 2Mark

B. Benefits of Ushajala pana, Kavala , Gandusha, Dantadhavana, Anjana, Abhyanga,Udvardana, Vyayama, Snana and Tambula - 4 Mark

C. Rarti bhojana, Definition of Nidra , Types of nidra, Ahita nidra, definitions of sleep disorders , Definitions of Brahmacharya and Abrahmacharya and Adanakala and Visarga kala ritus, Doshavastha ,Balavastha,Agniavastha of different ritus , Definition of Ritusandhi, Yamadamshttra - 2 Marks

D. Adharaneeya vegas , Dharaneeya vega , definition of sadvritta and Acararasayana - 2 Marks

E. Importance of Ahara, classification of foods, Aharasevana kala, Ashta ahara vidhivishesha ayatana, Dwadasaha asana pravicarana with slokas , listing of nityasevana ahara dravya( Preferebly sloka), meaning of Pathya , Samashana, Adhyashana, Vishamasana. Sources and deficiency diseases of nutrients, Pastuerization of milk and its methods, meaning of different diet patterns, definition of nutrogeomics, nutraceuticals, nutrigenetics and viridhha ahara . Definition, benefits and types of rasayana and definition of anti-oxidants with examples- 10 Marks

F. Definitions of Yoga , Meaning and types of Yama , Niyama, Asana,Pranayama, Pratyahara, Dharana, Dhyana,Samadhi ( slokas mandatory), listing of shatkarma and indications of shatkarma ( sloka mandatory), types of Bamdha, names of Shatchakra, diferences between Sushumna, Pingala and Ida nadi, definition of Moksha, Muktatma lakshana , Moksha upaya, , Basic principles of Naturopathy, Types of Fasting, Hydrotherapy and Massage - 5

Paper II - 25 Marks

	<p>A. Meaning and causes of Janapadodhwamsa, Definitions of terms related to Epidemiology and infectious diseases, Dynamics of disease transmission, Immunizing agents and Immunization schedule. Definition of vyadhikshamatva, Causative organisms and preventive measures of Communicable diseases -5 Marks</p> <p>B. Composition of Air, Definition of Comfort zone, Ventilation and its types, Definition of safe and wholesome water, Sources and types of Water , Purification methods of water as per Ayurveda &amp; Contemporary medicine, Definition of different types of waste, Definition of disaster and types of disasters- 5Marks</p> <p>C. Definition of occupational health, listing out occupational hazards and diseases. Est act &amp; Factories act, Health problems of school children, definition of different terms related to disinfection, types and agents of disinfection - 5 Marks</p> <p>D. Definition, principles and elements of Primary health care, population coverage , functions and staff pattern at Sub-centre, Primary health centre and Community health centre, Objectives, problems and indicators of MCH, Definitions of demography, family planning ,eligible couple and target couple and methods of family palnning - 5Marks</p> <p>E. Definition of Geriatrics,Problems of aged, Definition,structure and regions of WHO, Year of eshtablishment , head quarters and main functions of international health agencies, Definition and sorces of vital statistics, organizational structure of health administartion , Year of eshtablishment and main objectives of different national health programmes- 5 Marks</p>	
6	Elective t (Set SC)	10
7	Interna Assessment - .	30
<b>Total Marks</b>		<b>200</b>

**References Books/ Resources**

<b>S.No</b>	<b>Book</b>	<b>Resources</b>
1	Relevant portions of Charaka, Sushruta, Vagbhata, Sarngadhara, Bhavaprakasha, Yogaratnakara, Madhavanidana and Bhelasamhita.- relevantSamhithas	Print /online samhithas
2	SwasthavrittaSamucchaya	Vaidya . Rajeswaradutta shastri , Chaukhambha Viswabharathi, Varanasi, India
3	Swasthavrittavigyan	Dr.Ramaharsha singh , Chaukhambha Publishing house, Varanasi, India
4	Yoga sutras of Patanjali	BKS Iyengar , Published by Harper collins , Publishers India , Newdelhi
5	Hathayogapradipika	Swami Muktibodananda , Published by Yoga publications trust, Ganga darshan, Munger, Bihar, India
6	Gheranda samhitha	Edited with Sweta , English commentary of Mrs.Shweta Bhat and Edited by Goswami Prahlad Giri, Published by Krishnadas Academy , Varanasi- 221001
7	Yoga deepika	BKS Iyengar , Published by Harper collins , Publishers India , Newdelhi
8	Light on Yoga	BKS Iyengar , Published by Harper collins , Publishers India , Newdelhi
9	Light on Pranayama -	BKS Iyengar , Published by Harper collins , Publishers India , Newdelhi
10	The Foundations of Contemporary Yoga	Professor RH Singh , Published by Chaukhambha Sanskrit Pratishtan, Newdelhi ..
11	Park's Text book of Preventive and Social Medicine	K.Park , Published by M/s BANARASIDAS BHANOT, LABALPUR, INDIA
12	Text book of Preventive and Social Medicine	MC Gupta & BK Mahajan, Published by JAYPEE BROTHERS , Medical publishers , Newdelhi
13	Dr. Reddy's comprehensive guide to Swasthavritta	Dr.P.Sudhakar Reddy , Published by Chaukhambha Sanskrit Pratishtan, New Delhii
14	Indian food composition Tables	T Longvah , Published by National institute of Nutrition, Hyderabad
15	Food and nutrition	Swaminathan , Published by Bangalore Printing & Publishing Co.Ltd, Bangalore
16	Swasthavrittisudha	Vd.Kashinath Samagandi, Published by Ayurveda Sanskrit hindi pustak bhandar , Jaipur .

17	S.Kashi's Text book of Svasthavrtttamritam	Vd.Kashinath Samagandi, Published by Ayurved sanskrit hindi pustak bhandar, Jaipur
18	Text Book of Swasthavrittam	Dr. Mangala Gouri V Rao, Chaukhambha Orientalia, Varanasi, India (2022)
19	Text book on Swasthavritta	Dr.P. Sudhakar Reddy , Dr.Beena MDPublishers : Chaukhambha Orientalia, Varanasi, India Year : 2022
20	Bhojanakutuhalam	Raghunatha suri, Edited by Scholars of the Centre for Theoretical foundations ( CTF), Institute of Ayurveda and Integrative Medicine I-AIM, FRLHT , Bengaluru- 560064
21	Kshemakutuhalam	Compiled by Kshema sharma , Published By Indian institute of Ayurveda & Integrative medicine , Bengaluru-560064
22	Recent trends in Community Medicine	Suryakantha AH, Published by JAPEEPY BROTHERS
23	The Essentials of Natur cure	Dr.Mangala Gouri.V. Rao, Published by Chaukhambha Orientalia, Varanasi
24	WHO	<a href="https://www.who.int">https://www.who.int</a>
25	Food laws	<a href="https://www.corpseed.com/knowledge-centre/food-laws-and-regulations-in-india">https://www.corpseed.com/knowledge-centre/food-laws-and-regulations-in-india</a>
26	Food acts	: <a href="https://fssai.gov.in/cms/food-safety-and-standards-act-2006.php">https://fssai.gov.in/cms/food-safety-and-standards-act-2006.php</a>
27	National health programs	<a href="https://ncdc.mohfw.gov.in/index4.php?lang=1&amp;level=0&amp;linkid=55&amp;lid=138">https://ncdc.mohfw.gov.in/index4.php?lang=1&amp;level=0&amp;linkid=55&amp;lid=138</a>
28	Family welfare programme	<a href="https://ncdc.mohfw.gov.in/index4.php?lang=1&amp;level=0&amp;linkid=55&amp;lid">https://ncdc.mohfw.gov.in/index4.php?lang=1&amp;level=0&amp;linkid=55&amp;lid</a>
29	Health & Family welfare	<a href="https://www.india.gov.in/topics/health-family-welfare">https://www.india.gov.in/topics/health-family-welfare</a>
30	Census of India	: <a href="https://censusindia.gov.in">https://censusindia.gov.in</a>
31	Hatha yoga Pradeepika	Pandith. Hariprasad Tri[athi, Published by Chaukhambha Krishna das Academy, Varanasi , India
32	A Complete Handbook of Nature cure	H.K.BAKHRU , JAICO Publishing house, Bombay
33	Yoga & Ayurveda	Satyendra prasad MISHra , Published by Chaukhambha Sanskrit Samsthan , Varanasi
34	The Yoga Science	Dr. Ravi R Javalgekar , Published by Chaukhambha Sanskrit Sansthan , Varanasi, India
35	Concept of Ayurveda for perfect Health & Longevity	Vaidya H.S. Kasture , Published by Shree baidyanath Ayurveda Bhavan Private LTD, Nagpure , India

36	Essentials of Community medicine practicals	DK Mahabalaraju, Published by JAYPEE BROTHERS Medical publishers , Newdelhi
37	Positive health through Ayurveda	Dr.LP Gupta & Dr.LV Guru, Published by Chaukhambha sanskrit Pratishtana , Newdelhi
38	Food Science	B Srilakshmi , Published by NEW AGE INTERNATIONAL (P)LIMITED, PUBLISHERS , NEWDELHI
39	Apollo Clinical Nutrition- Handbook	Anita Jatan, Daphnee DK, Haritha Shyam, Priyanka Rohatgi and Kajal Pandya Yeptho- Published by JAYPEE BROTHERS MEDICAL PUBLISHERS PVT LTD, NEWDELHI

## Abbreviations

### Assessment

S.No	Short form	Discription
1	T-EMI	Theory extended matching item
2	T- EW	Theory Essay writing
3	T- MEQs	Theory MEQs
4	T-CRQs	Theory CRQs
5	T-CS	Theory case study
6	T-OBT	Theory open book test
7	P-VIVA	Practical Viva
8	P-REC	Practical Recitation
9	P-EXAM	Practical exam
10	PRN	Presentation
11	P-PRF	Practical Performance
12	P-SUR	Practical Survey
13	P-EN	Practical enact
14	P-RP	Practical Role play
15	P-MOD	Practical Model
16	P-POS	Practical Poster
17	P-CASE	Practical Case taking
18	P-ID	Practical identification
19	P-PS	Practical Problem solving
20	QZ	Quiz
21	PUZ	Puzzles
22	CL-PR	Class Presentation,
23	DEB	Debate
24	WP	Word puzzle
25	O-QZ	Online quiz

26	O-GAME	Online game-based assessment
27	M-MOD	Making of Model
28	M-CHT	Making of Charts
29	M-POS	Making of Posters
30	C-INT	Conducting interview
31	INT	Interactions
32	CR-RED	Critical reading papers
33	CR-W	Creativity Writing
34	C-VC	Clinical video cases,
35	SP	Simulated patients
36	PM	Patient management problems
37	CHK	Checklists
38	OSCE	OSCE
39	OSPE	OSPE,
40	Mini-CEX	Mini-CEX
41	DOPS	DOPS
42	CWS	CWS
43	RS	Rating scales
44	RK	Record keeping
45	COM	Compilations
46	Portfolios	Portfolios
47	Log book	Log book
48	TR	Trainers report
49	SA	Self-assessment
50	PA	Peer assessment
51	360D	360-degree evaluation
52	TT-Theory	Theory
53	PP-Practical	Practical
54	VV-Viva	Viva



## Domain

S.No	Short form	Discription
1	CK	Cognitive/Knowledge
2	CC	Cognitive/Comprehension
3	CAP	Cognitive/Application
4	CAN	Cognitive/Analysis
5	CS	Cognitive/Synthesis
6	CE	Cognitive/Evaluation
7	PSY-SET	Psychomotor/Set
8	PSY-GUD	Psychomotor/Guided response
9	PSY-MEC	Psychomotor/Mechanism
10	PSY-ADT	Psychomotor Adaptation
11	PSY-ORG	Psychomotor/Origination
12	AFT-REC	Affective/ Receiving
13	AFT-RES	Affective/Responding
14	AFT-VAL	Affective/Valuing
15	AFT-SET	Affective/Organization
16	AFT-CHR	Affective/ characterization

## T L method

S.No	Short form	Discription
1	L	Lecture
2	L&PPT	Lecture with Power point presentation
3	L&GD	Lecture & Group Discussion
4	L_VC	Lecture with Video clips
5	DIS	Discussions
6	BS	Brainstorming
7	IBL	Inquiry-Based Learning
8	PBL	PBL
9	CBL	CBL
10	PrBL	Project-Based Learning
11	TBL	TBL
12	TPW	Team project work
13	FC	Flipped classroom
14	BL	Blended Learning
15	EDU	Edutainment
16	ML	Mobile learning
17	ECE	ECE
18	SIM	Simulation
19	RP	Role plays
20	SDL	Self-directed learning
21	PSM	Problem solving method
22	KL	Kinesthetic Learning
23	W	Workshops
24	GBL	Game-Based Learning
25	D-M	Demo on Model

26	LS	Library Session
27	PL	Peer learning
28	RLE	Real life experience
29	REC	Recitation
30	SY	Symposium
31	TUT	Tutorial
32	PER	Presentations
33	PT	Practical
34	XRay	X ray identification
35	CD	Case diagnosis
36	LRI	Lab report interpretation
37	DA	Drug analysis
38	D	Demonstration
39	D_BED	Demonstration bedside
40	D_L	Demonstration Lab
41	DG	Demonstration Garden
42	FV	Field visit
43	PRA	Practical



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## **ShobhitUniversity, Gangoh**

(Established by UP Shobhit University Act No. 3, 2012)

### **SCHOOL OF AYURVEDA**

### **Ordinances,Regulations & Syllabus**

For

### **BAMS FIVE AND HALF YEARS PROGRAMME**

(W.e.f.session2020-2021)

## CENTRAL COUNCIL OF INDIAN MEDICINE NEW DELHI

### SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE INDEX

#### 1<sup>ST</sup> PROFESSIONAL

1.1	PADARTHA VIGYAN AND AYURVED ITIHAS	2-6
1.2	SANSKRIT	7-8
1.3	KRIYA SHARIR	9-14
1.4	RACHANA SHARIR	15-18
1.5	MAULIK SIDDHANT AVUM ASHTANG HRIDAYA	19

1.1 **PADARTHA VIGYAN EVUM AYURVEDA ITIHAS**

(Philosophy and History of Ayurveda)

Theory- Two papers– 200 marks (100 each paper)

Total teaching hours: 150 hours

**PAPER-I**

**Padartha Vigyanam**

**100marks**

**PART A**

**50 marks**

**1. Ayurveda Nirupana**

- 1.1 Lakshana of Ayu, composition of Ayu.
- 1.2 Lakshana of Ayurveda.
- 1.3 Lakshana and classification of Siddhanta.
- 1.4 Introduction to basic principles of Ayurveda and their significance.

**2. Ayurveda Darshana Nirupana**

- 2.1** Philosophical background of fundamentals of Ayurveda.
- 2.2** Etymological derivation of the word "Darshana". Classification and general introduction to schools of Indian Philosophy with an emphasis on: Nyaya, Vaisheshika, Sankhya and Yoga.
- 2.3** Ayurveda as unique and independent school of thought (philosophical individuality of Ayurveda).
- 2.4** Padartha: Lakshana, enumeration and classification, Bhava and Abhava padartha, Padartha according to Charaka (Karana-Padartha).

**3. Dravya Vigyanam**

- 3.1 **Dravya:** Lakshana, classification and enumeration.
- 3.2 **Panchabhuta:** Various theories regarding the creation (theories of Taittiriyanopanishad, Nyaya-Vaisheshika, Sankhya-Yoga, Sankaracharya, Charaka and Susruta), Lakshana and qualities of each Bhoota.
- 3.3 **Kaala:** Etymological derivation, Lakshana and division / units, significance in Ayurveda.
- 3.4 **Dik:** Lakshana and division, significance in Ayurveda.
- 3.5 **Atma:** Lakshana, classification, seat, Gunas, Linga according to Charaka, the method / process of knowledge formation (*atmanah jnasya pravrittih*).
- 3.6 **Purusha:** as mentioned in Ayurveda - Ativahikapurusha/ Sukshmasharira/ Rashipurusha/ Chikitsapurusha/ Karmapurusha/ Shaddhatvatmakapurusha.
- 3.7 **Manas:** Lakshana, synonyms, qualities, objects, functions, dual nature of mind (*ubhayaatmakatvam*), as a substratum of diseases, penta-elemental nature (*panchabhutatmakatvam*).
- 3.8 Role of Panchamahabhuta and Triguna in Dehaprakriti and Manasaprakriti respectively.
- 3.9 Tamas as the tenth Dravya.
- 3.10 Practical study/application in Ayurveda.

**4. Gunavigyaniyam**

- 4.1 Etymological derivation, classification and enumeration according to Nyaya-Vaisheshika and Charaka, Artha, Gurvadiguna, Paradiguna, Adhyatmaguna.
- 4.2 Lakshana and classification of all the 41 gunas.
- 4.3 Practical / clinical application in Ayurveda.

**5. Karma Vigyaniyam**

- 5.1** Lakshana, classification in Nyaya.
- 5.2** Description according to Ayurveda.
- 5.3** Practical study/ application in Ayurveda.

**6. Samanya Vigyaniyam**

- 6.1 Lakshana, classification.
- 6.2 Practical study/ application with reference to Dravya, Guna and Karma.

**7. Vishesha Vigyaniyam**

- 7.1** Lakshana, classification.
- 7.2** Practical study/ application with reference to Dravya, Guna and Karma.
- 7.3** Significance of the statement "*Pravrittirubhayasya tu*".

**8. Samavaya Vigyaniyam**

- 8.1 Lakshana
- 8.2 Practical study /clinical application in Ayurveda.

**9. Abhava Vigyaniyam**

- 9.1 Lakshana, classification
- 9.2 Clinical significances in Ayurveda.

**PAPER II****Padartha Vigyan and Ayurveda Itihas**

100 marks

**PART A - Pramana/ Pariksha- Vigyaniyam**

75 marks

**1. Pariksha**

- 1.1. Definition, significance, necessity and use of *Pariksha*.
- 1.2. Definition of *Prama*, *Prameya*, *Pramata*, *Pramana*.
- 1.3. Significance and importance of *Pramana*, Enumeration of *Pramana* according to different schools of philosophy.
- 1.4. Four types of methods for examination in *Ayurveda* (Chaturvidha-Parikshavidhi), *Pramana* in Ayurveda.
- 1.5. Subsudation of different *Pramanas* under three *Pramanas*.
- 1.6. Practical application of methods of examination (Parikshavidhi) in treatment (Chikitsa).

**2. Aptopdesha Pariksha/ Pramana**

- 2.1. Lakshana of Aptopadesha, Lakshana of Apta.
- 2.2. Lakshana of Shabda, and its types.
- 2.3. Shabdavritti-Abhidha, Lakshana, Vyanjana and Tatparyakhya. Shaktigrahaheetu.
- 2.4. Vaakya: Characteristics, Vaakyarthagyanahetu- Aakanksha, Yogyata, Sannidhi.

### 3. Pratyaksha Pariksha/ Pramana

- 3.1. Lakshana of Pratyaksha, types of Pratyaksha- Nirvikalpaka- Savikalpaka with description, description of Laukika and Alaukika types and their further classification.
- 3.2. Indriya-prapyakaritvam, six types of Sannikarsha.
- 3.3. Indriyanam lakshanam, classification and enumeration of Indriya. Description of Panchapanchaka, Penta-elemental nature of Indriya by Panchamahabhuta (*Panchabhautikatwa* of Indriya) and similarity in sources (*Tulyayonitva*) of Indriya.
- 3.4. Trayodasha Karana, dominance of Antahkaran.
- 3.5. Hindrances in direct perception (*pratyaksha-anupalabdihikaaran*), enhancement of direct perception (Pratyaksha) by various instruments/ equipments, necessity of other Pramanas in addition to Pratyaksha.
- 3.6. Practical study/ application of Pratyaksha in physiological, diagnostic, therapeutics and research grounds.

### 4. Anumanapariksha/Pramana

- 4.1. Lakshana of Anumana. Introduction of Anumiti, Paramarsha, Vyapti, Hetu, Sadhya, Paksha, Drishtanta. Types of Anumana mentioned by Charaka and Nyayadarshana.
- 4.2. Characteristic and types of Vyapti.
- 4.3. Lakshana and types of Hetu, description of Ahetu and Hetwabhasa.
- 4.4. Characteristic and significance of Tarka.
- 4.5. Practical study/ application of Anumanapramana in physiological, diagnostic, therapeutics and research.

### 5. Yুক্তipariksha/ Pramana

- 5.1. Lakshana and discussion.
- 5.2. Importance in Ayurveda.
- 5.3. Practical study and utility in therapeutics and research.

### 6. Upamana Pramana

- 6.1 Lakshana.
- 6.2 Application in therapeutics and research.

### 7. Karya- Karana Siddhanta (Cause and Effect Theory)

- 7.1. Lakshana of Karya and Karana. Types of Karana.
- 7.2. Significance of Karya and Karana in Ayurveda.
- 7.3. Different opinions regarding the manifestation of Karya from Karana: Satkaryavada, Asatkaryavada, Parinamavada, Arambhavada, Paramanuvada, Vivartavada, Kshanabhanguvada, Swabhavavada, Pilupaka, Pitharpaka, Anekantavada, Swabhavoparamavada.

## PART B - Ayurved Itihas

25 marks

1. Etymological derivation (Vyutpatti), syntactical derivation (Nirukti) and definition of the word Itihas, necessity of knowledge of history, its significance and utility, means and method of history, historical person (Vyakti), subject (Vishaya), time period (Kaal), happening (Ghatana) and their impact on Ayurveda.
2. Introduction to the authors of classical texts during Samhitakaal and their contribution: Atreya, Dhanwantari, Kashyapa, Agnivesha, Sushruta, Bhela, Harita, Charaka,



Dridhabala, Vagbhata, Nagarjuna, Jivaka.

3. Introduction to the commentators of classical Samhitas – Bhattaraharicchandra, Jejjata, Chakrapani, Dalhana, Nishchalakara, Vijayarakshita, Gayadas, Arunadutta, Hemadri, Gangadhara, Yogindranath Sen, Haranachandra, Indu.
4. Introduction to the authors of compendiums (Granthasamgrahakaala) – Bhavmishra, Sharngadhara, Vrinda, Madhavakara, Shodhala, Govinda Das (Author of Bhaishajyaratnawali), Basavraja.
5. Introduction to the authors of Modern era –Gana Nath Sen, Yamini Bhushan Rai, Shankar Dajishastri Pade, Swami Lakshmiram, Yadavji Tikramji, Dr. P. M. Mehta, Ghanekar, Damodar Sharma Gaur, Priyavrat Sharma.
6. Globalization of Ayurveda – Expansion of Ayurveda in Misra (Egypt), Sri Lanka, Nepal other nations.
7.
  - a) Developmental activities in Ayurveda in the post-independence period, development in educational trends.
  - b) Establishment of different committees, their recommendations.
  - c) Introduction to and activities of the following Organizations :- Department of AYUSH, Central Council of Indian Medicine, Central Council for Research in Ayurvedic Sciences, Ayurvedic Pharmacopeia commission, National Medicinal Plants Board, Traditional Knowledge Digital Library (TKDL)
  - d) Introduction to the following National Institutions :
    - National Institute of Ayurved, Jaipur.
    - IPGT&RA, Gujrat Ayurved University, Jamnagar.
    - Faculty of Ayurved, BHU, Varanasi.
    - Rashtriya Ayurveda Vidyapeetha, New Delhi.
8. Introduction to national & international popular journals of Ayurveda.
9. Introduction to activities of WHO in the promotion of Ayurved.

**Reference Books:-**

**A). Padartha Vigyan:-**

- |  |                                |
|--|--------------------------------|
| 1. Padarthavigyan                                      | Acharya Ramraksha Pathak       |
| 2. Ayurvediya Padartha Vigyana                         | Vaidya Ranjit Rai Desai        |
| 3. Ayurved Darshana                                    | Acharya Rajkumar Jain          |
| 4. Padartha Vigyana                                    | Kashikar                       |
| 5. Padartha Vigyana                                    | Balwant Shastri                |
| 6. Sankhyatantwa Kaumadi                               | Gajanans hastri                |
| 7. Psycho Pathology in Indian Medicine                 | Dr. S.P. Gupta                 |
| 8. Charak Evum Sushrut ke Darshanik Vishay ka Adhyayan | Prof. Jyotirmitra Acharya      |
| 9. Ayurvediya Padartha Vigyana                         | Dr. Ayodhya Prasad Achal       |
| 10. Padartha Vigyana                                   | Dr. Vidyadhar Shukla           |
| 11. Padartha Vigyana                                   | Dr. Ravidutta Tripathi         |
| 12. Ayurvediya Padartha Vigyana                        | Vaidya Ramkrishna Sharma Dhand |
| 13. Ayurvediya Padartha Vigyan Parichaya               | Vaidya Banwarilal Gaur         |
| 14. Ayurvediya Padartha Darshan                        | Pandit Shivhare                |

15. Scientific Exposition of Ayurveda Dr. Sudhir Kumar  
 16. Relevant portions of Charakasamhita, Sushrutasamhita.

**B) History of Ayurveda:-**

- |   |                                |
|---|--------------------------------|
| 1. Upodghata of Kashyapasamhita<br>Paragraph of acceptance of Indian medicine   | Rajguru Hem Raj Sharma         |
| 2. Upodghata of Rasa Yogasagar  | Vaidya Hariprapanna Sharma     |
| 3. Ayurveda Ka Itihas   | KaviraSuram Chand              |
| 4. Ayurveda Sutra   | Rajvaidya Ram Prasad Sharma    |
| 5. History of Indian Medicine (1-3 part)  | Dr. GirindrNath Mukhopadhyaya  |
| 6. A Short history of Aryan Medical Science                                     | Bhagwat Singh                  |
| 7. History of Indian Medicine   | J. Jolly                       |
| 8. Hindu Medicine   | Zimer                          |
| 9. Classical Doctrine of Indian Medicine  | Filiyosa                       |
| 10. Indian Medicine in the classical age  | AcharyaPriyavrata Sharma       |
| 11. Indian Medicine (Osteology)   | Dr. Harnley                    |
| 12. Ancient Indian Medicine   | Dr. P. Kutumbia                |
| 13. Madhava Nidan and its Chief<br>Commentaries (Chapters highlighting history) | Dr. G.J. Mulenbelt             |
| 14. Ayurveda Ka BrihatItihasa   | Vaidya Atridev Vidyalankara    |
| 15. Ayurveda Ka VaigyanikaItihasa   | Acharya Priyavrata Sharma      |
| 16. Ayurveda Ka PramanikaItihasa  | Prof. Bhagwat Ram Gupta        |
| 17. History of Medicine in India  | Acharya Priyavrata Sharma      |
| 18. Vedomein Ayurveda   | Vaidya Ram GopalS hastri       |
| 19. Vedomein Ayurveda   | Dr. Kapil Dev Dwivedi          |
| 20. Science and Philosophy of Indian Medicine                                   | Dr. K.N. Udupa                 |
| 21. History of Indian Medicine from<br>Pre-Mauryan to Kushana Period            | Dr. Jyotirmitra                |
| 22. An Appraisal of Ayurvedic Material in<br>Buddhist literature                | Dr. Jyotirmitra                |
| 23. Mahayana Granthon mein nihita<br>Ayurvediya Samagri                         | Dr. RavindraNathTripathi       |
| 24. Jain Ayurveda Sahitya Ka Itihasa  | Dr. Rajendra Prakash Bhatnagar |
| 25. Ayurveda- Prabhashaka Jainacharya   | Acharya Raj Kumar Jain         |
| 26. CharakaChintana   | Acharya Priyavrata Sharma      |
| 27. Vagbhata Vivechana  | Acharya Priyavrata Sharma      |
| 28. Atharvaveda and Ayurveda  | Dr. Karambelkara               |
| 29. Ayurvedic Medicine Past and Present   | Pt. Shiv Sharma                |
| 30. Ancient Scientist   | Dr. O.P. Jaggi                 |
| 31. Luminaries of Indian Medicine   | Dr. K.R. Shrikanta Murthy      |
| 32. Ayurveda Ke Itihasa Ka Parichaya  | Dr. RaviduttaTripathi          |
| 33. Ayurveda Ke Pranacharya   | Ratnakara Shastri              |
| 34. Ayurveda Itihasa Parichaya  | Prof. Banwari Lal Gaur         |

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## 1.2 laD`re

THEORY - ONE PAPER - 100 marks TEACHING

HOURS - 90 hours

PART-A

50 marks

### laD`r0;kdj.kk/; ; ue~

- 1- laKkizdj. ke'
- 2- foHkDR;FkkZ:
- 3- lfU/kizdj. ke' ¼ lfU/kfoPNsn:] lfU/kdj. ke' ½
- 4- ekM`fyaxizdj. ke' ¼ k`en : ik. ;so%
- 5- /kkrq;idj. ke' ¼ /kkrq:ik. ;so%  
¼ Hokfnx.kh; /kkrwuk iœ p yV`yksV`y3`iV`tof/kfy3`ydkjsek :ikf.k%
- 6- okP;iz;ksxk: ¼ drij de.l.k HkkookP;iz;ksxk:½
- 7- leklizdj. ke~
- 8- izR; ;k:  
¼ f.kp` u] uor 'kr` 'kkup` r`equ` r0;r r`p` DRok] Y;i` Y;qV` vuh;j erqi`  
bfu] ru] brp` v.k` bv` bd` Ro] rk] eku` be` fup` r:] =] nk] /kk] rji] rei`  
Vki` 3ki` ½
- 9- vuqokn:
  - A) From English / Hindi / regional language to Sanskrit
  - B) From Sanskrit to English / Hindi / regional language
  - C) Identification and correction of grammatical errors in the given sentences

**The sentences for translation should be selected from the under mentioned reference books-**

- 1) Laghusiddhanta Kaumudi- Acharya Varadaraja (Commentary by Shri Dhananand Shastri)
- 2) Brihatrayee- (Charaka Samhita, Sushruta Samhita, Ashtanga Hridayam)
- 3) Anuvada Chandrika-Chakradhara Hansa Nautiyal
- 4) Sanskruta Ayurved Sudha- Dr. Banwari Lal Gaur
- 5) Rachananuvada Kaumudi- Dr. Kapildev Dwivedi
- 6) Bhasha Sopanam- Published by Rashtreeya Samskruta Samsthanam, New Delhi

**PART- B**

**50 marks**

**Httett;;ue,**

- 1.) v 25 marks  
t'eer' thim, eh'pter.4)
- 2.) o 15 marks  
“
- 3.) iE prU=e`vijhf(krdkjde' ¼ {ki.kd dFkkr: e[kZif.MrdFkki;ZUre` 10 marks  
iE pdFkk:½

**REFERENCE BOOKS-**

- 1.) Sushruta Samhita, Shareera Sthanam, Chapter-4
- 2.) Prabhashanam Work Book, Su.sam.chap.4  
Published by-AYURVEDA ACADEMY@ BANGALORE;  
Email-ayuacademy@gmail.com
- 3.) Vaidyakeeya Subhashita Sahityam - Dr. Bhaskara Govinda Ghanekar
- 4.) Panchatantra-(Apareekshitakarakam) -Pt. Vishnu Sharma

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### **1.3 KRIYA SHARIR (PHYSIOLOGY)**

Theory-Two Papers-200 Marks (100 marks each)

Teaching hours-180 hours

PAPER- I

100 marks

PART- A

50 marks

1. Conceptual study of fundamental principles of Ayurvediya Kriya Sharir e.g - Panchamahabhuta, Tridosha, Triguna, Loka-Purusha Samya, Samanya-Vishesha. Description of basics of Srotas.
2. Definition and synonyms of the term Sharir, definition and synonyms of term Kriya, description of Sharir Dosha and Manasa Dosha. Mutual relationship between Triguna-Tridosha & Panchmahabhuta. Difference between Shaarir and Sharir. Description of the components of Purusha and classification of Purusha, role of Shatdhatupurusha in Kriya Sharira and Chikitsa.
3. Dosha- General description of Tridosha. Inter relationship between Ritu-Dosha-Rasa-Guna. Biological rhythms of Tridosha on the basis of day-night-age-season and food intake. Role of Dosha in the formation of Prakriti of an individual and in maintaining of health. Prakrita and Vaikrita Dosha.
4. Vata Dosha: Vyutpatti (derivation), Nirukti (etymology) of the term Vata, general locations, general properties and general functions of Vata, five types of Vata (Prana, Udana, Samana, Vyana, Apana) with their specific locations, specific properties, and specific functions.  
Respiratory Physiology in Ayurveda, Physiology of speech in Ayurveda.
5. Pitta Dosha: Vyutpatti, Nirukti of the term Pitta, general locations, general properties and general functions of Pitta, five types of Pitta (Pachaka, Ranjaka, Alochaka, Bhrajaka, Sadhaka) with their specific locations, specific properties, and specific functions. Similarities and differences between Agni and Pitta.
6. Kapha Dosha: Vyutpatti, Nirukti of the term Kapha, general locations, general properties and general functions of Kapha, five types of Kapha (Bodhaka, Avalambaka, Kledaka, Tarpaka, Śleshaka ) with their specific locations, specific properties, and specific functions.
7. Etiological factors responsible for Dosha Vriddhi, Dosha Kshaya and their manifestations.
8. Concept of Kriyakala.
9. Prakriti:
  - a) Deha- Prakriti: Vyutpatti, Nirukti, various definitions and synonyms for the term „Prakriti“. Intra-uterine and extra-uterine factors influencing Deha-Prakriti, classification and characteristic features of each kind of Deha-Prakriti.
  - b) Manasa- Prakriti: Introduction and types of Manasa- Prakriti.
10. Ahara: Definition, classification and significance of Ahara, Ahara-vidhi-vidhana, Ashta Aharavidhi Viseshayatana, Ahara Parinamkar Bhava.

11. Aharapaka (Process of digestion): Description of Annavaha Srotas and their Mula. Role of Grahani & Pittadhara Kala.
12. Description of Avasthapaka (Madhura, Amla and Katu). Description of Nishthapaka (Vipaka) and its classification. Separation of Sara and Kitta. Absorption of Sara. Genesis of Vata-Pitta-Kapha during Aharapaka process. Definition of the term Koshta. Classification of Koshta and the characteristics of each type of Koshta.
13. Agni – Definition and importance, synonyms, classification, location, properties and functions of Agni and functions of Jatharagni, Bhutagni, and Dhatvagni.

**PART- B**

**50 marks**

**Modern Physiology**

- a) Definition and mechanisms of maintenance of homeostasis. Cell physiology. Membrane physiology. Transportation of various substances across cell membrane.
- b) Resting membrane potential and action potential.
- c) Physiology of respiratory system: functional anatomy of respiratory system. Definition of ventilation, mechanism of respiration, exchange and transport of gases, neural and chemical control of respiration, artificial respiration, asphyxia, hypoxia. Introduction to Pulmonary Function Tests.
- d) Physiology of Nervous System: General introduction to nervous system, neurons, mechanism of propagation of nerve impulse, physiology of CNS, PNS, ANS; physiology of sensory and motor nervous system, Functions of different parts of brain and physiology of special senses, intelligence, memory, learning and motivation. Physiology of sleep and dreams, EEG. Physiology of speech and articulation. Physiology of temperature regulation.
- e) Functional anatomy of gastro-intestinal tract, mechanism of secretion and composition of different digestive juices. Functions of salivary glands, stomach, liver, pancreas, small intestine and large intestine in the process of digestion and absorption. Movements of the gut (deglutition, peristalsis, defecation) and their control. Enteric nervous system.
- f) Acid-base balance, water and electrolyte balance. Study of basic components of food. Digestion and metabolism of proteins, fats and carbohydrates. Vitamins & Minerals- sources, daily requirement, functions, manifestations of hypo and hypervitaminosis.

**PAPER- II**

**100 marks**

**PART- A**

**50 marks**

**1. Dhatu:**

Etymology, derivation, definition, general introduction of term Dhatu, different theories related to Dhatuposhana (Dhatuposhana Nyaya)

**2. Rasa Dhatu:**

Etymology, derivation, location, properties, functions and Praman of Rasa-dhatu. Physiology of Rasavaha Srotas, Formation of Rasa Dhatu from Aahara Rasa, circulation of Rasa (Rasa-Samvahana), role of Vyana Vayu and Samana Vayu in Rasa Samvahana. Description of functioning of Hridaya. Ashtavidha Sara (8 types

of Sara), characteristics of Tvakasara Purusha, conceptual study of mutual interdependence (Aashraya-Aashrayi Bhaava) and its relation to Rasa and Kapha. Manifestations of Kshaya and Vriddhi of Rasa.

### **3. Rakta Dhatu:**

Etymology, derivation, synonyms, location, properties, functions and Praman of Rakta Dhatu. Panchabhautikatva of Rakta Dhatu, physiology of Raktavaha Srotas, formation of Raktadhatu, Ranjana of Rasa by Ranjaka Pitta, features of Shuddha Rakta, specific functions of Rakta, characteristics of Raktasara Purusha, manifestations of Kshaya and Vriddhi of Raktadhatu, mutual interdependence of Rakta and Pitta.

### **4. Mamsa Dhatu :**

Etymology, derivation, synonyms, location, properties and functions of Mamsa Dhatu, physiology of Mamsavaha Srotas, formation of Mamsa Dhatu, characteristics of Mamsasara Purusha, manifestations of Kshaya and Vriddhi of Mamsa Dhatu .Concept of Peshi.

### **5. Meda Dhatu :**

Etymology, derivation, location, properties, functions and Praman of Meda Dhatu, physiology of Medovaha Srotas, formation of Medo Dhatu, characteristics of Medasara Purusha and manifestations of Kshaya and Vriddhi of Meda.

### **6. Asthi Dhatu:**

Etymology, derivation, synonyms, location, properties, functions of Asthi Dhatu. Number of Asthi. Physiology of Asthivaha Srotas and formation of Asthi Dhatu, characteristics of Asthisara Purusha, mutual interdependence of Vata and Asthi Dhatu, manifestations of Kshaya and Vriddhi of Asthi Dhatu.

### **7. Majja Dhatu :**

Etymology, derivation, types, location, properties, functions and Praman of Majjaa Dhatu, physiology of Majjavaha Srotas, formation of Majja Dhatu, characteristics of Majja Sara Purusha, relation of Kapha, Pitta, Rakta and Majja, manifestations of Kshaya and Vriddhi of Majja Dhatu.

### **8. Shukra Dhatu:**

Etymology, derivation, location, properties, functions and Praman of Shukra Dhatu, physiology of Shukraravaha Srotas and formation of Shukra Dhatu. Features of Shuddha Shukra, characteristics of Shukra-Sara Purusha, manifestations of Kshaya and Vriddhi of Shukra Dhatu.

**9.** Concept of **Ashraya-Ashrayi** bhava i.e. inter-relationship among Dosha, Dhatu Mala and Srotas.

**10. Ojas:** Etymological derivation, definition, formation, location, properties, Praman, classification and functions of Ojas. Description of Vyadhikshamatva. Bala Vriddhikara Bhava. Classification of Bala. Etiological factors and manifestations of Ojavisramsas, Vyapat and Kshaya.

- 11. Upadhatu:** General introduction, etymological derivation and definition of the term Upadhatu. Formation, nourishment, properties, location and functions of each Upadhatu.
- Stanya: Characteristic features and methods of assessing Shuddha and Dushita Stanya, manifestations of Vriddhi and Kshaya of Stanya.
  - Artava: Characteristic features of Shuddha and Dushita Artava. Differences between Raja and Artava, physiology of Artavavaha Srotas.
  - Tvak: classification, thickness of each layer and functions.
- 12. Mala:** Etymological derivation and definition of the term Mala. Aharamala: Enumeration and description of the process of formation of Aharamala.
- Purisha: Etymological derivation, definition, formation, properties, quantity and functions of Purisha. Physiology of Purishavaha Srotas, manifestations of Vriddhi and Kshaya of Purisha.
  - Mutra: Etymological derivation, definition, formation, properties, quantity and functions of Mutra. Physiology of Mutravaha Srotas, physiology of urine formation in Ayurveda, manifestations of Vriddhi and Kshaya of Mutra.
  - Sveda: Etymological derivation, definition, formation and functions of Sveda. Manifestations of Vriddhi and Kshaya of Sveda. Description of Svedvaha Srotas
  - Dhatumala: Brief description of each type of Dhatumala.
- 13. Panchagyanendriya:** Physiological description of Panchagyaanendriya and physiology of perception of Shabda, Sparsha, Rupa, Rasa and Gandha. Physiological description of Karmendriya.
- 14. Manas:** Etymological derivation, definition, synonyms, location, properties, functions and objects of Manas. Physiology of Manovaha Srotas.
- 15. Atma:** Etymological derivation, definition, properties of Atma. Difference between Paramatma and Jivatma; Characteristic features of existence of Atma in living body.
- 16. Nidra:** Nidrotpatti, types of Nidra, physiological and clinical significance of Nidra; Svapnotpatti and types of Svapna.

PART –B

50 marks

#### Modern Physiology

- Haemopoetic system – composition, functions of blood and blood cells, Haemopoiesis (stages and development of RBCs, and WBCs and platelets), composition and functions of bone marrow, structure, types and functions of haemoglobin, mechanism of blood clotting, anticoagulants, physiological basis of blood groups, plasma proteins, introduction to anaemia and jaundice.
- Immunity, classification of immunity: Innate, acquired and artificial. Different mechanisms involved in immunity: Humoral (B-cell mediated) and T-Cell mediated immunity. Hypersensitivity.
- Muscle physiology – comparison of physiology of skeletal muscles, cardiac muscles and smooth muscles. Physiology of muscle contraction.
- Physiology of cardio-vascular system: Functional anatomy of cardiovascular system. Cardiac cycle. Heart sounds. Regulation of cardiac output and venous



return. Physiological basis of ECG. Heart-rate and its regulation. Arterial pulse. Systemic arterial blood pressure and its control.

5. Adipose tissue, lipoproteins like VLDL, LDL and HDL triglycerides.
6. Functions of skin, sweat glands and sebaceous glands.
7. Physiology of male and female reproductive systems. Description of ovulation, spermatogenesis, oogenesis, menstrual cycle.
8. Physiology of Excretion – functional anatomy of urinary tract, functions of kidney. Mechanism of formation of urine, control of micturition. Formation of faeces and mechanism of defecation.
9. Endocrine glands – General introduction to endocrine system, classification and characteristics of hormones, physiology of all endocrine glands, their functions and their effects.

#### **PRACTICAL**

**100 marks**

**Teaching hours-180**

#### **Ayurvedic practical**

1. Assessment of Prakriti
2. Assessment of Dosha (Features of Vriddhi- Kshaya )
3. Assessment of Dhatu (Features of Vriddhi- Kshaya)
4. Assessment of Agni
5. Assessment of Koshtha
6. Assessment of Sara
7. Nadi pariksha

#### **Modern physiology practical**

1. Introduction to laboratory instruments- Simple & Compound Microscope, Scalp vein set, bulbs for blood collection, Sahli's Haemometer, Haemocytometer, pipettes, Urinometer, Albuminometer, Stethoscope, B.P. Apparatus, Harpenden's caliper, Clinical Hammer, Tuning Fork, Stop Watch, Thermometer, Centrifuge machine, ECG Machine
2. Collection of blood sample – prick, vene-puncture method, use of anticoagulants
3. Preparation of blood smear and staining
4. Estimation of Hemoglobin
5. Microscopic examination of blood
  - a. Total RBC count
  - b. Total WBC count
  - c. Differential leucocyte count
6. Packed cell volume (PCV) demonstration
7. ESR demonstration
8. Bleeding time, Clotting time
9. Blood grouping and Rh typing
10. Examination of Cardio-Vascular system
  - a. Pulse examination
  - b. Arterial blood pressure measurement
  - c. Examination of heart sounds
  - d. ECG demonstration
11. Examination of Respiratory system
  - a. Respiratory rate
  - b. Breath sounds
  - c. Spirometry
12. Examination of Nervous System- Sensory & Motor.

13. Urine examination –Physical examination, chemical examination. Test for normal constituents of urine. Detection of specific gravity and reaction of urine.

**Distribution of Practical marks**

1. Laboratory Practical	- 20
2. Human Experiment	- 15
3. Spotting	- 15
4. Prakriti Saradi pariksha	- 20
5. Practical Record	- 10
6. Viva- voce	- 20

**REFERENCE BOOKS:-**

- Ayurvediya Kriyasharir - Ranjit Rai Desai
- Kayachikitsa Parichaya - C. Dwarkanath
- Prakrit Agni Vigyan - C. Dwarkanath
- Sharir Kriya Vigyan - Shiv Charan Dhyani
- Abhinava Sharir Kriya Vigyana - Acharya Priyavrata Sharma
- Dosha Dhatu Mala Vigyana - Shankar Gangadhar Vaidya
- Prakrita Dosha Vigyana - Acharya Niranjana Dev
- Tridosha Vigyana - Shri Upendranath Das
- Sharira Tatva Darshana - Hirlekar Shastri
- Prakrita Agni Vigyana - Niranjana Dev
- Deha Dhatvagni Vigyana - Vd. Pt. Haridatt Shastri
- Sharir Kriya Vigyana (Part 1-2) - Acharya Purnchandra Jain
- Sharir Kriya Vigyana - Shri Moreshwar Dutt. Vd.
- Sharira Kriya Vijnana (Part 1 and 2) – Nandini Dhargalkar
- Dosha Dhatu Mala Vigyana - Basant Kumar Shrimal
- Abhinava Sharir Kriya Vigyana - Dr. Shiv Kumar Gaur
- Pragyogik Kriya Sharir - Acharya P.C. Jain
- Kaya Chikitsa Parichaya - Dr. C. Dwarkanath
- Concept of Agni - Vd. Bhagwan Das
- Purush Vichaya - Acharya V.J. Thakar
- Kriya Sharir - Prof. Yogesh Chandra Mishra
- Sharir Kriya Vigyana - Prof. Jayaram Yadav &Dr. Sunil Verma.
- Basic Principles of Kriya-Sharir (A treatise on Ayurvedic Physiology ) by Dr. Srikant Kumar Panda
- Sharir Kriya – Part I & Part II – Dr. Ranade, Dr. Deshpande & Dr. Chobhe
- Human Physiology in Ayurveda - Dr Kishor Patwardhan
- Sharirkriya Vignyan Practical Hand Book– Dr.Ranade, Dr.Chobhe, Dr. Deshpande
- Sharir Kriya Part 1 – Dr.R.R.Deshapande, Dr.Wavhal
- Sharir Kriya Part 2 – Dr. R.R.Deshapande, Dr.Wavhal
- Ayurveda Kriya Sharira- Yogesh Chandra Mishra
- Textbook of Physiology - Gyton & Hall
- A Textbook of Human Physiology – A.K.Jain
- Essentials of Medical Physiology - Sembulingam, K.
- Concise Medical Physiology - Chaudhari, Sujit K.
- Principals of Anatomy & Physiology - Tortora & Grabowski
- Textbook of Medical Physiology- Indu Khurana

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## 1.4 RACHNA SHARIR (ANATOMY)

Theory- Two Papers-200 Marks-(100 marks each)

Teaching Hours-180 hours

PAPER-I

100 marks

PART-A

50 marks

### 1. Shariropkramaniya Shaarira

Sharira and shaarira vyakhya (definitions of sharira and shaarira), shadangatvam (six regions of the body), anga pratyanga vibhaga (sub divisions). Mrita sharir samshodhan. Shaarira shastra vibhaga, shaarira gyan prayojana . Constitution of purusha according to dhatubheda, panchabhautikatvam, trigunatmakatvam, tridoshamayatvam, karma purusha, and doshadhatumala-mulakatvam.

### 2. Paribhasha Shaarira

Kurcha, kandara, jala, asthisanghat, seemanta, seevani, rajju, snayu and lasika.

### 3. Garbha Shaarira

Garbha definitions, explanation of shukra, artava, garbhadhana. Role of tridosha and panchmahabhuta in the fetal development. Beeja, beejabhaga and beejabhagavayava, linga vinischaya, masanumasika garbha vriddhi-krama, garbhottpadakbhava, garbhavriddhikara bhava, garbha poshana, apara nirmana , nabhinadi nirmana. Aanga pratyanga utpatti.

### 4. Pramana Shaarira: Anguli pramana.

### 5. Asthi Shaarira

Asthi vyakhya, number, types, asthi swaroopa, vasa, meda and majja.

### 6. Sandhi Shaarira

Sandhi vyakhya, numbers, types of asthi sandhi.

### 7. Sira, Dhamani, Srotas Shaarira

- Definition, types and number of sira and dhamani.
- Description of Hridaya.
- Sroto shaarira: Definition, types of srotas and srotomula.

### 8. Peshi Shaarira

- Peshi vyakhya, structure, types, number and importance.
- Description of Peshi.

### 9. Koshta Evam Ashaya Shaarira

- Definition of koshta and number of koshtanga.
- Types and description of ashaya.

### 10. Kalaa Shaarira

Kalaa: definition and types.

### 11. Uttamangiya Shaarira

Shatchakra, ida, pingala and sushumna nadi - brief description.

### 12. Marma Shaarira

Marma: definition, number, location, classification, clinical importance with viddha lakshana. Explanation of trimarmas. Detail description of marmas.

### **13. Indriya Shaarira**

Definition of indriya, indriya artha and indriya adhistan, their number and importance. Description of gyanendria, karmendriya and ubhayendriya (manas).

#### **PART-B**

**50 marks**

**1.** Definition and branches of anatomy. Preservation methods of the cadaver.

#### **2. Anatomical Terminologies**

Anatomical position, Planes, and explanation of anatomical terms related to skin, fasciae, bones, joints and their movements, muscles, ligaments, tendons, blood vessels, nerves,.

#### **3. Embryology**

Definitions and branches of embryology. Embryo and fetus. Sperm and ovum, fertilization. Cleavage. Germ layers formation and their derivatives. Laws of heredity, Sex determination and differentiation, Month-wise development of embryo. Foetal circulation, placenta formation, Umbilical cord formation.

#### **4. Osteology**

Bone: Definition, ossification, structure and types. Description of bones with clinical anatomy.

#### **5. Arthrology**

Joints: Definition, structure types and movements. Description of joints of extremities, vertebral joints and temporomandibular joint with their clinical anatomy.

#### **6. Cardiovascular system**

- a. Definition, types and structure of arteries and veins.
- b. Description of heart and blood vessels with their course and branches.
- c. Pericardium with applied aspect.

#### **7. Lymphatic system**

Definition, types and structure of lymph vessels, lymph glands with their clinical aspect.

#### **8. Myology**

- a) Structure and types of muscles.
- b) Description of muscles; their origin, insertion, actions, nerve supply and clinical anatomy.

#### **Paper II**

**100 marks**

#### **Part A**

**50 marks**

#### **1. Respiratory System**

- a. Bronchial tree and lungs with their clinical aspects.
- b. Respiratory tract: nasal cavity, pharynx, larynx, trachea, bronchial tree.
- c. Pleura with its clinical aspects.
- d. Diaphragm.

#### **2. Digestive system**

- a. Organs of digestive tract (alimentary tract) with their clinical aspects.
- b. Digestive glands: liver, spleen and pancreas.
- c. Description of peritoneum with its clinical aspects.

### 3. Urinary System

Urinary tract: kidney, ureter, urinary bladder and urethra with their clinical aspects.

### 4. Reproductive system

- a. Male Reproductive system: reproductive organs, tract and glands (prostate and seminal vesicles) with their clinical aspects.
- b. Female reproductive system: reproductive organs, tract and glands with their clinical aspects.

### 5. Endocrinology

Definition, classification & description of endocrine glands (pituitary, thyroid, parathyroid, thymus and suprarenal glands) with clinical aspects.

## PART B

50 marks

### 6. Nervous System

Nervous system: definition, classification and its importance. Description of brain and spinal cord.

Description of peripheral nervous system: cranial and spinal nerves, nerve plexuses, and autonomic nervous system, formation and circulation of cerebrospinal fluid and blood supply of brain and spinal cord.

### 7. Sensory organs

Description of structures of eye, ear, nose, tongue and skin with their clinical aspects.

### 8. Surface and radiological anatomy

- a. Study of radio-imaging of limbs, abdomen, pelvis and vertebral column with its clinical application.
- b. Surface anatomy of thoracic and abdominal viscera.

## PRACTICAL

100 marks

Teaching hours: 180

### Content of practical

1. Practical study of bones
2. Practical study of organs
3. Practical study of surface and radiological anatomy.
4. Shava vichhedana – detailed dissection of the whole body.
5. Practical study of location of marma
6. Demonstration of histology slides (10 slides)

### Distribution of marks

1. Spotting -	20 marks
2. Dissected organs and histology slides -	20 Marks
3. Bones, joints, marma -	20 Marks
4. Surface & radiological anatomy -	10 Marks
5. Practical records -	10 Marks
6. Viva-Voce -	20 Marks
<b>Total</b>	<b>100 Marks</b>

### Reference Books :-

<b>S. No.</b>	<b>Name of Book</b>	<b>Author</b>
1.	Brihat Shariram Vaidyaratna-	P.S. Varrier
2.	Abhinava Shariram-	Acharya Damodar Sharma Gaur
3.	Manava Sharir (Revised Edition)-	Prof. Dinkar Govind Thatte
4.	Manava Bhruna Vigyana -	Prof. Dinkar Govind Thatte
5.	Manava Anga Rekhankan Vikrian -	Prof. Dinkar Govind Thatte
6.	Sharir Rachana Vigyan (English)-	Vaidya P.G. Athawale
7.	Manual of Practical Anatomy Cunnigham	Practical Manual Vol-1, Vol-2, Vol-3
8.	Clinical Anatomy in Ayurveda -	Prof. D.G. Thatte & Prof. Suresh Chandra
9.	Sharir Rachna Vigyan (English)-	Prof. D.G. Thatte
10.	Ayurvedic Human Anatomy -	Prof. Dr. Giridhar M. Kanthi
11.	Regional Anatomy -	B. D. Chaurasia
12.	Rachana Sharir Vigyana -	Dr. Mahendra Sing
13.	elevant chapters of Brihtrayee and Laghuthrayee	
14.	Gray's Anatomy	
15.	Text Book of Human Anatomy-	Inderbir Singh
16.	Clinical Anatomy-	Richard S Snell
17.	Fundamentals of Human Anatomoy-	Dr. Chakraborty
18.	Human Osteology -	Poddar

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**1.5 Maulik Siddhant avum Ashtang Hridaya**  
**(Basic Principles and Ashtang Hridaya- An ancient text of Ayurveda)**

Theory- One Paper– 100 marks Teaching Hours -  
120 hours

**Part A** **60 marks**

Ashtang Hridaya Sutrasthana Adhyaya 1 to 15

**Part B** **40 marks**

1. Ashtang Hridaya Sutrasthana Adhyaya 16 to 30
2. Description of Ashta Prakriti
3. Shastra Lakshan (Tantra), Tantraguna, Tantradosha, Tachitalya, Arthasraya, Kalpana

**Reference Books:**

1. Astang Hridaya : Hindi commentary by Lalchanda Vaidya
2. Astang Hridaya : Hindi commentary by Vd. B.L. Gaur
3. Astang Hridaya : English commentary by Dr. T. Sreekumar
4. Astang Hridaya : English commentary by Dr. Vishwavasudhan Gaur
5. Astang Hridaya : Sanskrit commentary by Hemadri
6. Astang Hridaya : Sanskrit commentary by Arunadatta

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**CENTRAL COUNCIL OF INDIAN MEDICINE**  
**NEW DELHI**

**SYLLABUS OF AYURVEDACHARYA (BAMS)  
COURSE**

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**2.1**

## **DRAVYAGUNA VIGYAN**

**(PHARMACOLOGY & MATERIA MEDICA)**

Lectures: 200 Hrs.

**Practicals: 200 Hrs.**

Total Marks -400

**Theory Two Papers– 100 Marks Each**

**Practical/Viva voce – 200 Marks**

Paper I

100 Marks

**Part A**

**50 Marks**

- 1- Dravyaguna Shastra Paribhasa-** Lakshana of Sapta Padartha of Dravyaguna Vijnana viz Dravya- Rasa-Guna- Virya- Vipaka- Prabhava and Karma.
- 2- Dravya:**  
Etymological derivation, definition, panchbhoutikatwa.  
Classification of Dravya according to Samhitas and Nighantus Taxonomical classification.
- 3- Guna:**  
Etymological derivation, definition and Classification of Guna.  
Detailed knowledge of Gurvadi Guna & Paradi gunas.
- 4- Rasa:**  
Etymological derivation, definition, Meaning of "Rasa" in various contexts. Shad Rasas (Madhura, Amla, Lavana, Katu, Tikta, and Kashaya), Panchabhautik constitution of Rasas, Nirvritivisheshakrama (manifestation in general and particular), Ritu and shad rasa Rasanurasayoh bheda (Difference between rasa and anurasa), Lakshana (characteristics),Guna and Karma of shad Rasas, Kopana and Shamana of Dosha and dushya by Shad rasas. Effects of excess usage of Rasa. Rasopalabdhi, Rasaskandha.
- 5- Vipaka:**  
Etymological derivation and definition, difference between Avasthapaka and Vipaka, Types of Vipaka, (Dvididha-Trividha,Panchavidha) Guna and karma of Vipaka.  
Grades of Vipaka (taratamya), Vipakopalabdhi hetu (Factors to determineVipaka).
- 6- Veerya:**  
Etymological derivation, definition and Swarupa of Virya, Number of Virya.  
(Dwividha & Ashtavidha), Panchabhauthikatva  
Virya karmani (Effects of Virya), General principles in determination of virya along with exceptions.

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**7- Prabhava:**

Definition, Effects of Prabhava.

**8-** Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava with respect to their strength (balabal nirupana). Samanapratyayarabdha and Vichitrapratyayarabdha dravyas.

**9- Karma:**

Lakshana, swarupa and bheda of karma (Definition, nature and types of action).

Explanation of the following Karmas with examples:

- |                 |                |                 |
|-----------------|----------------|-----------------|
| 1. Deepana      | 2. Pachana     | 3. Samshodhana  |
| 4. Samshamana   | 5. Anulomana   | 6. Sransana     |
| 7. Bhedana      | 8. Rechana     | 9. Chhedana     |
| 10. Lekhana     | 11. Grahi      | 12. Sthambhana  |
| 13. Madakari    | 14. Pramathi   | 15. Abhishyandi |
| 16. Vyavayi     | 17. Vikashi    | 18. Rasayana    |
| 19. Vajeekarana | 20. Jeevaneeya | 21. Balya       |
| 22. Brimhana    | 23. Langhana   | 24. Medhya      |

**10.** Brief information on Karmas of dashemani gana of Charak Samhita.

**11- Mishraka Gana:**

11a)- Audbhida Gana (Vegetable origin) Brihatpanchamoola, Laghupanchamoola, Vallipanchamoola, Kantakapanchamoola, Trinapanchamoola, Madhyamapanchamoola, Jeevaneeya panchamoola, Panchapallava, Panchavalakala, Triphala, Trikatu, Trimada, Chaturusana, Panchakola, Shadusana, Chaturbeeja, Jeevaniya gana, Ashtavarga, Trijataka, Chaturajataka, Katuchaturjataka Panchatikta, Amlapanchaka, Chaturbhadra, Trikarshika, Swalpatriphala, Madhuratriphala, Mahavisha, Upavisha, Agrya aushadh varga- Knowledge of Agrayaaushadha Varga with example.

11 b)- Jangama Gana (Animal origin)- Ksheerashtaka, Mutrashtaka, Pitta panchaka.

11 c)- Parthiva Gana (Mineral origin) - Lavana Panchaka, Kshara dvaya, Kshara Ashtaka.

**12- Basis of nomenclature:**

Basis of nomenclature of dravya, Basis and Derivation of synonyms.

**13.** Bheashaja Pariksha vidhi (as described in Charaka samhita vimana sthana 8), Dravya Sangrahana (collection of dravya)- Ecology- Classification of desha (geographical area) and bhumi (soil), swarupa of sangrahaniya dravya of (Nature and quality of drug to be collected). Sangrahana vidhi (Method of collection) -Vegetable and Animal origin drugs according to part used. Period of collection according to virya, samrakshana vidhi (preservation of collected dravyas), bheshajagara (Storehouse), study on different prayojyanga (useful plant parts).

**Part B****50 Marks****(I)****20 Marks**

14 a) Concept of dravya shodhan (purification of dravya).

14 b) Brief knowledge of Apamishran (adulterants)

14 c) Concept of Abhava pratinidhi dravya (substitutes)

**15-** Prashasta bsheshaja (ideal drug), plant extracts. Concept of viruddha Dravya (incompatibility of the dravya).

**16-** Introduction to Nighantu Vigyan - Dhanwantari Nighantu, Bhavaprakashanighantu, Rajanighantu.

**17-** Brief knowledge of cultivation, conservation of medicinal plants and information about endangered species.

**(II)****30 Marks**

**18.** - Introduction, Definition & scope of Pharmacology and Principles of general Pharmacology. Brief Knowledge about pharmacology of the following - Anaesthetics, CNS depressants, Sedatives, Hypnotics, Tranquilisers, Antipyretics, Analgesics, Antiepileptics, Antihypertensive, Antianginal, Antiplatelet, Hypolipidaemic, Haemopoetic, Coagulants, Bronchodilators, Aerosols/ Inhalants, Expectorants, Digestants, Carminatives, Antacids, Antiulcer, Laxatives, Antidiarrhoeals, Antiemetic, Hepatoprotective, Diuretic, Antidiuretic, Lithotriptic, Antiinflammatory, Hormonal therapy, Antiobesity, Antidiabetic, Antithyroid, Oxytocic. Galactagogues, Contraceptives, Styptics, Antihistamines, Antimicrobial, Antibiotics, Antimalarial, Amoebicidal, Antifilarial, Anthelmentic, Antifungal, Vitamins, Minerals, Water imbalance and IV fluids, Vaccines, antivenom, antirabbies serum, Local anti septics, drugs in ophthalmic practice, Anti cancer drugs and immunomodulators.

**Paper II****100 Marks****Part A****70 marks****1-Detailed Knowledge of Following Dravya –**

1- Detailed knowledge of following drugs with respect to Basonym of drug, Main Synonyms, Regional Name, Botanical Name, Family, Classification of Dravya (Gana) as described in Charak and Sushrut, External morphology, Useful parts, Important phytoconstituents, Rasa panchaka, Action on Dosha, Dhatu, Mala, Prayogarha vyadhi (therapeutic indications), Amayikaprayoga and Matra (Therapeutic administration and Dose), Vishishta yoga (names of important formulations), Vishakta Lakshan (adverse effects), Chikitsopachara (remedial measures) and Shodhana (as required)

[Alphabetical order and Botanical names to all the drugs are to be added]

Agaru	Guggulu	Pashanabheda
Agnimantha	Haridradvaya	Patala
Agnimantha	Haritaki	Pippali-Pippalimula
Ahiphena	Hingu	Prishniparni
Amalaki	Jambu	Punarnava
Apamarga	Jatamansi	Pushkarmoola
Aragvadha	Jatiphal	Rasna
Aragvadha	Jeerakadvaya	Rasona
Ardraaka-Sunti	Jyotishmati	Rohitaka
Arjuna	Kalamegha	Saireyaka
Arjuna	Kampillaka	Sarivadvaya
Arkadvaya	Kanchanara	Sarpagandha
Ashvagandha	Kantakari	Shalaparni
Asoka	Kapikacchu	Shallaki
Ativisha	Karkatakshringi	Shalmali
Bakuchi	Karpura	Shankhapushpi
Baladvayam.	Katuki	Shatavari
Bhallataka	Khadira	Shigru
Bharangi	Kiratatikta	Shirisha
Bhrungaraj	Kumari	Shyonaka
Bibhitaka	Kumkum Kesara	Talisa Patra
Bijak/ Vijaysar	Kupilu	Tila
Bilva	Kushta	Trivrut
Brahmi	Kutaja	Tulasi
Bruhati	Lavanga	Tvak
Chandanadvaya,	Lodhra	Ushira
Chitraka	Madanaphala	Vacha
Dadima	Mandukaparni.	Varahi
Devadaru	Manjishtha	Varahi
Dhataki	Maricha	Varuna
Durva	Musta	Vasa
Eladvayam	Nagakeshara	Vatsanabha
Eranda	Nimba	Vidanga
Gambhari	Nirgundi	Vidari
Gokshura	Palasha	Yastimadhu
Guduchi	Parpata	Yavani

### Part B-

**II-** Brief Knowledge of following dravyas with Respect to Sanskrit Name, Botanical Name, Family, Habit (Samanya Swarupa), Parts Used and Indications.

Agastya	Jati	Palandu
Ajamoda	Jayapala	Parasika Yavani
Akarkarabh	Jeevanti	Parijata
Amlavetasa	Kadali,	Parisha
Amra	Kadamba	Parnabija

Amragandhiharidra	Kaidarya	Parnayavani
Ankola	Kakamachi	Parpataka
Aparajita	Kamala	Parushaka
Ashvagol	Kankola	Patalagarudi
Ashvattha	Karanja	Patha
Asthishrunkhala	Karavellaka	Patola
Atasi	Karavira	Patranga
Avartaki	Karira	Pilu
Avartani	Karpasa	Plaksha
Babbula	Kasamarda	Prasarani
Badara	Kasha	Priyala
Bakula	Kasni	Priyangu
Bhumyamalki	Kataka	Puga
Bijapooru	Katphala	Putiha
Bola	Kebuka	Putranjivaka
Chakramarda	Kharjura	Rajika/Sarshapa
Champaka	Kitmari	Rohitaka
Chandrashura	Kokilaksha	Saptachakra
Changeri	Koshataki	Saptaparna
Chavya	Kulatha	Saral
Chirbilva	Kumuda	Sarja
Chopachini	Kusha	Shala
Danti	Kusmanda	Shara
Darbha	Lajjalu	Sharapunkha
Dattura	Langali	Shatahwa
Dhanvayasa	Latakaranja	Shati
Dhanyaka	Latakasturi	Snuhi
Draksha	Madayantika	Sringataka
Dronapushpi	Mahanimba	Svarnakshiri
Gandhaprasarini	Mandukaparni	Tagara .
Garjara	Markandika	Tailaparni
Gojihva,	Masha	Talmuli
Gorakshaganja	Mashaparni	Taruni
Gunja	Matulunga	Tavakshira
hinsapa	Mayaphala	Teja Patra
Hinstra	Meshashrungi	Tuvaraka
Hribera	Methika	Udumbara
Hrutpatri	Mudgaparni	urana
Ikshu	Mulaka	Vamsha
Indravaruni	Murva	Vata
Ingudi	Nagabala	Vatada
Irimeda	Nala	Vrudhadaru
Ishvaku	Narikela	Vrukshamla
Isvari	Nili	
Japa	Padmaka	

**III .-**Introduction, Guna, Karma and Uses of following Jantava Dravya (Drugs of Animal Origin).

1. Kasturi

2. Gorochana

3. Mrigasringa

**IV- Introductory Knowledge of Following Annapana Varga:**

- |                |                     |                      |
|----------------|---------------------|----------------------|
| 1. Jala Varga  | 2. Dugdha Varga     | 3. Madhu Varga       |
| 4. Taila Varga | 5. Sukadhanya Varga | 6. Shamidhanya Varga |
| 7. Phala Varga | 8. Shaka Varga      | 9. Mamsa Varga       |
| 10. Aharayogi  |                     |                      |

**PRACTICALS**

1. A. Study of Macroscopic, Microscopic characters and Demonstration of organoleptic characteristics and grahya-agrahyatva of following plants and their useful parts.
  - i. Kanda (stem) - Guduchi or Ashtishrinkhala
  - ii. Patra (leaves) - Vasa or Kumari
  - iii. Pushpa (flower and Parts of flower)- Dhataki or Japa
  - iv. Phala (fruit) – Maricha or Madanaphala or Vidanga
  - v. Beeja (seeds) – Eranda or Kapikacchhu
  - vi. Twak (bark) – Kutaja or Arjuna or Ashwattha
  - vii. Moola(Root)- Punarnava or Chitraka
  - viii. Niryasa (exudate) – Guggulu or Mocharasa
  - ix. Jangama dravya - Madhu or Ghrita.
2. Records of Herbarium sheets of 50 medicinal plants Compulsory study tour other state/s for field knowledge and procurement of plant species.

**PRACTICAL MARKS DIVISION**

1	Herbarium	20 Marks
2	Practical record	20 Marks
3	Drug identification- spotting –Raw/crude drugs	30 marks
4	Plant identification spotting –fresh	30 marks
5	Practical	40 marks
6.	Viva-Voce	60 Marks
<b>Total</b>		<b>200 marks</b>

**Reference Books**

- 
- |     |   |   |  |
|-----|---|---|--|
| 1.  | Abhinav Buti Darpan (Vol.1-2)                           | - | Vd. Roop Lal Vaishya                                   |
| 2.  | Aushadna Vigyna Shastra                                 | - | Acharya Pt. Vishvanatha Dwidevi                        |
| 3.  | Ayurvediya Aushadnkarma vigyana                         | - | Acharya V.J. Thakur                                    |
| 4.  | Bedi Vanaspati Kosha                                    | - | Prof. Ramesh Bedi                                      |
| 5.  | Bhaishajyaguna Vigyana                                  | - | Dr. Alakhnarayan Singh                                 |
| 6.  | Bhav Prakash Nigantu (English)                          | - | Shreekanthamurti                                       |
| 7.  | Bhav Prakash Nighantu                                   | - | With Vd. Krishna Chandra<br>Chunekar commentary        |
| 8.  | Bhrinad dravyagunadarsha                                | - | Mahendra Kumar Shastri                                 |
| 9.  | Classical Uses of Medicinal Plants                      | - | Acharya Priyavrata Sharma                              |
| 10. | Controversial Medicinal Plants                          | - | Vd. G. Bapa Lal  |
| 11. | Dalhana Ka Dravyaguna Shastra Ke<br>Kshetra Me Yogadana | - | Vd. Shiv Kumar Vyas                                    |
| 12. | Dravyaguna Kosha  | - | Acharya Priyavrata Sharma                              |
| 13. | Dravyaguna Sutram                                       | - | Acharya Priyavrata Sharma                              |
| 14. | Dravyaguna Vigyana                                      | - | Dr. Gyanendra Pandey                                   |
| 15. | Dravyaguna Vigyana(Vol. 1-2)                            | - | Acharya Yadavji Tikram Ji                              |
| 16. | Dravyaguna Vijyana                                      | - | Dr. V.M. Gogate  |
| 17. | Dravyaguna Vigyana (Vol. 1-5)                           | - | Acharya Priyavrata Sharma                              |
| 18. | Dravyaguna Shastrum                                     | - | Vaidya G.A. Phadake                                    |
| 19. | Dravyaguna Vijyana                                      | - | Dr. A.P. Deshpande                                     |
| 20. | Dravyagunavijnana basic Principles                      | - | Prof.D.S.Lucas   |
| 21. | Forgotten Healers (Indian Medicinal<br>Plants)          | - | Dr. Prakash Pranjape                                   |
| 22. | Glossry of Vegetable Drugs in<br>Bhrittrayis            | - | Thakur Balwant Singh & Vd.<br>Krishna Chandra Chunekar |
| 23. | Introduction to Dravyaguna                              | - | Acharya Priyavrata Sharma                              |
| 24. | Kriyatamka Aushadi Parichaya                            | - | Acharya Pt. Vishvanath Dwidevi                         |
| 25. | Materia Medica  | - | Acharya Ghosh  |
| 26. | Nighantu Adarsh (Vol. 1-2)                              | - | Vd. Bapa Lal   |
| 27. | Pharmacological basis of Medical<br>Practice            | - | Goodman & Gillman                                      |
| 28. | Pharmacology and<br>Pharmacotherapeutics                | - | Satoskar Bhandarkar & Ainapure                         |
| 29. | Prayogatamaka Dravyaguna Vigyana                        | - | Dr. Maya Ram Uniyal                                    |
| 30. | Priya nighantu  | - | Acharya Priyavrata Sharma                              |
| 31. | Raspanchaka/Dravyaguna Siddhanta                        | - | Prof. Shivcharan Dhyani                                |
| 32. | System of Plant Nomenclature in<br>Ayurveda             | - | Dr. Gyanendra Panday                                   |
| 33. | Text Book of Pharmacognosy                              | - | Trees & Valis  |
| 34. | Textbook of Dravyaguna                                  | - | Dr.K.Nishteswar  |
| 35. | Unani Dravyaguna Vigyana                                | - | Hakim Daljeet Singh                                    |

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- |     |   |   |                           |
|-----|---|---|---------------------------|
| 36. | Useful parts of Charaka, Sushurut,<br>and Vagbhata. | - |                           |
| 37. | Uttarakand Ki Vanaspatiya                           | - | Dr. Gyanendra Pandey      |
| 38. | Vanoaushadi Darshika                                | - | Thakur Balwant Singh      |
| 39. | Vanoaushadi Nidarshika                              | - | Dr. Ram Sushil Singh      |
| 40. | Vedic Vanaspatiyan                                  | - | Dr. Dinesh Chandra Sharma |

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**Theory Two Papers – 100 Marks Each**  
**Practical/Viva voce – 100 Marks**

PAPER -1

100 Marks

**Part A****50 Marks****I. Dosha Dushyadi Vigyan**

1. Definition and importance of Roganidana.
2. Samanya Nidana and Samanya Lakshana of Dosha Vriddhi, Kshaya and Prakopa.
3. Dosha Dhatu Ashraya Ashrayi Bhava.
4. Dhatu Kshaya Vriddhi Lakshana.
6. Mala Kshaya Vriddhi Lakshana.
7. Hetu, Bheda and Lakshana of Agni Dushti.
8. Definitions and Samanya Lakshana of Ama.
9. Sama and nirama Dosha, Dushya Lakshana.
10. Dosha Paka and Dhatu Paka Lakshana.
11. Concept, classification, diagnosis and general complications of Avarana.
12. Doshagati and Rogmarga.
13. Detailed study of Srotomoola and Srotodushti Samanya and Vishishta Hetu Lakshana of all Srotas. Differences between Sroto Dushti and Kha Vaigunya.

**II. Vyadhi Vigyan**

1. Definition, synonyms and classification of Vyadhi & Vyadhi Ghatak.
2. Criteria for nomenclature of Diseases in Ayurveda (Vyadhinamakarana).
3. Bija, Bija Bhaga and Bija Bhaga Avayava Dushti.
4. Basic knowledge of Hereditary, Congenital, Acquired, Multifactorial, Traumatic and Environmental disorders.
5. Introduction to ICD Classification of Diseases of WHO and DSM classification.
6. Samanyaja and Nanatmaja Vikara. NidanarthakaraVyadhi, Hetu Sankara, Lingasankara, Vyadhisankara, Vyadhi Awastha.
7. Dhatu, Updhatu, Mala and Indriya Pradoshaj Vikara.
8. Concept of AshtaMahagada .
9. Introduction to Ashta Nindita.
10. Definition and classification of Vyadhikshamatva.
11. Ojas – types of Ojo Dushti- Visrimsa- Vyapad & Kshaya & It's Diseases.

**III. Basic Pathology**

1. Introduction to pathology and its sub-divisions.
2. Introduction to Cell Injury and Cellular adaptations.
3. Definition and brief description of inflammation – Healing/repair.
4. Definition and brief description of edema – shock – hemorrhage, Thrombosis , embolism, Ischemia and Infarction.
5. Types of Immunity – different types of immune responses in the body – Basic knowledge of auto immune diseases, Acquired immune deficiency disease and hypersensitivity.
6. Nomenclature and classification of tumors - difference between benign and malignant tumors.

7. Introduction to Nutritional disorders – disorders of macro and micro nutrients.
  8. Introduction to infections.
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9. Introduction and classification of microorganisms such as virus- bacteria-fungus.

**Part B**

**50 Marks**

**IV. Nidana Panchaka Vigyana**

1. Difference between Roga and Rogi Pariksha.
2. Importance of Nidan Panchaka.
3. Hetu - Definition, Synonyms and Classification.
4. Purva Rupa – Definition, Synonyms, Samanya and Vishishta Purvarupa.
5. Rupa - Definition, Synonyms, Samanya and Pratyatma Lakshana. Difference between Vyadhi and Lakshana.
6. Upashaya / Anupashaya– Definition, Types and its importance in diagnosis.
7. Samprapti – Definition, Synonyms and Type and Samprapti Ghataka.
8. Shat Kriyakaala. Relationship between Nidana Panchaka and Shat Kriyakaala.
9. Upadrava and Udarka.
10. ArishtaVigyan – Definition, Types and its importance.
11. Sadhyasadhyatwa – Types, their parameters and importance.
12. General diagnostic principles of AnuktaVyadhi (Ch. Vi. 4).

**V. Pariksha Vigyana**

1. Importance and knowledge of Aptopadeshadi & Darshanadi Trividha, Chaturvidha, and Shadvidha Pariksha.
2. Importance and Knowledge of Ashtasthana Pariksha.
3. Importance and Knowledge of Karanadi Dashavidha Parikshya Bhava.
4. Importance and Knowledge of Dashavidha Pariksha.
5. Basic knowledge of ECG, USG, X Ray, CT Scan, MRI.

**Paper II**

**100 Marks**

**Part A**

**50 Marks**

Systematic study of Nidana Panchaka of following diseases (Including Upadrava, Arishta and Sadhyasadhyata).

**I. Diseases of Rasavaha Srotas**

- 1(a) Jwara(Jwarabheda-Ama, Pachyamana and Nirama Jwara,Agantukajwara, Punaravartaka Jwara,Vishama Jwara, Dhatugata Jwara, Charakokta Sannipata Jwara.
- 1(b) General mechanism of Fever, Introduction to the Aetiopathogenesis of Malaria,Typhoid, Dengue fever, Influenza and Chikungunya.
- 2(a) Pandu, Amavata, Hridroga, Shotha.
- 2(b) Introduction to Anaemia & its Classification, Rheumatic fever, Rheumatoid Arthritis, Hypertension, Angina, Ischaemic Heart Disease, Myocardial Infarction and CCF.

**II. Diseases of Raktavaha Srotas**

1. Kamala - Raktapitta - Vatarakta – Kroshtuksheersha - Shitapitta – Maha Kushtha – Visarpa – Shwitra and Introduction to Kshudra Kushtha.
2. Introduction to Hepatomegaly, Spleenomegaly, Leukaemia, Thalessemia, Sickle cell Anaemia.
3. Introduction to Urticaria, Psoriasis, Eczema, Pemphigus.

**III. Diseases of Mamsavaha Srotas**

- (a) Galganda
- (b) Introduction to Thyroid disorders

**IV. Diseases of Medovaha Srotas**

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1. Sthoulya - Karshya – Prameha.
  2. Introduction to Obesity and Diabetes Mellitus.

**V. Diseases of Asthi – Majjavaha Srotas**

1. Vatavyadhi - Akshepaka - Apatanaka - Ardita - Pakshaghata – Gridhrasi –Vishwachi, Avabahuka, - Manyasthambha ,Katigraha,Pangutwa
2. Sandhigatavata, Asthi-Majjagata vata.
3. Introduction to Osteo- Arthritis, Osteoporosis.
4. Introduction to Parkinson’s disease, Stroke, Lumbago- Sciatica syndrome, Bell’s Palsy, Cervical- Lumber & Ankylosing Spondylitis.

**VI. Diseases of Shukravaha Srotas**

1. Introduction to Klaibya and Vandhyatva.
2. Introduction to male and female infertility.

**Part B**

**VII. Diseases of Pranavaha Srotas**

- 1(a). Kasa - Shwasa - Hikka – Urahkshata – Shosha – Rajayakshma.

**50 Marks**

1(b). Introduction to the aetiopathogenesis of Pneumonia, Pleural effusion, Bronchitis, Bronchiectasis, Bronchial Asthma.

#### **VIII. Diseases of Annavaha- PureeshavahaSrotas**

1. Agnimandya - Ajirna - Aruchi- Chhardi - Amlapitta- Shoola – Parinama Shoola – AnnadravaShoola- Atisara – Pravahika - Grahani –Gulma- Udara Roga.
2. Introduction to Anaha, Adhmana, Atopa, Visuchika Alasaka, Vilambika.
3. Introduction to Peptic Ulcer, Irritable Bowel Syndrome (IBS) Diarrhoea, Dysentery, Constipation, Inflammatory Bowel Diseases.

#### **IX. Diseases of Udakavaha Srotas**

- 1(a) Introduction to Trishna, Daha.
- 1(b) Introduction to water and electrolyte imbalance disorders.

#### **X. Diseases of Mutravaha Srotas**

- 1(a) Mutrakrichha – Mutraghata.
- 1(b) Introduction to Urinary Tract Infection, Nephropathies.

#### **XI. Diseases of Swedavaha Srotas**

- 1(a) Introduction to Khalitya, Palitya.

#### **XII. Diseases of Manovaha Srotas**

- 1(a) Apasmara, Unmada, Atatwabhinivesha-Vishada, Anidra, Mada, Murchha, Sanyasa.
- 1(b) Introduction to Epilepsy, Depression, Anxiety neurosis.

#### **XIII. Upasargajanya Vyadhi (Communicable diseases)**

- 1(a) Romantika – Masurika – Upadamsha – Phiranga.
- 1(b) Introduction to Measels, Chickenpox, Leprosy, Tuberculosis and AIDS.

#### **XIV. Krimi Vigyana**

- 1) Definition, classification of Krimi and features of Krimiroga
- 2) Snayuka, Shleepada.
- 3) Introduction of Filariasis and classification of common parasites.

### **PRACTICAL**

**(100 Marks)**

#### **i) Fundamental Principles of Laboratory Tests**

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Introduction to laboratory, Sterilization, glass wares, solutions reagents and safety procedures, Disposal of biomedical wastes.

#### **ii) Haematology**

- 1 Haemoglobin estimation.
- 2 Blood cells counting - WBC, RBC, platelets.
- 3 Hematocrit /Packed cell volume (PCV).
- 4 Erythrocyte indices - MCV, MCH, MCHC.
- 5 Peripheral blood smear, staining technique and differential leucocyte count.
- 6 Peripheral blood film examination in Anemia, Leukemia, Malaria, Filariasis (Demonstration).
- 7 ESR.
- 8 Screening test for bleeding disorders- bleeding time (BT), Clotting time (CT), Demonstration of Prothrombin time (PT).
- 9 Blood grouping - ABO system, Rh typing (Rhesus system).

#### **iii) Urine Examination**

1. Ayurveda anusara mutrapariksha.
2. Physical Examination - Volume, Reaction (Ph) & Specific Gravity.

3. Chemical Examination for - Proteins, Glucose, Phosphate, Ketone, Bile salts, Bile pigment.
4. Dipstick examination
5. Demonstration of Microscopic Examination.

**iv) Stool Examination**

- 1 Ayurveda anusara purishapariksha.
- 2 Physical examination, Sama-Nirama Pariksha.
- 3 Microscopic examination of ova & cyst (Demonstration)
- 4 Occult Blood Test.

**v) Demonstration of Sputum Examination**

- 1 Ayurveda anusara sthivanapariksha.
- 2 Physical, Chemical and Microscopic Examination of the sputum.
- 3 Sample collection and Demonstration of AFB.

**vi) Demonstration of Semen examination**

- 1 Ayurveda anusara Retaspariksha.
- 2 Semen examination.

**vii) Biochemical Examination – (Demonstration)**

Blood Glucose, Serum Bilirubin, Blood Urea, Lipid Profile, Serum Creatinine, Serum Uric acid etc.

**viii)** Demonstration of different staining techniques in microbiology.

**ix)** Demonstration of Sero-immunological Investigations: RA and Widal.

**x) Laboratory record** – maintenance of laboratory record book.

**Bed side Practical (Clinical Methods)**

1. Introduction and demonstration of clinical methods (General and Systemic Examination).
  2. Practical demonstration of examination of Roga based on Pancha Nidana.
  3. Demonstration of instruments used for clinical examination.
  4. Practical records of clinical examination of at least 20 long cases in I.P.D including Aturbala-pramana pareeksha.
  5. Practical records of clinical examination of at least 20 short Cases based on Ashta vidha pariksha in O.P.D.
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6. Demonstration of ECG, USG and Radio imaging techniques.

### **Distribution of Marks for final Practical Examination**

1. Daily Record -10 Marks
2. Identification of Instruments -10 Marks
3. Laboratory Experiments -20 Marks
4. Short Case -10 Marks
5. Long Case -20 Marks
6. Viva - Voce -30 Marks

**Total 100 Marks**

### **Reference Books**

1. Madhava Nidana (Madhukosha Pt. Yadunandan Upadhyay Commentary) Part 1 – 2
2. Doshakaranatwa Mimamsa - Acharya P.V. Sharma
3. Nadi Darshan - Vd. Tara Shankar Mishra
4. Nadi Vigyana Vidyotini Hindi Tika
5. Nadi Vigyan- Shri Satya Dev Vashisht
6. Nadi Vigyan- Gangadhar Tika
7. Rogi Pariksha vidhi Acharya- Priyavrata Sharma
8. Ayurvediya Roga Vargikaran- Vd. Ramanath Dwivedi & Vd. Gurdip Singh.
9. Ayurvediya Nidan Evum Chikitsa Ke Siddhanta - Prof. Ram Harsh Singh.
10. Relevant portions of Charak Samhita, Sushrut Samhita and Vagbhata.
11. Text Book of Pathology- William Boyds.
12. Text Book of Pathology- Harsh Mohan.
13. Text Book of Pathology- Dey and Dey.
14. Text Book of Parasitology -Ramnik Sood.
15. Clinical Pathology and Bacteriology- S.P. Gupta.
16. Clinical methods in Ayurveda- K. R . S. Murthy.
17. Parameswarappa's Ayurvediya Vikriti Vigyan and Roga Vikriti Vigyan-Dr. P.S. Byadgi.
18. Oxford Handbook of Clinical Examination Oxford Handbooks and Practical Skills.
19. Advanced Clinical Evaluation System for Practical Assessment of Clinical Examination Skills.
20. Symptoms & Signs in Clinical Medicine - Chamberlains.
21. Clinical Methods- Hutchison's.
22. Bedside Clinics in Medicine Part- I & II-Kundu.
23. Common Medical Symptoms- Mehta.
24. Advances in Pathology & Lab Med- Weimstean, Gralem, Anderson, Cortan, Wick, Zumwelt.
25. Clinical Laboratory medicine Edited by Kenneth D Mc. Chately.
26. General Pathology- Walter & Israel Churchill Living stone.
27. A Comprehensive Dictionary of Pathology- Chris Newann.
28. Practical Pathology- Dr. K. Uma Chaturvedi.
29. Clinical examination- Douglas/Macleod's.
30. Pathology Practical book for Undergraduates- Harsh Mohan.
31. Medical Laboratory Technology - R. Sood.
32. Clinical Diagnosis and Management by Todd, Sanford and Davidson Laboratory methods
33. Clinical Hematology In Medical Practice- Degruchy's.
34. Robbins Basic Pathology- Kumar, Abbas, Fausto et al.

## 2.3. Rasashastra Evam Bhaishajyakalpana

(IATROCHEMISTRY AND AYURVEDIC PHARMACEUTICS)

Theory -Two PapersTotal

Marks- 200 Teaching

hours-200

Practical :-

Total Marks-200 Teaching

hours-200

### RASASHASTRA

Paper 1

100 Marks

Part A

50 Marks

1. Definition and etymology of Rasa, History of Rasashastra, Importance of Rasaushadhi, Concept of Rasa-Rasayana, Concept of Raseshwar Darshana. Concept of Rasashala and Rasamandap.
2. Brief Description and Application of Technical terminologies (Paribhasha): Avapa, Nirvapa, Dhalana, Bhavana, Jarana, Murchana, Shodhana, Marana, Amrutikarana, Lohitikarana, Mruta Loha, Satwa Patana, Druti, Apunarbhava, Niruttha, Rekhapurna, Varitara.
3. Dravya Varga: Amlavarga, Panchamrittika, Panchagavya, Panchamrita, Ksharashtaka, Dravakagana, Mitra panchaka, Rakta varga, Lavanapanchaka.
4. Brief description of Yantras and their application Ulukhala Yantra, Khalwa Yantra, Kachhapa Yantra, Damaru Yantra - Vidhyadhara Yantra- Urdhwapatan, Addhapatan & Tiryakpatana Yantra, Jaranartha Tulayantra, Dolayantra, Patalayantra, Palika Yantra, Baluka Yantra, Bhudhara Yantra, Sthali Yantra, Swedana Yantra.
5. Brief description & application of Musha (Crucible): Samanya Musha, Gostani musha, Vajra Musha, Maha musha, Yoga musha, Vrintaka Musha, Malla / Pakwa musha. Different types of crucibles e.g. Silica crucible, platinum crucible. Mudra and Sandhi Bandhana.
6. Brief description & applications of Chullika, Satwapatana Koshthi, Patala Kosthi, Gara Koshthi, Angarakoshthi and knowledge of various heating appliances viz. Gas stove, Hot plate, Heating mantle, Induction Stove, Hot Air Oven.
7. Concept, definition and types of Puta: Suryaputa, Chandraputa, Gomayaputa, Lawakaputa, Kukkutaputa, Kapotaputa, Varahaputa, Gajaputa, Mahaputa, Kumbhaputa, Valukaputa, Bhudharaputa, Applications of Electric muffle furnace and fuel (diesel)dependent furnace. Brief introduction to thermocouple and pyrometer.
8. Knowledge of Parada: Synonyms, Occurrence, natural and artificial sources of Parada, Hingulottha parada, Types of Parada, Parada Dosha: Naisargika, Yougika, Aupadhika



(Kanchuka). Grahya-Agrahya Parada, Parada gati, Parada bandha, Shodhana of Parada. Parada sanskara and brief description of Ashtasamskara.

9. Concept of Murchhana and Jarana of Parada, Preparation of Kajjali, Classification of Rasaushadhi: Khalvi rasa e.g. Tribhuvana Keerti Rasa, Parpati Rasa- Rasa Parpati, Kupipakva Rasa- Rasa sindur, Pottali rasa - Hemagarbha pottali. Rasa sevana vidhi and pathya and apathya.
10. Brief introduction of quality control , standardization and GMP of Rasaoushadhies.

## Part B

50 Marks

Occurrence, Synonyms, Minerological identification, Sources, Types, Grahya and Agrahyata, Shodhana, Marana and other processing techniques. Properties, dose, anupan and therapeutic uses, pathya – apathya and ashuddha, apakwa and avidhee sevanjanya dosha and its management, important formulations of the following:

1. **Maharasa** –Abhraka (Biotite Mica), Vaikrantha, Makshika (Chalco-pyrite), Vimala (Iron Pyrite), Shilajatu, Sasyaka (Peacock ore), Chapala and Rasaka (Sphalerite).
2. **Uparasa** – Gandhaka (Sulfur), Gairika (Red Ochre), Kasisa (Green Vitriol), Kankshi (Alum), Haratala (Orpiment), Manahshila (Realgar), Anjana and Kankustha.
3. **Sadharana Rasa** – Kampillaka, Gauri pashana (Arsenic oxide), Navasadara (Ammonium chloride), Kaparda (Cowry), Agnijara, Giri Sindura (Red oxide of Hg), Hingula (Red Cinnabar) and Mriddara shringa (Litharge).
4. **Dhatu** -Swarna (Gold), Rajata (Silver), Tamra (Copper), Loha (Iron), Vanga (Tin), Naga (Lead), Yashada (Zinc), Kamsya (Bronze), Pittala (Brass), Vartaloha. Dhatu -graha sambandha.
5. **Ratna** - Manikya (Ruby), Mukta (Pearl), Pravala (Coral), Tarkshya (Emerald), Pushparaga (Topaz), Vajra (Diamond), Nilam (Sapphire), Gomeda (Zircon or Cinnamone stone), Vaidurya (Cats eye). Ratnapariksha, Ratnadosha, Ratna-graha sambandha.
6. **Uparatna**- Vaikranta (Tourmaline), Suryakanta (Sun stone), Chandrakanta (Moon stone), Rajavarta (Lapis lazuli), Perojaka (Turquise), Sphatikamani (Quartz), Trinakanta, Palanka, Putika, Rudhir.
7. **Sudha varga** – Sudha (Lime stone ), Kaparda (Cowries), Shukti (Oyster Shell) , Shankh (Conch Shell), Mriga shringa (Stag horn), Khatika, Godanti (Gypsum) and Samudraphena (Cattle Fish bone), Kukkutanda twak (Hen's Egg Shell).
8. **Sikata varga** - Sikata (Silica), Dugdhapashana (Talc), Nagapashana / Jaharmohara (Serpentine), Badarshama (silicate of lime), Vyomashma (Sangeyashab - Jade),

Kousheyashma (Asbestos) and Akika (Agate).

**9. Kshara varga** - Sarja kshara (Sodium bicarbonate), Yava kshara, Tankana kshara (Borax), Surya Kshara (Potassium Nitrate).

**10. Miscellaneous** - Mandura, Bola, Dam-ul Akhawayan (Raktabandhini), Kasturi, Bhoonag, Mayurpiccha, Sarjarasa, Madhoochishta.

**11. Visha and Upavisha**-Introduction, collection and storage, classification, synonyms, shodhana, antidote, therapeutic and toxic doses, anupan, therapeutic uses, and formulations of following Visha and Upavisha-Vatsanabha, Kuchala, Jayapala, Dhattura, Bhanga, Bhallataka, Gunja, Arka, Snuhi. Langali, Karaveera, Ahiphena and Chitrakmool.

**12. Aushadhi Yoga Gyanam- ingredients, manufacturing process, and bhesajprayogvidhi.** Arogya Vardhini Gutika, Kasturibhairava Rasa, Kumara Kalyana Rasa, Garbhapala Rasa, Chandraprabha Vati, Chandramrita Rasa, Pratapalankeshwara Rasa, Pravalapanchamrita Rasa, Anandbhairava Rasa, Yogendra Rasa, Laxmivilas Rasa, Vasantakusumakara, Vasantamalati Rasa, Brihat Vata Chintamani Rasa, Shankha vati, Shwaskuthara Rasa, Hinguleswara Rasa, Hemagarbhapottali, Hridyarnava Rasa, Swarnavanga, Makaradhwaja, Putapakwavaisham Jwarantaka Loha, Vatvidhvamsan Rasa, Kamadugha Rasa, Laghusutshekhar Rasa, Navayasa Loha, Saptamrita Loha, Tamra Parpati, Panchamrita Parpati, Sveta Parpati.

**13. Introduction to pharamcovigilance and its status in India, with reference to Ayurvedic drugs.**

- A) Necessary to know - From part A and B : S. No. 1 to 9  
B) Desired to know - From part B : S. No. 10

## Practical

**100 Marks**

Minimum Twenty five practicals to be performed

- |           |                       |  |
|-----------|-----------------------|--|
| <b>1.</b> | <b>Rasa [Parada]</b>  | Samanya Shodhana of Parada<br>Kajjali<br>Mugdha rasa   |
| <b>2</b>  | <b>Maharasa varga</b> | Shodhana of Abhraka<br>Dhanyabhraka nirmana<br>Shodhana of Makshika<br>Shodhana of Shilajatu<br>Shodhana of Sasyaka. |

**3. Uparasa varga**

Shodhana of Gandhaka  
Shodhana of Gairika  
Shodhana of Kasisa  
Shodhana of Kankshi  
Shodhana of Haratala  
Rasa manikya nirman  
Shodana of Manashila

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<b>4.</b>	<b>Sadharana rasa varga</b>	Shodhana of Hingula Shodhana of Navasadar Shodhana of Kapardika
<b>5.</b>	<b>Sudha Varga</b>	Shodhana of Shankha Shodhana of Shukti Shodhana of Pravala mula Shodhana of Godanti
<b>6.</b>	<b>Dhatu varga</b>	Samanya Shodhana of Lauha Shodhana of Mandura Samanya Shodhana of Tamra Shodhana of Naga Shodhana of Vanga Shodhana of Yashada
<b>7.</b>	<b>Kshara Varga</b>	Shodhana of Tankana
<b>8.</b>	<b>Parpati</b>	Preparation of Rasaparpati, Bola Parpati and Swetaparpati
<b>9.</b>	<b>Visha varga</b>	Shodhana of Vatsanabha, Bhallataka, Kupilu, Dhattura beeja, Jayapala, Gunja, Chitrakamoola.

#### **PRACTICAL FOR DEMONSTRATION / GROUP PRACTICALS**

- 1.** Hingulad rasakrishti (Hingulottha Parada).
- 2.** Bhasma: 4 (One from each group)
  - i. Abhraka bhasma, Swarna Makshika bhasma, Tamra bhasma
  - ii. Vanga bhasma, Naga bhasma, Yashada bhasma
  - iii. Mandura bhasma, Kasisa bhasma
  - iv. Shankha bhasma, Kapardika bhasma, Godanti bhasma.
- 3.** Pishti : 1 Pravala pishti, Jaharmohara / Akika pishti,  
Trina kantha mani pishti, Mukta pishti.
- 4.** Druti : 1 Gandhaka druti.
- 5.** Formulations 4 (one from each group)
  - i. Rasasindura, Swarna vanga, Sameer pannaga rasa
  - ii. Saptamruta lauha, Punarnava mandura, Navayasa lauha
  - iii. Agnitundi vati, Tribhuvana kirti rasa, Sootshekhara rasa,  
Laghusutashekhara Rasa
  - iv. Arogyavardhini vati, Laghumalinivasanta rasa, Hinguleshwar rasa,  
Anandbhairav rasa, Rajapravartini vati

## BHAISHAJYAKALPANA

Paper II

100 Marks

**Part A**

**50 Marks**

- 1. History and Chronological (kramika vikasa) development** of Bhaishajyakalpana. Concept of Aushadha and Bhesaja.
- 2. Fundamental principles of Bhaishajya Kalpana.**
- 3. Study of Ancient and Contemporary systems of 'Maana' (Units of measurement), Shushka -ardra -drava- dravya grahan niyam (Rules of measures of dry, fresh, liquid drugs);** Grahyagrahyatva, Nava Puran dravya grahan niyam.
- 4. Guidelines and Methods of collection, storage, preservation of Aushadhi dravya.** Concept of Saviryatavadhi (shelf life) and stability in ancient and contemporary science.
- 5. Bhesajprayogavidhi : Aushadha Matra, Anupana and sahapan and Aushadh sevan kaala. (Posology).**
- 6. Panchavidha kashaya kalpana and Other kalpana :** Kashaya Yoni, Swarasa, Kalka, Kwatha, Hima and Phanta, Pramathya, Aushadha siddha paniya, Tandulodaka, Laksha rasa, Mantha, Panaka, Arka, Churna, Rasakriya, Ghana, Phanita, Avaleha, Prasha, Gudapaka, Sharkara, Syrups, Ksheerapaka, Satva, Guggulu kalpana, Vati, Gutti, Pinda, Modaka, Varti Preparation of Tablets, pills, capsule and Suppositories. Masi kalpana, Lavana kalpana, Kshara kalpana and Kshara sutra.
- 7. Introduction and general knowledge of useful instruments/ Equipments -** Disintegrator, Mixer, Grinder, End Runner, Edge Runner, Sieve-Shaker, Granulator, Tableting machine, Pill making machines, coating and polishing pan, capsule filling machine, sieves and mesh.
- 8. Sneha kalpana :** Sneha yoni, Types of Sneha, Sneha murchana vidhi, Sneha paka vidhi, patra paka, types and their use. Sneha siddhi lakshana, dose, Preparation and uses of Triphala Ghrita, Bramhighrita, Narayana taila, Anutaila.
- 9. Sandhana Kalpana and its types:** Madya Kalpana, Asava, Arishta, Sura (Prasanna - Kadambari - Medaka - Jagala - Bakkasa), Maireya, Surasava, Shukta, Kanjika, Sauviraka, Tushodaka, Sidhu kalpana their methods of preparation, siddhi lakshana, properties, uses, doses. Takrarishta, Draksharishta, Ashokarishta, Dashamoolarishta, Kumaryasava, Chandanasava.

- 10. Kritanna and Aushadhisiddha anna Kalpana:** Definition of Kritanna, Concept of Pathya and Apathya, Yavagu –types of yavagu, Manda, Peya, Vilepi, Anna, Bhakta, Odan, Yush –types, Krishara, Mansa rasa, Vesavara, Khad Kamblika, Raga, Shadava, Dadhi and Takra Varga – Takra, Udasvita, Katvar, Mathita, Chhachika.

## **PART B**

- 1. Bahyopacharartha kalpana (External Applications)-Lepa** -Types of Lepa, methods of preparation and mode of application. Udvartan and Avachurnan, Method of preparation of Siktha Taila, Malahara – Sarjarasa Malahara, Gandhak Malahara, Upanaha, Atasi upanaha, Shatadhouta and Sahastradhouta Ghrita. Brief introduction of semi solid dosage forms- Ointments, Creams, Emulsions, Gels, Lotions.
- 2. Principles and precautions for preparation of formulations for following:**
  - 2.1 Netraupacharartha kalpana (Ophthalmic preparations)** – Seka, Drava, Pindi, Anjana - Ashchyotana - Tarpana - Putapaka and Vidalaka, Methods of preparation of eye drops, eye ointments.
  - 2.2 Nasyopachararth Kalpana** - Classification of Nasya, Navana, Avapidana, Pradhaman, Marsha and Pratimarsha nasya.
  - 2.3 Dhumapanarth kalpana** - Classification of dhumpaana, Method of preparation of dhumvarti and it's therapeutic uses. Dhupan: Vranadhupan, arshodhupan.
  - 2.4 Mukhaprayogarth kalpana** - Gandoosha - Kavala - Pratisaran, Tooth paste, Tooth powders and Mouth wash.
  - 2.5 Basti kalpana**- Classification, Method of preparation of Niruha and Anuvasana, Basti Therapeutic properties and uses of Basti.
- 3** Brief knowledge of Standardization of Ayurvedic formulations- Kastaushadhi.
- 4** Brief introduction of Drug and Cosmetics Act 1940 and Rules 1945.
- 5** Concept of, Aushadhi Nirmanshala, with respect to Good Manufacturing Practices (GMP) in accordance to Schedule T.

## **Practical Bhaishajya Kalpana**

**50 Marks**

**Following practicals to be performed- (Minimum one from each category)**

Method of preparation, therapeutic uses, dose and anupana of the following

- 1.** Swarasa- Ardraka swarasa, Tulasi swarasa, Kumari Swarasa, Vasa putapaka swarasa
- 2.** Kalka- Nimba kalka, Rasona kalka.
- 3.** Kwatha- Punarnavasthaka kwatha, Rasna Saphthaka kwatha, Kulattha kwath.
- 4.** Hima- Dhanyaka hima, Sarivadi hima .
- 5.** Phanta- Panchakola phanta, Yastimadhu Phanta.

6. Pramathya- Mustadi pramathya
7. Mantha- Kharjuradi mantha
8. Aushadh siddha paniya- Shadanga paniya
9. Laksha Rasa.
10. Arka - Yavani arka, Gulab arka, Misreya arka
11. Panaka- Chinchapanaka, Chandan panaka.
12. Sharkara- Banapsha sharkara, Nimbu sarkara.
13. Churna- Sitopaladi Churna, Hinguwashtaka Churna.
14. Gutika- Chitrakadi Gutika, Sanjivani Vati.
15. Guggulu-Triphala Guggulu, Kaishora Guggulu.
16. Avaleha- Chyavanaprashavaleha, Vasavaleha, Vyaghri Haritaki avaleha, Manibadra avaleha.
17. Rasa kriya - Darvi Rasakriya, Guduchi Ghana, Kutaja Ghana.
18. Khanda- Haridra khanda, Narikela khanda, Sowbhagya shunti paka
19. Satva- Amruta satva,
20. Varti- Phala varti, Chandrodaya varthi
21. Lavana- Arka lavana, Narikela lavana
22. Masi- Triphala masi, Mayurpiccha Masi
23. Ksheerapaka- Arjuna ksheerapaka, Rasona ksheerapaka, Shunthi Ksheerapaka
24. Kshara- Apamarga kshara, Snuhi kshara, Ksharasutra. .
25. Manda, Peya, Vilepi, Yavagu, Krishra, Vesavara
26. Yusha - Mudga yusha, Saptamushtika yusha, Kulattha yusha
27. Aristha- Kutajarishta, Takrarishta .
28. Asava - Kumaryasava, Kanakasava
29. Sukta kalpana- Kanji
30. Udaka- Tandulodaka
31. Upanaha- Atasi Upanaha
32. Siktha Taila Nirmaan
33. Malahara- Sarjarasa malahara, Gandaka malahara, Cream, Emulsion. Sneha Kalpana  
Sneha Murchhana - Ghrita Murchana, Taila Moorchhana, Ghrita kalpana: Jatyadi ghrita, Triphala ghrita, ksheerashatphala ghrita- Taila kalpana-Panchaguna taila, Arka taila, Bala taila, Jatyadi taila
35. Taila patana- Bhallataka taila patana, Jayapala taila patana
36. Shodhana- Guggulu, Hingu.

## II. Visit of minimum three GMP approved Ayurvedic manufacturing units.

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**Distribution of Practical Marks: Total 200 MarksRasashastra -**

**100**

- |                |   |          |
|----------------|---|----------|
| 1. Record Book | - | 10 Marks |
| 2. Experiment  | - | 30 Marks |
| 3. Spotting    | - | 20 Marks |
| 4. Viva-voce   | - | 40 Marks |

**Bhaishajyakalpana - 100**

- |                |   |          |
|----------------|---|----------|
| 1. Record Book | - | 10 Marks |
| 2. Experiment  | - | 30 Marks |
| 3. Spotting    | - | 20 Marks |
| 4. Viva-voce   | - | 40 Marks |

**Reference Books**

- |   |                                |
|---|--------------------------------|
| 1. Adyatan Rasa Shastra                   | R.K. Goyal                     |
| 2. Abhinav Rasa Shastra                   | Vaidya Somadev Sharma          |
| 3. Asava Arishta Vigyanam                 | Dr. Pakshdhar Jha              |
| 4. Ayurvediya Rasa Shastra (Sachitra)     | Chandrabhusan Jha              |
| 5. Ayurvediya Rasa Shastra                | Badrinarayan Pandey            |
| 6. Rasa Bhaishajya Paribhasa              | Sureshananda Thapaliyal        |
| 7. Ayurvediya Rasa Shastra                | Prof. Siddhi Nandan Mishra     |
| 8. Ayurved Prakash                        | Vaidya Gujrat Mishra           |
| 9. Drugs and Cosmetic Act - 1940          |                                |
| 10. Paka Darpana                          | Dr. Indradev Tripathi          |
| 11. The Paka-darpana of King Nala         | Dr. Madhulika critical study   |
| 12. Parada Vigyaniam                      | Vasudev M. Dwivedi             |
| 13. Pratyaksha Aushadh Nirmanam           | Acharya VishwanathDwivdei      |
| 14. Bhaishjyakalpana Vigyanam             | Dr. Agnihotri                  |
| 15. Rasa Tarangini                        | Sadanand Sharma                |
| 16. Rasa Darpan                           | Prof. Bhajan Das Swami         |
| 17. Rasa Bindu                            | Dr. Sanjay Sharma              |
| 18. Rasa Bhaishajya Kalpana Vigyan Vaidya | Santosh Kumar Khandal          |
| 19. Rasa Mitra                            | Dr. Tryambak Nath Sharma       |
| 20. Rasa Ratna Samuchchaya (Hindi)        | Dattatreya Ananta Kulkarni.    |
| 21. Rasaratna samuchchaya-                | Ambikadatta shastri            |
| 22. Rasaratna samuchchaya -               | Damodar Joshi                  |
| 23. Rasa Shastra Prayogiki Srivastava,    | Yadav and Prof. Ramesh Saxena  |
| 24. Rasamritam                            | Vaidya Yadavji Tirkramji Achar |



25. Vaidyak Paribhasha Pradeep (Hindi Translation)
26. Sharangadhara Samhita
27. Bharatiya Bhaishajya Kalpana Vigyana
28. Bhaishajya Kalpana Vijnanam
29. Rasa Shastra (English)
30. Rasa Ratna Samuchchaya (English)
31. Rasendra Chintamani (Hindi)
32. Ayurvedic formulary of India 38. Ayurvedic Pharmacopiea of India , CCRAS
33. Bhaishjya Kalpana Vigyan
34. Textbook of Rasashasra
35. Ashadhayoga Vigyanam
36. Vaidyaka Paribhasha Pradipa (English Translation)
  
37. Relevant parts of Brihatrayee
38. Text book of Bhaishjya Kalpana -
39. Text Book of Rasa Shastra
40. Rasa Chandashu  
47 .Bhaishjya Ratnawali
41. 48 Yoga Ratnakar

- Dr. Indradev Tripathi  
Dr. Radhakrishna Parashar  
Gananath Vishwanath Dwivedi  
Dr. K Ramachandra Reddy  
Prof. Damodar Joshi  
Prof. Damodar Joshi  
Prof. Siddhinandan Mishra
- Siddhi Nandan Mishra  
Dr. K Ramachandra Reddy.  
Dr. K. Ramachandra reddy  
Dr. K. Ramachndra Reddy &  
i. Dr. P. Suresh
- Dr Shobha G Hiremath  
Dr P H C Murthy  
Prof S S Savirkar (CCRAS Publication)  
Prof S N Mishra

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## 2.4 CHARAKASAMHITA -PURVARDHA

(Sutrasthana, Nidanasthana, Vimanasthana, Sharirasthana and Indriyasthana)

Theory- One Paper– 100 Marks

**Lectures – 200 Hours**

### Part A

- |                  |   |          |
|------------------|---|----------|
| 1. Sutrasthana   | - | 40 Marks |
| 2. Indriyasthana | - | 10 Marks |

### Part B

- |                  |   |          |
|------------------|---|----------|
| 1. Nidanasthana  | - | 15 Marks |
| 2. Vimanasthana  | - | 20 Marks |
| 3. Sharirasthana | - | 15 Marks |

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**CENTRAL COUNCIL OF INDIAN MEDICINE**  
**NEW DELHI**

**SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE**

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**3<sup>RD</sup> PROFESSIONAL**

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# AGADTANTRA, VYAVAHAR-AYURVED EVUM VIDHIVAIIDYAK

(TOXICOLOGY, FORENSIC MEDICINE AND MEDICAL JURISPRUDENCE)

**Theory One Paper – 100 Marks**

**Practical/Viva voce -50 Marks**

Theory -200 hrs

Practical - 100 hrs

**Part- A**

**50 Marks**

- 1** Derivation, definition of Visha and Agadatantra. Scope of Agadatantra. Visha Utpatti, Visha Prabhava, Visha Pranaharana Kriya, Visha Guna, Visha Gati, Visha Vega Visha Sankata, Shanka Visha.
- 2** Definition of toxicology, Definition of poison, suicidal and homicidal poisons, classification of poisons, their action and route of administration, absorption, excretion, metabolism, diagnosis and general principles of treatment, duties of a medical practitioner in case of suspected poisoning.
- 3** Origin and Classification of Visha:-Its sources, Difference between Visha, Madya and Oja guna, Visha Upadrava and Visha Mukta Lakshana.
- 4** Tests for detection of Visha, and Modern Toxicological Techniques of detection of poisons Visha Data Lakshana, Visha Peeta Lakshana, Signs and symptoms of Visha afflicted organs and personal effects. (Poisoning with Anjana, Lepa paduka, Abharana etc.
- 5** Introduction to Environmental Toxicology- Samuhika Vishaprayoga- effect of chemical and nuclear warfare.
- 6** Vishopakrama described by Charak, General principles of Management of poisoning.
- 7** Manifestation of poisoning due to poisons of plant origin their fatal Dose, fatal period, management of poisoning, post mortem appearance and its medico legal importance. Visha and Upavisha- Arka, Snuhi, Langali, Karaveera, Gunja, Ahiphena, Dhattura, Bhallataka, Vatsanabha, Kupeelu, Jayapala, Bhang & Tobacco, Parthenium hysteriphorus, Chitraka, Eranda, Digitalis and Cerebra Odallam.
- 8** Garavisha, Dooshivisha, Viruddhahara. Food adulteration and poisoning–classification, diagnosis, management and contemporary significance.
- 9** Jangama Visha – Detailed study of Sarpa, Keeta, Loota, Vrischika, Mooshika, Alarka – Visha; Lakshana, Bheda, Chikitsa and their Sadhyasadhyata (contemporary and classical views).
- 10** Introduction to poisoning due to Acids, Alkalis, metals, Non-metals, Asphyxiants and others, their Fatal Dose, Fatal period, Manifestation, management, medico legal importance and postmortem appearance of poisoning due to:
  - a) Acid and Alkalis– Sulphuric acid, Hydrochloric acid, Nitric acid, Hydrocyanic acid, Oxalic acid, Carbolic acid, Formic acid, alkalis in general.
  - b) Asphyxiants – Carbon monoxide, Carbon dioxide, Hydrogen sulphide**
  - c) Nonmetallic poisons – Phosphorous, Iodine  
Metallic poisoning – Arsenic, Mercury, Lead, Copper, Zinc, Tin.
  - d) Others - Petroleum – Kerosene Organo phosphorus compounds -Aluminum

phosphate, Organo Chlorinated Compounds, Household poisons.

**11** Madya and Madatyaya. Alcohol poisoning (Ethanol and Methanol).

**12** *Introduction to Narcotic drugs and Psychotropic substances Act 1985.*

**Part –B**

**50 Marks**

- 1.** Definition of Vyavahara Ayurveda (Forensic medicine) and Vidhivaidyaka (Medical jurisprudence), concise history of Vyavahara Ayurveda (Forensic medicine) and Vidhivaidyaka (Medical jurisprudence). Introduction to Indian Penal Code, Indian Evidence Act and Criminal Procedure Code.
- 2.** Legal Procedures:- Inquest, Evidence, Witness, Courts and their powers.
- 3.** Personal identity and its Medico legal aspects, forensic odontology, Introduction to Forensic Serology and DNA profiling.
- 4.** Death and its Medico Legal Aspects, Medico Legal autopsy and *exhumation*.
- 5.** Injuries and thermal injuries, their medico Legal aspects, general introduction of weapons.
- 6.** Dowry deaths (Domestic Violence), their Medico Legal importance and laws in relation to it.
- 7.** Asphyxial deaths and its Medico Legal importance.
- 8.** Medico Legal importance of Pregnancy, Delivery; Impotence & Sterility, Abortion, Infanticide, battered baby. Virginity, Artificial Insemination, Legitimacy.
- 9.** Sexual offences, and their Medico Legal aspects. Sexual perversions.
- 10.** Introduction to Forensic psychiatry.
- 11.** Introduction to forensic laboratory.
- 12.** Ethics as in classical Texts. Types of Vaidya, Pranabhisara and Rogabhisara Vaidya, Qualities of Vaidya, Responsibilities of Vaidya, Chaturvidha Vaidyavrutti, Duties of Vaidya to his patient, Vaidya Sadvritam, Apujya Vaidya, Code of conduct.
- 13.** Laws in relation to Medical practitioners: Indian Medicine Central Council Act.
- 14.** Maintenance of medical record.
- 15.** Physician's responsibility in criminal matters, Professional negligence, Civil negligence, Criminal negligence, Medico Legal aspects of Acquired Immune Deficiency Syndrome, Rights of an unborn child, Medical Termination of Pregnancy Act Transplantation of human organs Bill 1994, Pre Natal Diagnostic Testing Act, Malingering of feigned diseases, International Code of Medical Ethics for Doctors. Clinical establishment Act.

Consumer Protection Act 1986.

## PRACTICAL

### Practical Training

1. Post Mortem examination
2. Evidence in the court
3. Demonstrations in the Forensic & Toxicology museum  
(Toxic & Anti toxic substances, medico legal specimens & Charts)
4. Clinical postings
5. Library Hours for compilation

### Distribution of Practical Marks

- |  |          |
|--|----------|
| 1. Post Mortem examination and Court posting – Case Record | 10 Marks |
| 2. Practical/Clinical Record Book                          | 10 Marks |
| 3. Identification (spotting)                               | 10 Marks |
| 4. Viva – voce   | 20 Marks |

### Total

**50 Marks**

### Reference Books

- |   |  |
|---|--|
| 1. Topics related to Agada Tantra from Charak Samhita, Sushrut Samhita, Ashtanga Hridaya, Ashtanga Samgraha, Kasyapa Samhitha, Yogaratnakara, Bhavaprakasha and Madhava Nidana. |  |
| 2. Vidhivaidyaka (Vyavahar Ayurveda Vijnan)   | Dr.Charuchandra Pathak                 |
| 3. Medical Jurisprudence and Toxicology   | Modi                                   |
| 4. Basavarajeeyam   | Edited by Vd.Govardhan                 |
| 5. Agada Tantra   | Sh. Ramanath Dwivedi                   |
| 6. Text book of Agada Tantra  | Edited by Dr Huparikar, Dr.Joglekar    |
| 7. Agadatantra ki Pathyapustaka   | Edited By Dr Huparikar,<br>Dr.Joglekar |
| 8. Agad Tantra  | Dr. Shekher Namboodri                  |
| 9. Vishachikitsa<br>(Ayurveda Toxicology English Translation)   | Vaidya Balakrishnan Nair, Kerala       |
| 10. Medical Ethics and Medical Laws in India  | Dr. H.S. Mehta                         |
| 11. Toxicology Ayurvedic Perspective  | VPSV Ayurveda college Kottakkal        |
| 12. Kautilya Arthashastra (English)   | Prof. Kangle                           |
| 13. Kautilya Arthashastra (Hindi)   | Dr. Raghunath Singh                    |
| 14. Vyavahar Ayurveda   | Dr.Ayodhya Prasad Achal                |
| 15. Vyavahar Ayurveda Vigyanam  | Dr.Indramohan Jha (Sachchan)           |
| 16. Textbook of Forensic Medicine and Toxicology  | Dr. V.V.Pillay                         |
| 17. Forensic Medicine   | Dr. B. Umadathan                       |
| 18. Relevant Acts   | Govt. of India                         |
| 19. Relevant topics from Manu Smriti  |  |

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### **3.2**

## **SWASTHAVRITTA**

**Theory- Two papers - 100 marks each**

**Practical / Viva voce -100 marks**

Lectures –200 Hrs

Practicals and demonstration – 100 Hrs

Paper-I

### **PART A- VAIYAKTIKA SWASTHAVRITTA**

**50 marks**

#### **Introduction**

Definition of swastha & swasthya and swasthavritta. Arogya lakshana, swasthavritta prayojanam, WHO definition of health.

Dimensions of health-Physical, Mental, Social.

Concept of wellbeing- objective, subjective, standard of living, quality of life.

#### **Dinacharya**

1. Definition of Dinacharya
2. Aims and importance of dinachary
3. Brahma Muhurta evam Utthana
4. Usha Jalapana
5. Sharirachinta
6. Malatyaga
7. Mukha prakshalan
8. Dantadhavana and preparation of Ayurvedic tooth powder and paste
9. Jihvanirlekhanavidhi
10. Anjana
11. Pratimarsha Nasya
12. Gandusha and Kavala
13. Tambulasevana
14. Dhoomapana
15. Abhyanga
16. Udvartana
17. Utsadana
18. Vyayama
19. Chankramana
20. Snana
21. Anulepana
22. Vastra dharana
23. Danda dharana
24. Padatra dharana
25. Chatra dharana
26. Ushnisha dharana
27. Ratnabharana dharana
28. Madhyahna charya
29. Cosmetic effect of Dinacharya procedures

#### **Rathricharya**

1. Sandhya charya
2. Rathri bhojana vidhi
3. Shayanavidhi according to Bhavamishra

## **Ritucharya**

1. Importance of ritucharya
2. Ritu presentation as per different acharyas
3. Adana kala & visarga kala
4. Sanchaya-Prakopa-Prashamana of Dosha according to ritu
5. Doshashodhana in Ritu Charya
6. Relation of Agni bala and Ritu
7. Pathya and Apathya Ahara and Vihara in different ritus
8. a) Ritusandhi  
b) Yamadamsthra  
c) Rituharitaki  
d) Rituviparyaya

## **Sadvritta**

Description of Sadvritta and Achara Rasayana their role in Prevention and control of diseases.

## **Trayopastambha**

**i) Ahara-** Nirukti, Swarupa, Pramukhatva, Ahara dravya Vargikaranam, Aharavidhividhana, Dwadashashana pravicharana, Ashtaharvidhivisheshayatanani, Pathyahara, Apathyahara, Samashana, Adhyashana, Vishamashana, Ahara dushparinama & tajjanya vyadhaya, Santarpanajanya evam Apatarpanajanya vyadhi, Viruddhahara and its effects, Shadrasabhojanasya mahatwam.

Dietetic standards, Proximate principles of Food, Nutritional requirements, Sources and deficiency diseases of Protein, Carbohydrate, Fat, Vitamins and Minerals.

Concept of balanced diet in Ayurveda, Nitya sevaneeya dravya, Balanced diet for different sections of people in the society, Social aspects of nutrition.

Aharavarga - Dhanya varga(Cereals and millets), Shaka and Harita varga (Leafy and Non leafy vegetables), Kanda varga (roots and tubers), Phala varga (Fruits), Taila varga(Fats and Oils), Ikshu varga & Madhya varga(Alcoholic Beverages), Dugdha varga (Milk and Milk products), Masala and vyanjana dravyas (Spices & Condiments), Kritanna varga(Prepared Food), Mamsa varga (Meat types).

### Food hygiene

Milk hygiene-Milk composition, Source of infection (for Milk), Milk borne diseases, Clean and Safe milk, Pasteurization of milk.

Meat hygiene-Meat inspection, Slaughter house, Freshness of fish and egg. Fruits and Vegetables hygiene

Sanitation of eating places, Preservation of food, Food handlers, Food borne diseases, Food fortification, and Food adulteration, Food toxicants, Properties of Vegetarian and Non- vegetarian diet, Effects of spices and condiments

Consumption of Alcohol and its effects on personal and social health. Effects of pathya-apathya in life style disorders-Diabetes, Hypertension, Obesity and Coronary heart Disease.

**ii) Nidra-** Nirukti and Utpatti, Types , Nidra – Swasthya sambandha, Properties of Yukta Nidra, Effects of Ratri Jagarana, Diwaswapna, Anidra, Atinidra, Ahara and Vihara causing disturbed sleep , Ahara and Vihara Causing sound sleep.

Duration of sleep according to age, Sleep in healthy and diseased persons.



**iii) Brahmacharya** – Brahmacharya and Abrahmacharya, Importance of Bharmacharya and Abrahmacharya, Vyavaya sambandhi niyama, Effects of Ativyavaya. Methods of Virya Raksha, Surataspriha (Libido) through Vajikarana, Viryanasa phala.

**Roganutpadaniya-** Concept of Vega- Adharaniya Vega and Dharaneeya Vega, Diseases due to vegadharana and their chikitsa, sharir shodhan.

**Rasayana for Swastha-**Nirukti, paribhasha (definition), classification and examples

**Ashta nindita purusha**

**Menstrual hygiene**

**Part B (YOGA AND NISARGOPACHARA)**

**50 marks**

## **YOGA**

### **Introduction**

Yoga shabda utpatti, definitions, Different schools of Yoga – Rajayoga, Hathayoga, Mantrayoga, Layayoga, Jnanayoga, Karmayoga, Bhaktiyoga.  
Yoga prayojana

Ayurveda yoga sambandha, swasthya rakshane yogasya mahatvam  
Yogabhyasa pratibhandhaka & siddhikara bhavas as per Hathayoga.  
Mitahara and Pathyapathyani during Yogabhyasa.

### **Panchakosha Theory**

#### **Astanga yoga**

Yama, Niyama

Asana and its importance

#### Standing Postures

Ardhakatichakrasana, Padahastasana, Ardachakrasana, Trikonasana.

#### Sitting postures

Swasthika, Gomukhasana, Padmasana, Vajrasana, Bhadrasana, Shashankasana, Ushtrasana, Pashchimottanasana, Suptavajrasana, ardhmatsyendrasana, Siddhasana.

#### Supine Postures

Pavanamuktasana, Sarvangasana, Matsyasana, Halasana, Chakrasana, Shavasana, Setubandhasana.

#### Prone postures

Bhujangasana, Shalabhasana, Dhanurasana, Makarasana.

Suryanamaskara – procedure and benefits.

#### **Pranayama**

Benefits of pranayama, time of practice, avara-pravara-madhyama lakshana, yukta-ayukta lakshana

Nadishudhi Pranayama .

Kumbhakabheda – suryabhedana, ujjayi, sheetali, Sitkari, Bhastrika, BhramariMurcha, Plavini.

Nadishudhilakshana

#### **Shatkarma**

Dhauti, Basti, Neti, Trataka, Nauli, Kapalabhati

### **Bandhas and Mudras**

**Shad chakras, Ida-pingala-sushumna nadis.**

**Pratyahara, Dharana, Dhyana, Samadhi**

### **Description of Yoga in Ayurveda**

Moksha and Muktatma lakshana and upaya, Naishthiki chikitsa, Satyabuddhi, Tatvasmriti, Ashta Aishwarya, Ashta siddhis.

### **NISARGOPACHARA (Prakritika chikitsa)**

Definition, history, aims and objectives Theories as per Western school of Naturopathy Indian school – Panchabhutopasana

Relation of Ayurveda and Naturopathy

Importance of Naturopathy in present era.

**Jalachikitsa(hydrotherapy)** – Hot water treatment, Cold water treatment, foot and arm bath, Spinal bath, hip bath, abdominal wet pack, Steam bath, enema and whirl pool bath.

#### **Mrittika chikitsa (Mud therapy)**

Types of soil, doctrine of mud selection, mud bath.

#### **Suryakirana sevana (sun bath - heliotherapy)**

**Mardana (Massage)** – different methods and effects.

**Diet types** – Soothing, Eliminative, Constructive, Positive and negative diet, Acidic and alkaline diet

**Upavasa chikitsa(Fasting therapy)** – Importance, types, therapeutic effects of fasting.

#### **Visrama chikitsa upayoga**

### **PAPER II – SAMAJIKA SWASTHAVRITTA**

Part A

50 marks

### **Janapadodhwamsa**

Causes, Manifestations and control measures, importance of Panchakarma and Rasayana.

### **Vayu (Air)**

Vayu guna according to sushruta samhita, Properties of Vayu as per different directions, Vayu shudhi prakara – Ayurvedic aspect.

Composition of air.

Air of occupied room- Thermal discomfort and comfort zone, indices of thermal comfort.

Air pollution – health and social aspects, Prevention and control of air pollution ,Global warming.

Ventilation and its types.

Mountain air & High altitude – Health problems

### **Jala (Ayurvedic and modern aspects)**

Importance of water , safe and wholesome water, water requirements, properties, types and sources of water, water pollution and health hazards, Methods of water purification.

Hardness of Water.  
Examination, Tests and analysis of water.  
Rain water harvesting and water recycling

**Bhumi and nivasa sthana(Land and housing)**

Types of soil, soil & health, Land pollution, Bhumi shodhana, Nivasa yogya bhoomi, Social goals of housing, Housing standards, Mahanasa (Kitchen) standards, Rural housing, Housing and health, Overcrowding.

**Prakasha(lightning)**

Requirement of good lighting, natural lighting, artificial lighting, biological effects of lighting.

**Dhwani pradooshana(Noise pollution) -Noise, Sources, effects, & control**

**Vikirana(Radiation)-** sources, effects and control

**Apadravya Nirmulana (Disposal of solid waste)**

Different types of solid waste  
Storage and collection of refuse  
Methods of disposal of solid waste (Rural & urban)  
Bio-medical waste management

**Malanishkasana Vyavastha (Excreta Disposal)**

Methods for Unsewered area and Sewered area Latrines  
for camps, fairs and festivals

**Disposal of dead body** – Burial, Burning, Electric cremation.

**Meteorology (Ritu evam Vatavarana jnanam)**

Definition of weather and climate, factors influencing weather and climate.

**Disaster management**

Definition, natural and man-made disasters, epidemiologic surveillance and disease control.

**Occupational Health**

Occupational Hazards, Occupational Diseases, Prevention of Occupational Diseases, Health & precautionary measures, ESI Act, Indian factories Act.

Offensive Trades- Effects on health and precautionary measures .

**School health services**

Health problems of school children, aspects of school health service, duties of school medical officers, Maintenance of healthy environment

**Epidemiology**

Concept of Epidemiology, Dynamics of disease transmission, concept of diseases, concept of causation, Epidemiological triad, natural history of disease, concept of control, concept of prevention, Risks factor, modes of intervention, incidence and prevalence. Susceptible host, host defenses, Immunizing Agents, Disease prevention and control, investigation of epidemic.

Disinfection – definition, types.

Ayurvedic concept of Vyadhikshamatva and sankramaka rogas.

Epidemiology of communicable Diseases

Chicken Pox, Measles, Diphtheria, Pertussis, Mumps, Tuberculosis, SARS, Influenza, Pneumonia, Cholera, Polio, Viral Hepatitis , Typhoid, Leptospirosis, Dengue Fever, Chikungunia, Malaria, Filariasis , Leprosy, Rabies , Tetanus, Emerging and re-emerging diseases

Kuprasangaja vyadhi (STDs)

AIDS, Syphilis, Gonorrhoea, Chancroid

**Non-communicable disease epidemiology**

Diabetes, Obesity, Hypertension, Coronary Heart Diseases, Rheumatic Heart Disease, Cancer

**Chikitsalaya Bhavana (Hospital Building)**

**Part B**

**50marks**

Prathamika swasthya samrakshana(Primary Health Care)Definition, principle, elements,levels of health care.  
Structure at village, sub centre, PHC,CHC, Rural hospital levels.  
Health insurance, Private agencies, Voluntary health agencies, NGOs and AYUSH sector.Role of Ayurveda in Primary Health Care.

**Parivara kalyana Yojana (Family welfare Programmes)**– Demography, demographic cycle, life expectancy.

Family planning, methods of family planning.

**Matru sishu kalyana Yojana – MCH programme**

Ante natal, intra natal, post natal, neo natal care. Child health problems and indicators of MCH care.

**Preventive geriatrics**–Problems of elderly,prevention and control measures.

**World Health Organisation**–Objectives,structure and functions.

**International health agencies**–United Nations agencies,Health work of bilateral agencies.

**Alma Ata declaration  
National Health Policy**

**Health statistics**– Definition, Sources, uses Data collection, Classification, Presentation.  
Vital statistics–Morbidity rates,Mortality rates ,Fertility rates.  
Health survey

**Swasthya prashasana(Health Administration)** – Health administration at Centralincluding AYUSH, state, district, village levels.

**National health programmes**

Tuberculosis(RNTCP), Leprosy(NLEP), AIDS (NACP), Blindness (NPCB), Polio(PPI),Diabetes (NDCP), Cancer (NCCP) , Guinea worm, Vector born disease control programme, NRHM, allthe upcoming national health programmes, RCH programme, Universal ImmunizationProgramme.

**National Nutritional Programmes** - IDD, Vitamin A prophylaxis, Mid day meal, anemia control programmes.

# PRACTICALS

**Demonstration of Dinacharya procedures-** anjana, nasya, kavala, gandoosha dhoomapana, abhyanga, udvartana.

Parichaya of aharadravya, immunization agents, disinfectants and family planning devices

Practical demonstrations of Asanas mentioned in the syllabus  
Pranayama (Suryabhedana, Ujjayi, Shitali, Sitkari, Bhastrika, Bhramari and Nadishuddhi) and Shad karmas (Jala dhauti, Jalaneti, Sutraneti, Trataka, Kapalabhati).

Preparing and delivering of a health educational talk on health related issues.  
A short compilation on any topic on environmental health.

## **Educational Visits**

Observe the functioning of the Milk Dairy, Water purification unit, Sewage treatment unit, MCH/Family welfare centre, Leprosy hospital and industrial unit.  
Visit to Primary Health Centre for knowledge of actual implementation of National health programmes including knowledge of rural health.  
Visit of rural Ayurvedic dispensary.  
Visit to naturopathy centre to observe naturopathic treatment modalities.

**Health survey-** Minimum 5 families of rural and urban areas.

There should be 3 case sheets for Yoga Naturopathy & pathya apathya together and 3 case sheets for communicable diseases.  
Proformas for Case sheets/practical records/survey/Dinacharya projects etc should be prepared by the respective universities.

## **Practical and Viva Voce examination**

### **Marks distribution**

	<b>100 marks</b>
1. Vaiyaktika Swasthavritta	20
2. Samajik swasthavritta	20
3. Demonstration of Yoga	10
4. Naturopathy	10
5. Journal and compilation work	10
6. Viva voce	30

### **Reference Books:**

Relevant portions of Charaka, Sushruta, Vagbhata, Sarngadhara, Bhavaprakasha, Yogaratnakara, Madhavanidana and Bhelasamhita.

Swasthavritta Samucchaya	- Pandit Rajeshwar dutt Shastri
Swasthya Vigyan	- Dr. Bhaskar Govind Ghanekar
Swasthya Vigyan	- Dr. Mukund swarup Varma
Swasthavritta	- Vaidya Sakad
Swasthavritta	- Dr. Ranade and Dr. Firke

Ayurveda Hitopadesh	- Vaidya Ranjit Rai Desai
Yoga and Ayurved	- Acharya Rajkumar Jain
Swasthavritta vigyan	- Dr. Ramharsha Singh
Swasthavrittam	- Dr. Brahmanand Tripathi
Swasthavrittam	- Dr. Shivkumar Gaud
Ayurvediya Swasthavritta	- Vaidya Jalukar Shastri
Patanjala yogasutra	- Patanjali Maharshi
Hathayogapradipika	- Swatmaram Yogendra
Gheranda samhita	- Gherand Muni
Yoga Paddhati	- Bharatiya Prakritik Chikitsa Parishad
Yogik Chikitsa	- Shri. Kedar Nath Gupta
Sachitra Yogasan darshika	- Dr. Indramohan Jha
Yoga deepika	- Shri. B.K.S. Iyengar
Light on Yoga	- Shri. B.K.S. Iyengar
Light on Pranayama	- Shri. B.K.S. Iyengar
Yoga and yoga chikitsa	- Dr. Ramharsha Singh
Foundations of Contemporary Yoga	- Dr. Ramharsha Singh
Yoga Sidhant evam Sadhana	- Harikrishna Shastri datar
Prakritik chikitsa Vidhi	- Sharan Prasad
Prakritik chikitsa vigyan	- Verma
Preventive and Social Medicine	- J. Park
Preventive and Social Medicine	- Baride and kulkarni
Janasankhya Shiksha Sidhanta	- Dr. Nirmal Sahani
Evam upadesya	
Health Administration in India	- S.C.Seel
Health and family welfare	- T.L.Devaraj
Positive Health	- L.P. Gupta
Biogenic Secrets of food in Ayurveda	- L.P.Gupta
Smriti granthon mein nihit	- Dr. Smt. Nigam Sharma
Swasthaprakara samagri	
Dr. Reddy's comprehensive guide to Swasthavritta	- Dr.P.sudhakar Reddy
Nutritive value of Indian foods	- ICMR
Yoga and Nisargopachar	- Vd. Prama Joshi
Prachin Vangmay mein prakritik chikitsa	- swami Anant Bharati, CCRYN
Swasthavritta	- Vd Yashwant Patil and Vd. Vhawal
Food and nutrition	- Swaminathan
Organology and sensology in yoga	-Prashant S Iyengar
Yoga-A game for Women	-Geeta S Iyengar
Yoga-A game for Women(hindi translation)-Madhu Pandey	

### **3.3**

## **PRASUTI TANTRA & STRIROGA**

**Marks 200 (100marks each paper)**

Practical-100 marksHOURS

Theory-200 HrsPractical-100

Hrs

PAPER-1 PRASUTI TANTRA

### **PART-A**

#### **INTRODUCTION TO SUBJECTSTRI**

#### **SHARIRAVIJNAN**

Etymological origin of the word Stri. Artava vaha and Stanyavaha strotamsi. Tryavarta yoni Stri Vishishta,Peshi Marmani.

Anatomy of female reproductive system.(External and internal genital organs) Soft & Bony Pelvis and its obstetrical importance.

DESIRABLE (non detail)

Vayobhedena Stri sangnya

#### **RAJO VIGYANA**

Description of Raja, Artava and Prathama Rajo Darshana, Rajasvala Charya. Ritumati Lakshana, Ritumaticharya, Ritukala

Menarche, Menstrual cycle and their regulation by endocrine glands,

Ovulation –Importance in conception

DESIRABLE (non detail)

Concept of Stri Sukra

#### **GARBHA VIGYANA**

- a) Garbhasya paribhasha, Garbhadhanavidhi, Garbhavakranti, Garbha Sambhava samagri, Garbhakara bhava, Panchabhautikatwa of Garbha, Masanumasika Vridhi of Garbha, Garbha Poshana , Garbhasayasthe Garbhasthiti

Foetal attitude, lie, position, presentation

- b) Apari, GarbhaNabhinadi, Jarayu, Ulba

Formation, Development, Function of Placenta, Umbilical cord, Amniotic fluid

Foetal membranes -Abnormalities of Placenta

DESIRABLE (non detail)

Garbhalingotpatti, Garbhasya Avayavotpatti, Garbha Varnotpatti, Garbha Vikriti

### **GARBHINI VIGYANA**

- a) Lakshana of Sadhyograhita Garbha, Lakshana of Vyakta Garbha, Pumsavana vidhi  
Diagnosis of Pregnancy
- b) Garbhini vyavastha: Garbhini Paricharya, Garbha Upaghatakara Bhava, Dauhrida  
Ante Natal care-Examination, Investigation and Management
- c) Garbha Vyapada: Nidana, Samprapthy and Chikitsa Garbhasrava and Garbhapata-  
Garbha shosha-Upavishtaka, Nagodara, Upashushka, Leena garbha,  
Antarmrita garbha, Raktagulma, Bahugarbhatha
- d) Abortions, Rh-incompatability-  
Causes, clinical features, complications and management.

Gestational trophoblastic neoplasias, Ectopic pregnancy, IUGR, Intrauterine foetal death, Multiple pregnancy

### **GARBHINI VYAPAD**

- a) Hrillasa, Chardi, Aruchi, Atisara, Vibandha, Arsa, Udavarta, Sotha, Parikarthika, Vaivarnya, Kandua, Kikkisa, Pandu, and Kamala, makkala
- b) Common ailments of Pregnancy-High Risk Pregnancy, Emesis gravidarum, Gestational Anemia, Gestational Hypertension, Gestational Diabetes, Toxemias of Pregnancy, Jaundice, AIDS,

Ante Partum Hemorrhage causes, clinical features complications and Management

## **PART B**

### **PRASAVA VIGYANA**

- a) Prasava Paribhasha, Prasava hetu, Prasavkaala, Sutikagaranirmana, Sangrahananiya Dravyani, Sutikagara pravesavidhi.
- b) Prasavavastha; Prajayani/ Upasthita Prasava/ Asannaprasava lakshana, Aavi. Prasavaparicharya, Jatamatraparicharya
- c) Normal Labour:-Definition of Labour, Physiology & Mechanism of Labour, Monitoring of Labour and management, Pictogram, Episiotomy, care and resuscitation of newborn.



## **PRASAVA VYAPAD**

- a) Garbhasanga, Yonisamvarana, Aparasanga, Mudagarbha-defenition, Nidana, Types & Management
- b) Induction and augmentation of labour, Cervical dystocia, Cephalopelvic disproportion, Prolonged labour, Preterm labour, Post term labour, foetal distress, Assisted Labour, Caesarian
- c) Retention of Placenta, PPH - causes, clinical features and management, Genital tract Injuries during labour

DESIRABLE (non detail)

Uterine Inversion, Amniotic Fluid Embolism, Garbhasthithi parivarthan(Version), Forceps Delivery, Ventouse Delivery.

## **SUTIKA VIGYANA**

- a) Sutika Paribhasha, Sutika Kaal, Sutika paricharya. Changes during sootika avastha(Sareerika&Manasika)  
Normal and abnormal Puerperium and its Management
- b) Sutika Roga – Number of Sutika Roga, Sutika Jwara, Shotha and Makkala.
- c) Stanyavijnan- Sthanyadushti, Sthanyakshaya, Sthanyavidhi -their causes, clinical features and treatment
- d) Emergency care in obstetrics

DESIRABLE(non detail)Stana stanya –Pareeksha, Stanya sampat.

## **PART-2 STRI ROGA PART-**

### **A**

## **ARTAVA VYAPAD**

- a) Artava-kshaya vridhi, Ashtartavadushti lakshana chikitsa  
Asrigdara lakshana samprapti Chikitsa
- b) Menstrual disorders-Amenorrhoea, hypomenorrhoea, Oligomenorrhoea, Dysmenorrhoea, Abnormal uterine Bleeding

## **YONI VYAPAD**

Sankhya, Nidana, Lakshana, Upadrava evam Chikitsa

Endometriosis, Fibroid uterus, Genital Prolapses, Retroverted Uterus, Pelvic infections, Cervical erosion, Pelvic Inflammatory Diseases

**VANDHYATWA** – Prakar, Nidana, Chikitsa

Infertility – Causes, Types, Investigations and Management.

Yoni Kanda, Yoni Arsa, Granthi, Arbud,

Pelvic Infections including Sexually Transmitted Infections, HIV, AIDS, Preventive measures.

MENOPAUSE-changes during menopause ,menopause syndrome, management.

DESIRABLE (non detail)

Congenital malformations of female genital tract.

Sukra vijnan –kshaya,vridhi, dushti hetu lakshana and chikitsa

Benign and Malignant tumours of Genital Tract

## **PART-B**

### **STANA ROGA**

- a) Stanakeela- nidana lakshana chikitsa, Stanagranthi, Stanavidradhi, Stanashoph Mastitis, Breast abscess, Galactocele -Etiopathology, clinicalfeatures, diagnosis, prognosis and complications
- b) Sthanik Chikitsa  
Snehana, Swedana, Uttarabasti, Pichu, Varti, Lepana, Dhupana, Dhavana, Dahana, Ksharakarma -. Practical knowledge of all these procedures along with indications, complications and management.

### **Shastra Karma**

Surgical procedures their Indications, Contraindications of cauterization of cervix, cervical dilatation and curettage, female surgical sterilization

Knowledge of indication and procedure of PAP smear. Endometrial biopsy and interpretation of the reports

Stri roga Sambandhita Pramukha Aushadhyai, Prasuti & Stri Roga Chikitsa Upayogi Yantra Shastra Parichaya and Vyadhivinishchaya Upaya (Investigative and Diagnostic Aids)

Garbhanirodhaka Upaya.

Parivar Niyojana, Reproductive and Child Health Care, AIDS/HIV control Programme, MCH, PNDT Act, MTP Act, and importance of current National Programme

Knowledge of important Commonly used Ayurvedic and Allopathic drugs used in Prasutitantra and Streeroga. Pharmacotherapeutics of allopathic drugs in obstetrics and Gynaecology

Record keeping,ethical and medicolegal issues in Streeroga and prasutitantra

DESIRABLE (non detail)

Laproscopy, hysteroscopy, hysterosalpingography, USG, X-RAY, Colposcopy, Cervical Biopsy. Granthi evum Granthi nirharan samanyajnan (Myomectomy, hysterectomy)

## **CLINICAL TRAINING-OBSTETRIC SKILLS**

To perform independently

1. History taking and examination of antenatal and gynaecological cases
2. Diagnosis of Pregnancy, assessing of gestational period, to diagnose onset of labour
3. To monitor labour progress, able to plot Partogram
4. Observation of 10 labours
5. To diagnose abnormalities of labour and decide about the referral of the patient
6. Able to provide first aid for obstetric emergencies
7. Recognition of post partum complications
8. Counselling and promoting of breast feeding
9. Record 5 antenatal cases, 5 intrapartum and 5 post partum cases

To observe/assist-D&C, D&E, Caesarean section, Repair operations, Resuscitation of new born.

## **GYNAECOLOGICAL SKILLS** -To perform independently

1. History taking and examination of gynaecological cases
2. Recording 10 gynaecological cases, 5 gynaecological procedures
3. Taking vaginal smear, high vaginal swab
4. Practical knowledge of sthanika chikitsa
5. Observation and practical knowledge of minor gynaecological procedures
6. Observation of Surgical procedures
7. Identification, uses., Demonstration of surgical instruments
8. Observation of Method of sterilization, MTP, Surgical procedures Hystrectomy, Oopherctomy

## **DISTRIBUTION OF PRACTICAL MARKS**

1. Case taking-2cases –one Gynec,one obstetric- 30marks

2. Instruments ,Drugs, &Models-	20 marks
3. General Viva-	40 marks
4. Record -2-(one Prasuti, one streerog)-	10 marks
<b>Total</b>	<b>100 marks</b>

### **3.4. Kaumarbhritya (Ayurvedic Pediatrics)**

**Theory One Paper – 100 Marks**  
**Practical Viva Voce - 50 Marks**

Paper I 100 Marks

#### **Kaumarbhritya Parichaya Evum Balaka Paricharya (Introduction to Ayurvedic Pediatrics and Child Care)**

Part A 50 Marks

1. General introduction and scope of Kaumarbhritya (Ayurvedic Pediatrics), Definitions and terminologies used in Kaumarbhritya.
2. Scientific contribution of Kashyapa Samhita in Kaumarbhritya.
3. Vayobheda (Classification of age): Garbha, Bala, Kumara; Kshirada, Kshirannada & Annada etc. and modern classification of childhood period.
4. Prana Pratyagamanam (Neonatal Resuscitation): Methodology; complications and their management (Ayurvedic and modern view). Assessment of gestational age.
5. Navajata Shishu Paricharya (Neonatal Care): Care of the Jatmatra (Newly born child) and the Sadyojata, Care of the Samaya-purvajata Shishu (Preterm), Purnakalika Shishu (Full term), and Samaya-Paschatjata Shishu (Post term neonate), Nabhinala Chhedana (Cutting of umbilical cord), Complications of improper cutting of umbilical cord and its treatment, Rakshoghna Karma (Protective measures- Ayurvedic and modern view).
6. Navajata Shishu Parikshana (Examination of newborn): Ayu-Parikshana, Modern approach to Neonatal Examination
7. Navajat Shishu Poshana (infant feeding): Specific feeding schedule as per Ayurvedic texts and modern concept; Stanya-Sampat (Properties of normal breast milk) Stanyotpatti (Physiology of lactation), Stanya Sangathana (Composition of breast milk), Stanya Parikshana (Examination of breast milk), Stanya-Piyusha (Colostrum); Stanya-Pana-Vidhi (Techniques of breast feeding), Stanyakshaya- Stanyanasha (Inadequate production and absence of breast milk), Dhatri (wet nurse)- Stanyabhava dugdh Vyavastha (alternative feeding in the absence of breast milk), Various other milk feeding methods.
8. Stanyadosha (Vitiation of Breast milk), Stanya Shodhana (Purification of breast milk), Stanya Janana and Vardhanopakrama (Methods to enhance breast milk formation).
9. Garbha Vridhi Vikasa Krama: Samanya Parichaya (brief monthwise development of

fetus), Milestones of development during infancy and childhood including concepts of various Samskaras.

10. Poshana (Nutrition): Normal requirements of nutrients and common food sources.
11. Dantotpatti evum Danta Raksha Vidhi (Dentition and dental care): Danta-sampat (Characteristics of healthy teeth), Danta Nisheka evum Dantodbheda (Eruption of teeth), Dantodbhedjanya Vikara (Dentition disorders).
12. Vyadhikshamatva: General concepts of Bala (Immunity) and methods of Bala Vriddhi.
13. Prashan & Lehana: Indications, contra-indications, different drugs used in lehana
14. Knowledge of National Programs related to Child Health Care: Reproductive and Child Health (RCH) Program, Community Child Health Programs, Nutritional Programs, National Immunization Program and other programs incorporated by Govt. of India from time to time

## **Part B**

**50 Marks**

### **Samanya Chikitsa Siddhanta and Balaroga**

#### **(General Principles of Treatment and Management of Pediatric Disorders)**

1. Bala Pariksha-vidhi Evam Shishu Vedana Parigyan (Examination of sick child and Diagnostic methods-Ayurvedic and modern). Samanya Chikitsa Siddhanta (General principles of treatment in children).
2. General Aushadhi Matra Nirdharana - for Ayurvedic and modern drugs preparations (drug doses according to age, weight and drug contents)
3. Specific therapeutic panchakarma procedures in children with special emphases on snehan, swedan and basti.
4. Prasava Kaleena Abhighata (Birth injuries): Shwasavrodha (Asphyxia neonatorum), Ulvaka, Upashirshaka (Caput Succidanum and Cephalohaematoma), Facial Paralysis, Erb's Paralysis, Bhagna (fractures).
5. Brief description of Sahajavyadhi (Congenital disorders): Sahaja Hridaya Vikara (Congenital Cardiac Disorders) Jalashirshaka (Hydrocephalus), Khandaoushtha (cleft lip), Khanda-Talu (cleft palate) Sanniruddha Guda (Anal stricture / imperforated anus), Pada Vikriti (Talipes equinovarus and valgus), Spina bifida, Meningocele, Meningomyelocele.
6. Brief knowledge of genetic disorders): Down syndrome, Turner Syndrome, Muscular dystrophy, Sickle-Cell Anemia, Thalassaemia, Sahaja Madhumeha (Juvenile diabetes).
7. Prasavottara Vyadhi (Neonatal disorders): Navajata Kamala (Neonatal Jaundice), Navajata Netrabhishyanda (Neonatal conjunctivitis), Nabhiroga (Umbilical disorders), Navajatshishu-raktavishmayata (Neonatal Septicemia)
8. Dushta Stanyapanajanya Vyadhi (Disorders due to Vitiated Milk): Lactose intolerance, Kshiralasaka, Kukunaka, Ahiputana (Napkin Rashes)
9. Kuposhanajanya Vyadhi (Nutritional disorders): Karshya, Phakka, Balashosha and Parigarbhika (Protein Energy Malnutrition), Vitamin and Micro-nutrient deficiency

disorders, Hyper-vitaminosis, failure to thrive.

10. Aupasargika Vyadhi (Infectious Diseases): Karnamula Shotha (Mumps), Romantika (Measles), Rubella, Masurika (Chicken Pox), Rohini (Diphtheria), Kukkura-Kasa (Whooping Cough), Dhanurvata (Tetanus), Krimiroga (Worm Infestations), AntrikaJwara (Typhoid), Mastisakavarnashotha (Meningitis), AIDS, Dengue, Malaria, Rajayakshma (Tuberculosis), Jivanujanya Yakrit Shotha (Hepatitis)
1. Srotas Vikara:
  - a) Pranavaha Srotas: Pratishyaya (common cold), Kasa (Cough), Shwasa (Respiratory distress syndrome), Tamaka Shwasa (Bronchial Asthma), Utphuliika, Swasanaka Jwara (Pneumonia/Pneumonitis, Bronchiolitis), Gala shotha (Pharyngitis, Laryngitis), Talukantaka (Tonsillitis)
  - b) Annavaha\_ Srotas: Ajirna (Indigestion), Atisara (Diarrhoea), Chhardi (Vomiting), Vibandha (Constipation), Mukhapaka (Stomatitis), Gudapaka (Proctitis), Parikartika (Anal fissure), Udarshula (Infantile Colic), Pravahika (Dysentery), Gudabhransa (Rectal Prolapse). Ama and its disorders like Ama vata jwara (Rheumatic fever).
  - c) Rasavaha Srotas: Jwara (Fever), Pandu (Anemia), Mridbhakshanajanya Pandu (Anemia associated with clay eating/Pica).
  - d) Raktavaha Srotas: Kamala (Jaundice), Raktapitta (Haemorrhagic disorders), Yakritodara (Hepatomegaly).and Pieehodara (Spleenomegaly)
  - e) Mamsa-Medovaha Srotas: Apachi (Lymphadenitis), Galaganda (Goitre), Gandamala (Cervical Lymphadenopathy).
  - f) Mutravaha Srotas: Shopha in Vrikka (Glomerulonephritis and Nephrotic syndrome)
2. Anya Bala Vikara (Miscellaneous Pediatric Disorders), Apasmara (Epilepsy), Akshepa (Convulsions), Nirudhaprakasha (Phimosis), Cerebral palsy.
3. Behavioral Disorders of Children, their management and counseling: Breath holding spell, Shayyamutra (Bed wetting), Pica, Unmada, Autism, ADHD (Attention Deficit and Hyperactive Disorders), Jadatwa (Mental retardation).
4. Pran raksha vidhi (Life saving measures in children): Principles of management of Shock and Anaphylaxis, Poisoning, Foreign body in respiratory tract, Status epilepticus, Hemorrhage, Acute Renal Failure, Febrile Convulsion, Status Asthmaticus, Fluid and Electrolyte Management.
5. Balagraha: General description, classification, clinical features and management.

## **PRACTICAL**

### **Content of Practical / demonstration**

1. Clinical training of above mentioned disorders of children.
2. Exposure to -
  - a) Navajata Shishu Paricharya (Care of the newborn)
  - b) Pranapratyagamana Vidhi (Resuscitation procedure of new born)
  - c) Vaccination
  - d) Panchakarma Vidhi (Panchakarma procedures) especially Snehana, Swedana, Basti.
3. Knowledge of various equipments such as phototherapy unit, overhead radiant

warmer, resuscitation equipments, Panchakarma equipments and their application

4. Knowledge of IV fluid administration, blood sampling
5. Anthropometry measurements and their interpretation
6. Various Ayurvedic & modern Procedures and investigations in pediatric practice

### **Distribution of Marks**

Clinical work: Pediatric and neonatal case records [1.0 case sheets of each]	10 Marks
Patient Examination	20 Marks
Spotting	05 Marks
Viva – voce	15 Marks
<b>Total</b>	<b>50 Marks</b>

### **Reference Books**

1. Kashyapa Samhita Complete Hindi translation by Satyapal Vidhyalankara English translation by Prof. Premvati Tiwari
2. Principles & practice of Pediatrics in Ayurveda: Dr. CHS Shastry
3. Child Health Care in Ayurveda: Prof. Abhimanyu Kumar
4. Ayurvedic Concepts of human Embryology: Prof. Abhimanyu Kumar
5. Kaumarbhritya by Prof. D.N. Mishra
6. Kaumarbhritya Ke Antargata Balgraho Ka Kramika Evam Vaigyanika Adhyana by Prof. Chanchal Sharma
7. Notes on Kaumarbhritya-by Dr. Dinesh K S
8. Pran - Pratyagannanann-by Dr. B.M. Singh
9. Ayurveda Dwara Matra Evam Shishu Paricharya by Dr. KS Patel,V.K.Kori & Raigopal
10. Kaumarbhritya related references from Charaka Samhita, Sushruta Samhita Vagbhata etc.
11. Clinical Methods in Paediatrics by Meharban Singh
12. Pediatrics Emergencies by Meharban Singh
13. Essential Pediatrics O,P. Ghai
14. Text Book of Pediatrics Nelson
15. Care of New Born by Meharban Singh
16. Panchakarma in Pediatrics Dr. Yogita Srivas

### **3.5. CHARAK SAMHITA- UTTARARDHA**

(Uttarardha: Chikitsa – Kalpa - Siddhi Sthana)

**Theory- One Paper – 100 Marks**

The marks of theory examination are distributed as follows:

- |                    |          |
|--------------------|----------|
| 1. Chikitsa sthana | 60 Marks |
| 2. Kalpa sthana    | 15 Marks |
| 3. Siddhi sthana   | 25 Marks |

#### **Reference Books**

1. Charak Samhita -Chakrapani Tika (Sanskrit Commentary)
2. Charak Samhita (Hindi Commentary) Vd. Jayadev Vidyalankar or Vd. Atridev Vidyalankar or Prof. Gorakh Nath Chaturvedi & Kashinath Shastri or Dr. BrahmanandTripathy or Dr. Ravidutta Tripathy
3. Charak Samhita (English Commentary): Dr. Ram Karan Sharma & Vd. Bhagwan Dash or Acharya Priyavrata Sharma.



**CENTRAL COUNCIL OF INDIAN MEDICINE**  
**NEW DELHI**

**SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE**

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## **4.1 KAYACHIKITSA**

Theory Two Papers – 100 Marks Each  
Practical/Viva voce – 100 Marks

**Paper I**

**100 Marks**

Part - A

50 Marks

- 1 Derivation of the terms 'Kaya', 'Chikitsa' and their definitions and synonyms. Definition of 'Kayachikitsa, Definition of 'Bheshaja'. Types and detailed description of Bheshaja and Chikitsa, Knowledge about Chikitsa Chatushpada, Rogi Roga Pariksha Siddhantha, Astasthan Pariksha.
- 2 Importance of Kriya Kaala according to stages of Dosha and their management.
- 3 Chikitsa sutra and Management of vridhhi (increased) and kshaya (decreased) of Dosha, Dhatu and Mala, Ojo Vyapat (Kshaya, Visramsa and Vyapat) and its management. Chikitsasutra and Management of Sama-Nirama states, Roga-Anutpattikara Chikitsa, Roga Prashamana Chikitsa (Doshapratyanika, Vyadhipratyanika, Ubhayapratyanika), Doshopakrama, Chikitsa sutra and Management of Sthanantara Dosha (Ashayapakarsha, Anuloma/Pratiloma gati of Dosha, Vimarga gamana of Dosha), Knowledge of Lina Dosha & its management, Diagnosis, Chikitsa Sutra and Management of Avarana and of Dhatu Pradoshaja diseases, Importance of Dosha, Dushya , Bala, Kaala, Agni, Prakriti, Vaya, Sattva Satmya, Desha, Ahara and stage of diseases in treating them. Chikitsa Sutra and Management of 'Samanyaja and Nanatmaja' diseases.
- 4 Detailed description of Dvididhopakrama (Santarpana and Apatarpana) and Shadavidhopakrama (Rookshana, Snehana, Swedana, Sthambhana, Langhana and Brimhana). Detailed description of Shodhana, Shamana and Nidana Parivarjana. Knowledge of Aushadha matra, Sevan kaala and Anupana, Definition and Knowledge of Pathya-Apathya with examples of diseases of various systems.
- 5 Derivation of the term 'Manas', its sthana (place), Guna (qualities) and Karma (functions). Samanya Chikitsa Siddhanta of Manasa Roga.
- 6 Principles & Management of Nutritional deficiency disorders.
- 7 Management of Vardhakyajanita vikara, Indriyapradoshaja vikara, Alzhiemer's Disease, Sleep disorders, General debility.

- 8 General introduction and principles of Management of diseases produced by Genetic, Environmental and Iatrogenic factors. Disorders due to drug and Food allergy and their management and other allergic conditions.

Part B

50 Marks

1. Detailed description of Chikitsa Sutra and Management of Jwara and its types. Etiopathogenesis & relevant Ayurvedic and Modern management of following types of Fevers-Typhoid, Pneumonia, Pleurisy, Influenza, Mumps, Meningitis, Encephalitis, Tetanus, Yellow fever, Plague, Dengue Fever, Chikun Guniya, Leptospirosis, Viral Fever, Anthrax, Masurika (Small pox), Laghu Masurika (Chicken pox), Romantika (Measles).
1. Chikitsa sutra and Management of the diseases of Rasavaha Srotas such as – Pandu,

- Amavata, Madatyaya, Hridroga, Hridshoola, Hypotension, Hypertension, Anaemia, Rheumatoid arthritis.
2. Chikitsa sutra and Management of the diseases of Raktavaha Srotas such as - Raktapitta, Kamala, Kumbhakamala, Halimaka, Daha, Mada, Murcha, Sanyasa, Vatarakta, Plihadasha, Yakrut dosha, Haemolytic disorders, Hepatitis, Cirrhosis of Liver, Leukaemia, Kushta, Shvitra, Visarpa, Sheetapitta, Udarda, Kotha and Kshudra Roga.
  3. Knowledge of National Health Programmes and the relevant Ayurvedic Management of the following diseases enlisted by World Health Organisation- Malaria, Filaria, Kala Azar, Leprosy, Tuberculosis, AIDS.
  4. Introduction of general principles of maintenance of health and management of diseases of following systems of Medicine- Yoga, Naturopathy, Unani, Siddha, Physiotherapy and Rehabilitation.
  5. Diseases of different Endocrine Glands- such as Thyroid, Parathyroid, Pituitary, Pancreas and Adrenal glands and their management.
  6. General introduction, types and Management of diseases caused by Vyadhi Kshamatwa Hinata (Immuno deficiency disorders), Auto Immune Disorders.
  7. Description and Management of following Emergency Conditions- Acute Haemorrhage, Hypertensive Emergencies, Acute abdominal pain (Renal colic, Biliary colic, Gastritis, Pancreatitis, Peritonitis and Appendicitis), Acute Abdomen, Anuria/ Oliguria, Congestive Heart Failure, Myocardial Infarction/Angina, Shock, Syncope, Convulsions, Hyperpyrexia, Hyperglycaemia, Hypoglycaemia, Status Asthmaticus, Acute Respiratory distress Syndrome, Drowning and Electric shock.

## **PAPER II**

**100 Marks**

### **Part A**

**50 Marks**

1. Chikitsa sutra and Management of the diseases of Pranavaha Srotas such as - Kasa, Shwasa, Hikka, Rajayakshma, Urakshata, Parshwashoola, Bronchitis, Bronchiectasis, Emphysema and COPDs.
  2. Chikitsa sutra and Management of the diseases of Udakavaha Srotas such as- Shotha, Jalodara, Trishna, Water & Electrolyte Imbalance.
  3. Chikitsa sutra and Management of the diseases of Annavaha Srotas such as - Agnimandya, Aruchi, Ajirna, Anaha, Atopa, Adhmana, Alasaka, Vilambika, Visuchika, Chardi, Grahani, Amlapitta, Gulma, Shoola, Bhasmaka, Acid peptic disorders.
  4. Principles of treatment and management of Vata Vyadhi such as - Pakshavadha, Ekangavata, Sarvangavata, Ardita, Avbahuka, Kati Graha, Manyastambha, Gridhrasi, Vishwachi, Khalli, Khanja, Pangu, Padaharsha, Padadaha, Vatakantaka, Kroshtukashirsha, Udavarta, Kampavata, Dhatugata and Ashayagata Avarana Vata, other Vata Rogas, Parkinsonism.
  5. Nidana and Chikitsa of Urusthambha, Gullian Barrie syndrome, Muscular Dystrophy, Myasthenia Gravis, Motor Neuron Diseases and Neuralgia.
-

1. Chikitsa Sutra and Management of Mamsavaha Srotas and Medovaha Srotas such as Gandamala, Galaganda, Mamsashosha, Arbuda, Apachi, Prameha, Sthaulya, Karshya, Diabetes Mellitus, Dyslipidaemia.
2. Chikitsa Sutra and Management of 'Asthi and Majjavaha Srotas such as Asthimajja Vidradhi, Asthisousharya, Asthi kshaya, Sandhigata Vata, Osteo Arthritis, Osteomyelitis, Osteoporosis, Osteopenia.
3. Chikitsa sutra and management of Shukravaha srotas such as Klaibya, shukralpata, shukradosha, kshina shukra, dhvajabhanga.
4. Chikitsa Sutra and Management of diseases of Mutravaha Srotas such as -Mutrakricha, Mutraghata, Ashmari, Cystitis, Nephritis, Nephrotic Syndrome, BPH, Renal Failure.
5. Chikitsa Sutra and Management of diseases of Purishavaha Srotas such as - Atisara, Pravahika, Arsha, Purishaj Krimi, IBS and Ulcerative Colitis.
6. Chikitsa Sutra and Management of Sexually Transmitted Diseases such as - Phiranga, Puyameha, Upadamsha, lymphogranuloma inguinale, Syphilis, Gonorrhoea.
7. Introduction, Definition and Management of Kama, Krodha, Lobha, Moha, Mada, Matsarya, Shoka, Bhaya, Vishada, Dainya, Harsha and Pragyaparadha.
8. Manas and Manovahasrotas, Nidana and Chikitsa of the following disorders - Unmada- Apasmara-Atattvabhinivesha, Chittodvega, Vishada, Anxiety disorders, Depression, Somatoform and Mood disorders, Stress induced disorders, Psychosexual Disorders. Importance of Daivavyapashraya, Sattwavajaya, Adravyabhuta Chikitsa. Medhya Rasayana in the management of Manasa Roga. Bhuta Vidya diagnosis and management of graha disorders.
9. Derivation, definition and synonyms of Rasayana, importance of Rasayana and its benefits. Indications of Rasayana therapy. Classification of Rasayana. Kutipravesika and Vatatapika Rasayana. Indications of Vatatapika Rasayana. Knowledge of Kayakalpa, Achara Rasayana. Procedures of Kutipravesika, Poorvakarma and specific schedules to be followed after Kutipravesha, benefits of Kutipravesika Rasayana, duration of process, Rasayana yoga and directions for their use. Determination of dose of Rasayana according to age. Rules and regulation after Rasayana therapy, Importance of Immunomodulators and antioxidants in Rasayana therapy.
10. Vajikarana- Derivation, definition, synonyms, necessity, benefits, importance of fertility, Symptoms of Shûkra (Semen), Vajikaran Dravya and Aushadhi. Properties, doses, methods of administration, ingredients and methods of formation of Rasayana & Vajikarana formulation. Classification and importance of Vajikarana Dravya

## Distribution of practical Marks 100

- |                                |            |
|--------------------------------|------------|
| 1) Daily case record/ 20 cases | - 20 marks |
| 2) Patient examination         |            |
| a) 1 Long case                 | - 20 marks |
| b) 1 short case                | - 10 marks |
| 3) Viva -voice                 |            |
| a) Paper I                     | - 25 marks |
| b) Paper II                    | - 25 marks |

Reference books:

1. Charak Samhita, Sushrut Samhita, Ashtanga Samgraha and Ashtanga Hridaya with their commentaries. Madhav Nidana with Madhukosha Commentary.
2. Ayurvediya Vyadhi Vigyana - Yadavji Trikamji
3. Roga Pariksha Vidhi - Priyavrat Sharma

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4. Panchakarma Vigyan -Haridasa Sridhar Kasture
5. Cikitsadarsha -Pandit Rajesvardutta Shastri
6. Kayachikitsa I-IV -Ramaraksha Pathaka

7. Ayurved Nidan Chikitsa Siddhanta -Prof. R.H.Singh.
8. Kayachikitsa Vol. I-IV. -Prof. Ajay Kumar
9. Davidson's Principles and Practice of Medicine.
10. API Text Book of Medicine.
11. Harrison's Text Bok of Medicine.
12. Cecil Text Book of Medicine.
13. Panchkarma Illustrated by Dr. G.Srinivasacharya.
14. Other relevant publications on subjects concerned

## **4.2. PANCHAKARMA**

Theory One Paper – 100 Marks Practical Viva-voce – 50 Marks

Hours of teaching Theory – 100 Clinical training: 3 months

### **I. Snehana**

1. Etymology and Definition of Sneha and Snehana
2. Snehayoni- Sthavara and Jangama: Properties of Sneha dravyas, Snehopag Dravyas
3. General knowledge of Ghrita, Taila, Vasa and Majja with their specific utility and actions ,Yamaka, Trivrit and Maha Sneha
4. Metabolism of fat
5. Achcha and Pravicharana of Sneha
6. Snehapaka and its importance in Panchakarma
7. **Types of Snehana:** i) Bahya and ii) Abhyantara Snehana

#### **i) Bāhya Snehana :**

Methods, indications and contraindications of the following types of Bahyasnehana; Mardana, Unmardana, Pādāghāta, Samvāhana, Karna Purana & Akshi Tarpan, Lepa, Talam,

**Murdhni Taila:** Siro-Abhyanga, Shiro Seka/dhārā, Siro Pichu and Siro-Basti

#### **ii) Ābhyantara Snehana**

Three Types of Ābhyantara Snehana: Shodhanārtha, Shamanārtha and Brimhanārtha Snehana, Indications and contraindications for Snehana

##### Shodhanārtha Snehana

- a. Importance and method of Deepan Pāchan and Rookshana in Shodhanārtha Snehana. Properties of Rookshana Dravya. Samyak Rookshana Lakshana
- b. Consideration of Agni and Koshtha in Snehana
- c. Indication of Different Matra, Various dose schedules for Shodhanārtha Snehana; Hraseeyasi, Hrasva, Madhyama and Uttama Mātrā, Ārohana Mātrā
- d. Methods of Shodhanārtha Snehana,

##### e. Jeerna and Jeeryaman Lakshana

- f. Samyak Yoga, Ayoga and Atiyoga of Snehana, Sneha Vyāpat & their management according to Ayurveda & Modern Medicine
- g. Diet and regimen during Snehana

**Sadyo Sneha:** Method of administration, dose fixation and utility **Shamanārtha Snehana,** Method of administration, dose fixation and utility **Bronhanarth Senhana:** Method of administration, dose fixation and utility **Avapeedak Sneha:** Method of administration, dose fixation and utility

### 8. Snehana Kārmukata (mode of action)

9. Special Procedures:

Takradhara, Udvartanam, Putpāka, Aschotana, Anjana, Gandusha, Kavala, Dhoompāna, Udvartana, Utsādana, Udgharshana, Talapothichil

**II.** Svedana

1. Etymology and Definition of Sveda and Svedana
2. Classifications of Sveda/Svedana
3. General Sweda dravya, Properties of Sweda dravyas, Swedaopag dravyas ,
4. Indications and contraindications of Svedana
5. Ten Types of Niragni Svedana
6. Knowledge of 13 types of Sagni Svedana and Chaturvidh Svedan
7. Detailed Knowledge with their Utility of the following Svedana procedures:  
Sankara/Pinda Sveda-Ruksha and Snigdha Sveda  
Patrapinda Sveda, Jambir Pinda Sveda, Vāluka Sveda, Churna Pinda Sveda, Kukkutand  
Pinda Sveda, Shashtika Shalipinda Sveda, Nadi Sveda, Bashpa Sveda Ksheer dhooma  
, Ksheer Seka, Kwath Seka, Avagaha Sveda, Dhanymla Dhara  
Parisheka Sveda, Pizichil, Upanaha Sveda, Annalepa
8. Local Basti such as Kati Basti, Janu Basti, Greeva Basti and Urobasti
9. General precautions during Sagni Svedana and Methods to protect vital during svedana
10. Samyak Yoga, Ayoga and Atiyoga of Svedana
11. Complications of Svedana and their Management according to Ayurveda & Modern Medicine
12. Diet and management during and after Svedana
13. Parihār Vishaya
14. Svedana Kārmukata (Mode of action)
15. General Knowledge about current Sudation techniques like Sauna bath, Steam bath

**III.** Vamana Karma

1. Etymology, definition and importance of Vamana Karma
2. Utility of Vamana Karma in health and disease
3. Indications and Contraindications for Vamana
4. Knowledge of Koshta and Agni
5. General knowledge of Vamana and Vamanopaga drugs; properties, actions, preparations, preservation with special reference to Madanphala, Kutaj, Nimba, Yashti, Vacha
6. Purva Karma of Vamana: Deepan-Pāchana, Abhyantara Snehana and diet



7. Management of one gap day-Abhyanga & Svedana, diet, special Kapha increasing diet
8. Preparation of the patient on Morning of Vamana day
9. Vamaka Yoga, Anupana, fixation of dose and method of administration
10. Administration of Vamanopaga Dravya such as milk, sugarcane juice, Yashtimadhu decoction
11. Lakshana indicating Doshagati during the process
12. Management during Vamana Karma & observations
13. Symptoms of Samyak Yoga, Ayoga and Atiyoga of Vamana Karma
14. Post Vamana management
15. Types of Shuddhi-Hina, Madhya and Pravara
16. Peyadi Samsarjana Krama and Tarpanadi Kram with their specific indications
17. Complication of Vamana and their management with Ayurveda and modern drugs
18. Pariharya Vishaya
19. Vamana Karmukata (Mode of action).

#### **IV. Virechana Karma**

1. Etymology, definition and importance of Virechana Karma
2. Utility of Virechana Karma in health and disease
3. Indications and Contraindications for Virechana
4. Knowledge of Koshta and Agni
5. Classification of Virechana Drugs, General properties of Virchana dravya
6. General knowledge of single and compound Virechan drugs; properties, actions, preparations, preservation with special reference to Trivrutta, Aragvadha, Eranda, Katuki, Jaipal
7. Purva Karma of Virechana: Deepan- Pachana, Abhyantara Snehana and diet
8. Management of 3 gap days-Abhyanga, Svedana & diet
9. Management on Morning of Virechana day
10. Preparation of Virechana Kalpa, Anupana, dose and method of its administration
11. Method of Virechana Karma and management during Virechana Karma & observations
12. Symptoms of Samyak Yoga, Ayoga and Atiyoga of Virechana Karma
13. Post Virechana management
14. Types of Shuddhi-Hina, Madhya and Pravara and accordingly Samsarjana Krama
15. Complications of Virechana and their management with Ayurveda and modern drugs
16. Pariharya Vishaya
17. Virechana Kārmukatā (Mode of action)

#### **V. Basti Karma**

1. Etymology, definition and importance of Basti as Ardha-Chikitsa
2. Utility of Basti Karma in health and disease
3. Basti Yantra- Putaka & Netra, Detailed study of traditional Basti Yantra and their Doshas  
Knowledge of alternative Basti Yantra-enema can, enema syringe, modified plastic/rubber bag for Putaka, modified plastic netra.
4. Classifications of Basti

5. Karma, Kāla and Yoga Basti schedules along with their utility.
6. **Niruha Basti:** Its etymology, synonyms, definition, classifications, sub-classifications & indications and contraindications.
  - a. Dose fixation of Niruha Basti according to age
  - b. Contents and Method of preparation of Niruha Basti dravya
  - c. Diet
  - d. Administration of Niruha Basti
  - e. Pratyāgamana Kāla, Post Niruha Basti management
  - f. Samyak Yoga, Ayoga and Atiyoga of Niruha.
  - g. Complication of Niruha Basti and its management according to Ayurved and Modern Medicines
  - h. Pariharya Vishaya and kala
7. **Anuvasana Basti:** Its etymology, synonyms, definition, classifications, sub-classifications & indications and contraindications.
  - a. Dose fixation of Anuvasan Basti according to age
  - b. Contents and Method of preparation of Anuvasan Basti dravya
  - c. Diet
  - d. Administration of Anuvasan Basti
  - e. Pratyāgamana Kāla, Post Anuvasan Basti management
  - f. Samyak Yoga, Ayoga and Atiyoga of Anuvasana.
  - g. Complication of Anuvasan and its management according to Ayurved and Modern Medicines
  - h. Pariharya Vishaya and kala
8. Basti Kārmukatā (Mode of action).
9. Knowledge of following types of Basti:  
Madhutailika Basti, Erandmuladi Basti, Yāpana Basti, Pichchha Basti, Kshira Basti, Kshara Basti, Vaitarana Basti, Panchprasutik Basti, Lekhan Basti, Krumighna Basti, Tiktashir Basti, Ardhamātrika Basti
10. **Uttara Basti:** its definition, indications and contraindications, Detailed study of traditional Basti Yantra and their Doshas Knowledge of alternative Basti Yantra
  - a. Preparation of patient,
  - b. Preparation of Trolley for Uttarbasti,
  - c. drug preparation and Fixation of dose,
  - d. method of administration in male and females,
  - e. observations,
  - f. complications and their management

## VI. Nasya

1. Etymology, definition, Significance of Nasya Karma.
2. Classifications and sub-classifications
3. Knowledge of general Dravya used for Nasya Karma, Shirovirechan Gana, Shirovirechanopag dravyas
4. Indications and contraindications of Nasya
5. Time of administration of Nasya
6. Dose fixation of different types of Nasya
7. Diet and regimen before and after Nasya Karma
8. Administration of Marsha, Pratimarsha, Avapeedaka, Dhoomapana and Dhuma Nasya
9. Symptoms of Samyak-yoga of Nasya,

10. Complication of Nasya and their management
11. Parihār Vishaya
12. Nasya Karmukata (mode of action)

**VII. Raktamokshana**

1. Definition, importance and Types of Raktamokshana
2. General Principles and rules of Raktamokshana
3. Classification of Raktamokshan
4. General Indication and Contra indication of Raktamokshan
5. **Jalaukavacharana:** Knowledge of different types of Jalauka (Leech) , Indications and contraindications of Jalaukavacharana, various types of Jalauka. Method of Application, Samyak Lakshan, Complication of Jalaukavacharana and their management with Ayurveda and Modern medicines.
6. **Pracchāna:** Indications and contraindications of Pracchana. Method of Application, Samyak Lakshan, Complication of Pracchana and their management with Ayurveda and Modern medicines
7. **Sirāvedha:** Indications and contraindications of Siravedha. Method of Application, Samyak Lakshan, Complication of Siravedha and their management with Ayurveda and Modern medicines
8. Knowledge of emergency management of complications such as water & electrolyte imbalance, shock, bleeding per rectal, hematemesis, epistaxis

**VIII. Physiotherapy**

1. Definition, Utility and Importance of Physiotherapy.
2. Basic Knowledge of Static exercise, Infrared, Short wave diathermy, Electromagnetic therapy, Wax bath therapy, Ultrasonic therapy.

PRACTICALS / CLINICAL TRAINING –

Total Duration of 3 Months posting

OPD (for 1-Month): observation of OPD patients, selection of the patients, observation of OPD base Panchakarma procedures

IPD (Panchakarma) and Panchakarma Unit – Observation of different procedures of Panchakarma, Assistance to the procedure under guidance of Panchakarma specialist  
Under clinical posting, each student has to study and write 15-long Cases and 10 short cases in prescribed format

Long case Paper- minimum 1 Vaman , 1 Virechan, 1Niruha & Anuvasan Basti, 1Nasya, 1 Raktamokshan

Short case paper –Minimum one each of Pinda sweda, Shirodhara, Abhyanga, Netra Tarpan, Bahya Basti, Nadi Sweda etc.

Distribution of Marks

- |                                      |          |
|--------------------------------------|----------|
| 1. Practical Record of 25 procedures | 05 Marks |
| 2. Long Procedure                    | 10 Marks |

3. Long Procedure Viva	05 Marks
4. Short Procedure	08 Marks
5. Viva on Short Procedure	02 Marks
6. General Viva-voce	20 Marks
<b>Total</b>	<b>50 Marks</b>

### Reference Books

1. Charak Samhita with Commentary of Ayurveda Dipika by Chakrapanidatta & Jalpakalpataru by Gangadhara
2. Sushrut Samhita with the Sushruta Nibhandha Samgraha Commentary of Dalhana & Nyayachandrika Panjika of Gayadasa on Nidana Sthana
3. Ashtanga Hridaya with Sarvanga Sundara & Ayurveda Rasayana Commentaries
4. Ashtanga Sangraha with Shashilekha Commentaries
5. Ayurvediya Panchakarma Chikitsa Dr Mukundilal Dwivedi
6. Panchakarma Vigyan Dr Haridas Shreedhar Kasture
7. Illustrated Panchakarma Dr.G Srinivasa Acharya
8. Clinical Panchkarma (English) Dr. P.Yadaiah
9. Prayogika Panchkarma (Hindi) Dr. P. Yadaiah
10. Vivida Vyadhiyome Panchkarma (Hindi) Dr. P. Yadaiah
11. The Panchkarma Treatment of Ayurveda with Kerala Specialtie Dr. T.L. Devaraj
12. Panchkarma Therapy Dr. R.H. Singh
13. Ayurveda-Principles and Panchakarma Practice Dr Mandip R. G. & Prof. Gurdip Singh
14. Principles and Practice of Basti Dr. Vasudevan & Dr. L. Mahadevan
15. Panchakarma Sangraha Dr. Manoj Shamkuwar
16. Essential of Panchakarma Therapy Dr.Pulak Kanti Kaur
17. Principles and Practice of Panchakarma Vaidya Vasant Patil
18. Harrison's Principle of Internal Medicine
19. Guyton's Physiology

## **4.3 SHALYA TANTRA**

Theory Two Papers – 100 Marks Each  
Practical - Viva voce – 100 Marks

PAPER –I

100 Marks

Part – A

50 Marks

### **Definition of Shalya, Shalya Tantra and its importance. Introduction to Shalya**

**Tantra:** Historical background and progress made.

- **Target** - Fluency in textual reading and comprehension.
- Preferable targets - Know recent developments and controversies.

### **Description of Yantra, Shastra, Anushastra: Definition, number, types, uses, Dosh, Guna, Karma. Relevant modern instruments.**

- Target - Basic understanding of the concepts of Yantra and Shastra. Acquaintance with commonly used surgical instruments. Knowledge of textual descriptions.
- Preferable targets - Knowledge about currently used surgical instruments, their specifications, procurement sources etc.

### **Nirjantukarana / Sterilization: Methods, types and its role in surgical practice.**

- Target - Basic surgical discipline of maintaining asepsis.
- Preferable targets- Knowledge of recently developed chemicals, instruments for sterilization.

### **Sangyahan / Anaesthesia: Definition and Types.**

- Local anaesthesia** – Drugs, Techniques, Indications, Contraindications, Complications and their Management.
  - Regional and General anaesthesia**- Drugs, Techniques, Indications, Contraindications, Complications and their Management.
- Target-Basic knowledge of the drugs and instruments of anaesthesia. To observe the process of induction, monitoring and recovery.
  - Preferable targets- Assisting and handling anaesthesia.

### **Trividha Karma – Purva Karma, Pradhana Karma and Paschat Karma.**

- Target- Capability to identify conditions which can affect the outcome of surgery in pre, intra and post- operative period.
- Preferable targets- Experience of handling incidents.

### **Ashtavidha Shastra Karma - Surgical procedures.**

- Targets- Appreciation and comprehension of concepts and indications of different procedures.
- Preferable targets –Hands on experience of surgical procedures.

### **Yogya - Experimental Surgery.**

- Target –Appreciation and comprehension of concepts of Yogya. Idea of patient's safety in experimental training.
- Preferable targets- Hands on training on mannequins.

### **Marma: Nirukti, types, description and importance.**

- Target –Clinical application of concepts of marma.
- Preferable targets- Study of relevance of marma in the light of current anatomical and surgical knowledge.

### **Kshara and Kshara Karma:**

- Nirukti, Pradhanyata, Guna, Dosha, Karma, Prakara, Yogya, Ayogya, Procedure, Upadrava and Chikitsa.**
- Kshara nirmana vidhi, knowledge of Kshara Varti, Taila and Pichu.
- Kshara Sutra – Preparation, Indications, Contraindications and Method of application, Complications and their Management.**
  - Target – Capability to identify and practice the use of kshara, kshara sutra in common clinical conditions.
  - Preferable targets – Broader knowledge of current trends and ongoing researches in kshara application.

### **Agnikarma: Mahatva, Upakarana, Vidhi, Akrti bheda, Yogya, Ayogya and Upadrava Chikitsa.**

Contemporary techniques and tools of Agnikarma.

- Target - Capability to appreciate the clinical indications and comprehend Agnikarma procedure.
- Preferable targets - Hands on experience of use of cautery in surgical practice.

### **Raktamokshana: Mahatva, Prakara - Siravyadha, Pracchanna, Shringa, Alabu, Jaloukavacharana – Yogya, Ayogya, Procedure, Upadrava and Chikitsa.**

- Target- Capability to appreciate and comprehend clinical indications of Jaloukavacharana and other Raktamokshana procedures.
- Preferable targets - Uses of bloodletting in current therapy.

### **Bandha Vidhi – Prayojana, Dravya, Indications, Contraindications, Prakara, Upadrava, Pichu, Plota, Kavalika and Vikeshika.**

- Target- Hands on experience of techniques of bandaging.
- Preferable targets - New generation of bandaging and splintage tools.

### **Pranasta Shalya and Nirharana Upaya.**

- Target – Importance of concepts of Sushruta in the management of Shalya and concerns of patient safety. Identification and management of foreign bodies.
- Preferable targets - Current concepts and diagnostic tools of dealing with foreign bodies.

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**Fluid, Electrolyte, Acid Base Balance and Nutrition:**

- i. Introduction of physiology of fluids and electrolytes.
- ii. Dehydration and over hydration.
- iii. Specific electrolyte loss, Acidosis, Alkalosis, Symptomatology and Management.
- iv. Electrolyte changes in specific diseases like pyloric stenosis, intestinal obstruction and anuria.
- v. Various replacement fluids in surgery, mode of administration and complications.
- vi. Nutrition.
  - Target – Capability to identify and manage fluid and electrolyte imbalance. Ability to administer parenteral fluid.
  - Preferable targets - Advanced techniques of fluid and electrolyte assessment and management.

**Rakta Mahatwa, Raktasrava / Haemorrhage: Prakara and Lakshana.**

- i. Raktastambhana – Haemostasis.
- ii. Blood Transfusion –Blood groups, Compatibility, Indications, Contraindications and Complications with Management.
- iii. Component therapy.
  - Target-Knowledge of achieving haemostasis in haemorrhage.
  - Preferable targets - Detailed knowledge of blood bank techniques.

**Antibiotics, analgesics, anti-inflammatory and emergency drugs in surgical practice.**

- Target – Working knowledge of commonly used drugs.
- Preferable targets - Advanced pharmacological study of the above drugs.

**Diagnostic techniques** – X-ray, Imaging techniques, Ultrasonography, CAT Scan, MRI, Biopsy / Cytological study.

- Target- Knowledge of proper indications for optimum investigational tools and their interpretation.
- Preferable targets - Capability to work independently in the field of diagnostic techniques.

**Part - B**

50 Marks

**Shat Kriyakala in surgical practice.**

- Target- Clinical utility of the concepts.
- Preferable targets - Applied aspects of Kriyakalas in the light of current concepts of pathogenesis.

**Nirukti, Nidana, Samprapti, Prakara, Lakshana, Sadhya-asadhyata, Upadrava and Chikitsa of the following disorders.**

- i. Vranashotha - Inflammation
  - ii. Vidhradi - Abscess
  - iii. Pidika - Boils
  - iv. Nadi Vrana - Sinus / Fistulae
  - v. Vrana Granthi - Keloid / Hypertrophic scar
- 
- vi. Marmagata - Shock
  - vii. Kotha – Gangrene and Principles of Amputation.
  - viii. Granthi - Cyst
  - ix. Arbuda - Tumour
- Target-Clinical application of the concepts.
  - Preferable targets - Hands on experience of management of different conditions.

**Vrana – Nirukti and Prakara**

- i. Nija Vrana – Nidana, Samprapti, Vrana Vasthu, Prakara, Lakshana, Vrana Pariksha – Sthana, Vrana Akrti, Srava, Gandha, Vedana. Vrana Avastha- Dustavrana, Shuddha Vrana, Ruhyamana Vrana, Samyak Roodha Vrana, Vrana Sadhya-asadhyatha and Vrana Upadrava.
- ii. Vrana Chikitsa – Pathya-apathya and Shashti Upakrama, Vranitagara and Rakshakarma.
- iii. Agantuja Vrana :
  - a. Sadyo Vrana - Traumatic wounds – Nidana, Prakara, Lakshana, Upadrava and Chikitsa.
  - b. Management of bites and stings.
- iv. Dagdha Vrana – Burns and scalds.
- v. Ulcer - Types and their management.
- vi. Wound healing stages and their management.
- vii. Pramehapidaka - Diabetic carbuncle and wounds.
  - Target - Clinical application of the concepts.
  - Preferable targets - Hands on experience of management of different conditions.

**Twak Vikara - Nidana, Samprapti, Lakshana and Chikitsa of Chippa – Paronychia, Kadara – Corn and Kshudra rogas.**

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Manya Vikara – Nidana, Samprapti, Lakshana and Chikitsa of Galaganda – Goitre, Gandamala, Apachi –Lymphadenitis, Pashanagardhabha – diseases of parotid gland.**

- Target-Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Sira Vikara - Venous disorders – Superficial and Deep venous thrombosis, Haemangioma, Varicose veins - Diagnosis and their Management.**

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.



**Dhamani Vikara - Arterial disorders – Nidana, Samprapti, Lakshana and Chikitsa of Aneurysm, Buerger’s disease, Atherosclerosis, Raynaud’s disease.**

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Snayu Vikara - Diseases of tendons and ligaments – Tennis elbow, Ganglion and their Management.**

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Care of AIDS - HIV and hepatitis infected patients.**

- Target - *Knowledge of safety precautions.*

PAPER - II

100 Marks

Part - A

50 Marks

**Bhagna – Skeletal injuries: Prakara including pathological fracture, Samanya Lakshana, Upadrava and Chikitsa.**

Description of fracture of following bones with Clinical features, Diagnosis, Complications and Management – scapula, clavicle, humerus, radius, ulna, femur, patella, tibia and pelvis bones.

Sandimoksha - Dislocation: Dislocation of following joints with Clinical features, Diagnosis, Complications and Management of shoulder, elbow and hip.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of bone:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Osteomyelitis, Cysts, Tumours and Tuberculosis.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Cranio-cerebral injuries:** Mechanism, Pathology, Classification, Investigations, Complications and primary management.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Spine:** Mechanism, Pathology, Classification, Investigations, Complications and primary management of Tuberculosis, Ankylosing Spondylitis and Disc prolapse.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of breast:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Sthana Vidradhi - Breast abscess and Sthana Arbuda - Breast tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of chest:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Chest injury, Pleural effusion, Pleurisy and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of esophagus:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Oesophagitis, Varices, Ulcer and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Gulma Roga** - Nidana, Prakara, Lakshana, Upadrava and Chikitsa.

**Shoola vyadhi** - Nidana, Prakara, Lakshana, Upadrava and Chikitsa.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of acute abdomen.

**Udara Roga:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Jalodara - Ascites, Chidrodara – Perforation, Peritonitis and Badhagudodara-Intestinal obstruction.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of stomach and duodenum:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Pyloric Stenosis, Peptic Ulcer and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of small intestine:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Tuberculosis, Obstruction and Perforation.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of large intestine** - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Tuberculosis, Obstruction, Perforation, Tumours, Appendicitis, Crohn's disease and Ulcerative Colitis.

- Target - Clinical utility of the concept.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Rectum and Anal Canal** – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital disorders, Arshas - Haemorrhoids, Parikartika - Fissure-in-ano, Bhagandara - Fistula-in-ano, Guda Vidradi - Anorectal abscesses, Gudabhramsa - Rectal prolapse, Sanniruddaguda - Anal stricture, Incontinence, Rectal Polyp and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Abdominal injuries and their management.**

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

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**Part – B**

**50 Marks**

**Diseases of Liver:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Yakrit Vidhradi - Abscess, Neoplasia, Portal hypertension and Yakritdalyodar –Hepatomegaly.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Gallbladder:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Cholecystitis, Cholelithiasis, Obstructive jaundice and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Pancreas:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Pancreatitis, Cysts of Pancreas and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Spleen** – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Pleehodara – Splenomegaly and Splenic rupture.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Kidney and Ureters** - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Polycystic kidney, Injuries, Perinephric abscess, Calculus and Neoplasms.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Urinary bladder** – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Injuries, Ashmari - Vesical Calculus, Cystitis and Neoplasms.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Mutraghata and Mutrakrichra** - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management. Retention of urine.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Prostate** - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Prostatitis, Prostatic abscess, Benign Enlargement of Prostate and Carcinoma of Prostate.

- Target - Clinical utility of the concepts.
  - Preferable targets - Hands on experience of management of different conditions.
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**Diseases of Urethra** – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Urethritis, Stricture and Rupture.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Penis:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Niruddhaprakasha -Phimosis, Parivartika -Paraphimosis, Avapatika - Prepuceal ulcer, Arbuda- Tumours and Lingarsha - Penile Warts.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Diseases of Scrotum and Testis:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Epididymo-orchitis, Epididymal cyst, Scrotal filariasis, Shukrashmari - Seminal calculus, Torsion of testis, Ectopic testis, Undescended testis and Tumours.

**Vridhhi Roga:** Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Mutravridhhi – Hydrocele.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

**Antra Vridhhi** – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Hernia - Inguinal, Femoral, Epigastric, Umbilical, Incisional and rare forms of Hernia.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

### PRACTICALS

#### **Content of Practicals:**

1. Identification, uses, demonstration of surgical instruments and methods of sterilization.
2. Training of case taking, bed side clinicals and case presentation.
3. Demonstration and Practical training in Anaesthesia.
4. Training to develop skills in following Parasurgical and other procedures
  - i. Kshara Karma
  - ii. Agnikarma
  - iii. Kshara Sutra
  - iv. Raktamokshana
  - v. Application of bandages and splints
  - vi. Catheterization
  - vii. Wound management procedures like Parisheka and Patradana
  - viii. Ryle's tube aspiration
  - ix. Injections -Intramuscular / Intravenous / Subcutaneous / Intradermal
  - x. Incision and drainage of abscess
  - xi. Suturing of open wounds
5. Observation of following procedures

- i. Circumcision
  - ii. Hydrocele
  - iii. Hernial repair
  - iv. Vasectomy
  - v. Haemorrhoidectomy
  - vi. Fistulectomy
  - vii. Fissurectomy
  - viii. Appendectomy
  - ix. Cholecystectomy
6. Training of Surgical Emergencies and Management.

**Clinical Training (Indoor and Outdoor)**

- Shalya (Samanya)
- Shalya (Kshara and Anushastra Karma)
- Asthi and Sandhi Chikitsa (Orthopaedics and Trauma)
- Anaesthesia
- Radiology

**09 Months**

- 03 Months (atleast one month in OT)
- 03 Months (atleast one month in OT)
- 02 Months
- 15 days
- 15 days

**Distribution of Marks**

- |                  |             |
|------------------|-------------|
| 1) Daily records | - 10 Marks  |
| 2) Instruments   | - 20 Marks  |
| 3) Short case    | - 10 Marks  |
| 4) Long case     | - 20 Marks  |
| 5) Viva – voce   | - 40 Marks  |
| Total            | - 100 Marks |

**Reference Books**

- |  |  |
|--|--|
| 1. Sushruta Samhita  |  |
| 2. Ashtanga Sangraha   |  |
| 3. Ashtanga Hridaya  |  |
| 4. Charaka Samhita   |  |
| 5. The Surgical instruments of the Hindus                      | - Girindranath Mukhopadhyaya                             |
| 6. Shalya Tantra Samuchchaya                                   | - Pandit Ramadesh Sharma                                 |
| 7. Shalya Vigyan (Part 1-2)                                    | - Dr. Surendra Kumar Sharma                              |
| 8. Shalya Samanvaya (Part 1-2)                                 | - Vd. Anantaram Sharma                                   |
| 9. Shalya Pradeepika   | - Dr. Mukund Swaroop Verma                               |
| 10. Sushruti   | - Dr. Ram Nath Dwivedi                                   |
| 11. Clinical Shalya Vigyan                                     | - Dr. Akhilanand Sharma                                  |
| 12. Bhagna Chikitsa  | - Dr. Prabhakar Janardhan Deshpande                      |
| 13. Kshara sutra management in anorectal ailments              | - Dr. S.K. Sharma, Dr. K.R.Sharma and Dr. Kulwant Singh. |
| 14. Anorectal diseases in Ayurveda                             | - Dr. Sijoria and Dr. Praveen Kumar Chowdary.            |
| 15. Adhunik Shalya Chikitsa Siddhanta                          | - Dr. Katil Narshingham Udupa                            |
| 16. Agnikarma Technology Innovation                            | - Dr. P.D. Gupta   |
| 17. Shalya Tantra Ke Siddhant                                  | - Dr. K.K.Takral   |
| 18. Recent advances in the management of Arshas / Haemorrhoids | - Dr. P. Hemantha  |

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- |  |  |
|--|--|
| 19. Arsha Evum Bhagander Mein sutra Avacharan                      | Kumar  |
| 20. Kshara Sutra   | - Vd. Kanak Prasad Vyas                                  |
| 21. Surgical ethics of Ayurveda                                    | - Dr. S.N.Pathak   |
| 22. Bailey and Love's Short Practice of Surgery                    | - Dr. D.N. Pande   |
|  | - Norman.S. Williams, Charles.V. Mann and R.C.G. Russell |
| 23. Clinical methods in surgery                                    | - S. Das   |
| 24. Textbook of Operative Surgery                                  | - S. Das   |
| 25. Shalya Vigyan (Sachitra)                                       | - Anantram Sharma  |
| 26. Anushastra Karma   | - Dr. D.N. Pande   |
| 27. Concept of Vrana is Ayurveda                                   | - Dr. Lakshman Singh                                     |
| 28. Significance for Poorva Karma in Surgical Patient              | - Dr. Lakshman Singh                                     |
| 29. Sangyahan Prakash  | - Dr. D.N. Pande   |
| 30. A concise Text Book of Surgery                                 | - S. Das   |
| 31. A manual on Clinical Surgery                                   | - S. Das   |
| 32. A System of Surgical Diagnosis                                 | - T.N. Patel   |
| 33. A Practical Guide to Operative Surgery                         | - S. Das   |
| 34. Drugs and Equipment for Anaesthesia                            | - Arun kumar   |
| 35. Manual of Surgical Instruments                                 | - M.M. Kapur   |
| 36. Ward Procedures  | - Patel Mansukh. B                                       |
| 37. Recent trends in the management of Arshas / Haemorrhoids       | - Dr. P. Hemantha Kumar                                  |
| 38. Primary Anaesthesia  | - Maurice King   |
| 39. Synopsis of Anaesthesia  | - Lee  |
| 40. Clinical Anatomy/ Surgical Anatomy                             | - John E.Skandalakis                                     |
| 41. Surgical Instruments of the Hindus                             | - Girindharnath Mukopadyay                               |
| 42. Outline of Orthopedics   | - John Crawford Adams and David Hamblen. L               |
| 43. Outline of Fracture  | - John Crawford Adams                                    |
| 44. Recent trends in the management of Bhagandara / Fistula-in-ano | - Dr. P. Hemantha Kumar                                  |
| 45. Principles and Practice of Agnikarma                           | - Dr. Anand Kumar and Dr. Kanchan Shekokar               |
| 46. Manipal Manual of Surgery                                      | - Dr. Rajgopal Shenoy                                    |

Theory Two Papers – 100 Marks Each  
Practical/Viva voce – 100 Marks

**NETRA ROGA VIGYAN**

Paper I

100

Marks

**I. Introduction**

- Shalakyatantra nirukti, Parichayam, Ithihasam
- Netra rachana shariram (Mandala, Patala, Sandhi, Drushti Vichara) and Netra Kriya Sharira alongwith modern anatomy of Eye.
- Eye examination and knowledge of basic instruments/equipments required for examination of Eye.
- Netrarognanam – Samanya Hetu (Nija and agantuja), Purvarupa, Samprapti, Rupa and Chikitsa.
- Classification of Netraroga and its importance.

**II. Netra Samanya and Vishishta Chikitsa - Kriya Kalpa**

- Netra and Chakshu swasthya hitkara Dinacharya, Ritucharya, Aahara evam Vihara.
- Kriya-kalpa-Seka, Aschyotana, Pindi, Vidalaka, Tarpana, Putapaka, Anjana and importance of Panchkarma in Netra Chikitsa.
- Basic fundamentals of Netra Shastra Chikitsa e.g. Purva – Pradhana - Paschat karma, Ama-Pachyaman-Pakva Vrana shotha, Vranitopasana, Pranashashalya, & Vranbandhana. Methods and concepts of sterilization, asepsis and antisepsis as per ancient and modern point of view.
- Basic applied knowledge of Ashtavidha shastrakarma, agni, kshara, raktamokshana in Netra rogas.
- Essential diagnostic and therapeutic modern pharmacological agents required in Netra Chikitsa

**III. Sandhigata Roga(Diseases of junctional areas of eye)**

- Number of sandhigata rogas, detailed etiology, pathology, clinical features and management of Pooyalasa and Srava Rogas.
- Brief Study of krimi granthi, Parvani and Alaji Rogas.
- Study of Acute and Chronic Dacryocystitis, Epiphora, Blepharitis including their aetiology, pathology, signs & symptoms, differential diagnosis and medical & surgical management.

**IV. Vartmagata Roga(Diseases of Lids)**

- Number of vartmagata rogas, and detailed knowledge of etiology, pathology, clinical features and management of Anjananamika, Utsangini, Lagana, Vatahata vartma, Pakshma kopa, Sikta vartma, Pothaki, Klinna vartma, Krichronmeelana and Kukunaka diseases of Vartma.
- Brief Knowledge of Vartmarbuda, Utklishta vartma, Nimesh, Pakshmeshata, Vartmarsha
- Knowledge of Hordeolum, Ptosis, Trachoma, Trichiasis, Entropion, Ectropion including their Etiology, signs and symptoms differential diagnosis and medical & surgical management.

**V. Shuklagata Roga(Diseases of sclera and conjunctiva)**

- Number of Shuklagata rogas, detailed knowledge of etiology, pathology, clinical features



- 
- and management of Arma, Arjuna and Shuktika
- b) Brief Knowledge of Sira pidika, Sira jala, Pishtaka, Balasgrathita.
  - c) Study of Pterygium, Scleritis, Episcleritis, Sub-Conjunctival Hemorrhage including their Etiology, signs and symptoms, differential diagnosis and medical & surgical management.

**VI. Krishnagata Roga (Diseases of cornea and uvea)**

- a) Number of krishnagata rogas, detailed knowledge of Etiology, Pathology, Clinical features, differential diagnosis, complications and Management of Savrana /kshata Shukla (Shukra), Avrana shukra (Shukla)
- b) Brief knowledge of Sira shukla, Akshipakatyaya and Ajakajata.
- c) Knowledge of Corneal ulcer, Corneal Opacity, Uveitis, Acute Iridocyclitis, Staphyloma, their aetiology, pathology, symptoms, differential diagnosis, complications and management.

**VII. Sarvagata Roga (Diseases effecting all parts of eye)**

- a) Number of Sarvagata rogas, detailed knowledge of etiology, pathology, clinical features, complications, differential diagnosis and Management of Abhishyanda, Adhimantha, Hatadhimantha and Shushkakshipaka.
- b) Brief Knowledge of Amloshit, Vata paryaya, Anyato vata, Sashopha & Ashophakshipaka-Pilla roga, Sirotkata and Siraharsha.
- c) Knowledge of Conjunctivitis, Glaucoma, Dry Eye Syndrome including their etiology, pathology, clinical features, differential diagnosis, complications and their management.

**VIII. Drishtigata Roga (vision disorders)**

- a) Number of Drishtigata rogas detailed knowledge of - etiology, pathology, clinical features, differential diagnosis and management of Timira, Kacha and Linga nasha.
- b) Brief Knowledge of Abhighataja lingnasha, sanimittaja & Annimittaja Lingnasha Doshandhya/Kaphavidagdha drishti, Naktandhya, Ushna vidagdha drishti, Pittavidagdha drishti, Dhumadarshi, Hriswajadya, Gambhirika, Nakulandhya, Nayanabhighata.
- c) Knowledge of Refractive errors, Cataract including their etiology, pathology, clinical features, differential diagnosis, complications and their management.
- d) Study of Eale's disease, Hypertensive & Diabetic Retinopathies, Age related Macular degeneration, Strabismus, Retinitis pigmentosa, Night blindness, Amblyopia, Central serous retinopathy, Optic Neuritis and Optic atrophy

**IX. Miscellaneous Diseases**

- a) Xerophthalmia and other malnutritional eye disorders.
- b) Knowledge of ocular trauma and their management.
- c) Introduction to Eye bank, Eye donation, Corneal Transplantation
- d) Preventive Ophthalmology and Community Ophthalmology

## SHIRA - KARNA- NASA- MUKHA ROGAS

**PAPER II**

**100 Marks**

### **I Samanya Chikitsa**

- a) Study of therapeutic procedures like Sveda, Kavala, Gandusa, Dhuma, Murdhni Taila, Nasya, Pratisarana, Karna Purana, karna prakshalana, nasa prakshalana Mukha Lepa.
- b) Ashtavidha shastrakarma and anushastrakarma used in the treatment of Shira, Karna, Nasa evam Mukha Rogas.

### **II Shiro Roga**

- a) Importance and Superiority of Shira.
- b) Number, general etiology, pathology and cardinal features of shiro rogas and kapalgata rogas along with their common line of management/treatment.
- c) Detailed study of Vataja, Pittaja, Kaphaja shirashoola, Suryavarta, Ardhavabhedaka, Khalitya, Palitya.
- d) Brief Knowledge of Raktaja shiraha shoola, Krimija shiraha shoola, Kshayaja shiraha shoola & Sannipataja shiraha shoola, Ananta vata, Indralupta, Darunaka.
- e) Detailed study of Headache, Migraine its differential diagnosis and treatment.

### **III Karna Roga**

- a) Detailed study of Rachana and Kriyasharir of Karna (Ear) & Shravanendriya as per Ayurvedic and modern view, Examination of Ear along with instruments/equipments required in Ear examination.
- b) Detailed study of etiology, pathology, classification, clinical features and management of diseases of Karna – karna shool, karna nada & shweda, Badhirya, karnastrava, karna pratinaha, pootikarna, karnagoothaka, karnavidradhi.
- c) Brief Knowledge of karna kandu, karnapaka, karnarsha, karnarbuda, krimikaran & karnapali rogas, Karna sandhana (Auroplasty), fundamentals, method and Vaikritpaham
- d) Detailed study of Otagia, ASOM, CSOM, Deafness, wax including their etiology, pathology, clinical features, differential diagnosis, complications and medical & surgical management
- e) Brief Knowledge of Otomycosis, Otosclerosis, Tinnitus, Vertigo, Foreign body in ear and Noise pollution.

### **IV Nasa Roga**

- a) Detailed study of Rachana and Kriyasharir of Nasa (Nose and paranasal sinuses) & Ghranendriya as per Ayurvedic and modern view, Examination of Nose. along with instruments/equipments required in Nose examination.
- b) Detailed study of Pratishyaya, Dushta pratishyaya, Nasanaha, Kshavathu, Nasagata raktapitta & Nasarsha.
- c) Brief Knowledge of Putinasa, Bhranshatu, Peenasa, Apeenasa, Nasarbuda, Nasashotha, Dipta, Nasa Sandhana.
- d) Detailed study of Rhinitis & Sinusitis Epistaxis, Nasal Polyp, DNS, Foreign body including their Etiology, pathology, clinical features differential diagnosis and medical & surgical management.
- e) Brief Knowledge of Nasal trauma, Tumours of nose and Para nasal sinuses.

## **V Mukha Roga (Diseases of Oral Cavity)**

- a) Detailed study of Rachana and Kriyasharir of Mukha Rogaadhithana- oshtha, dantamoola, danta, jivha, talu, gal, sarvasara (Oral cavity ) as per Ayurvedic and modern view along with their Basic examination including instruments/equipments required for the examination
- b) Mukha and Danta Swasthya as per ancient and modern concepts including prevention of malignancy of oral cavity.
- c) Number and general aetiology, pathology, cardinal features of Mukha rogas along with their common line of management/treatment.

### **Oshtha Roga (Diseases of Lips)**

- a) Detailed study of Etiology, pathology, classification, clinical features and management of - Oshtha prakopa, khandoshtha
- b) Brief Knowledge of Gandalaji, Jalarbuda, Kshataja Oshthaprakopa
- c) Knowledge of cleft lip.

### **Dant Mula Gata Roga (Diseases of Periodontia)**

- a) Detailed study of Etiology, pathology, classification, clinical features and management of - Shitada, Dantaveshta, Upakush, Danta Nadi, Danta Vidradhi, Adhimansa
- b) Brief Knowledge of dantapupputaka, Saushira, Mahasaushira, Danta Vaidarbha , Paridara, Vardhana.
- c) Detailed study of Etiology, pathology, classification, clinical features and management of Gingivitis, Apical abscess, Periodontitis (Pyorrhoea).

### **Danta Roga (Dental Diseases)**

- a) Detailed study of Etiology, pathology, classification, clinical features and management of Daalan, Krimidanta, Dantaharsha, Danta sharkara, Hanumoksha
- b) Brief Knowledge of karala, Bhanjanak , Kapalika, Shyava Danta, Danta bheda,
- c) Danta chaal, Adhidanta, Danta Utpatana including Jalandhar bandha method and Danta Purna.
- d) Knowledge of Dental Caries, Dental Tartar & Tooth extraction.

### **Jihva Gata Roga (Diseases of Tongue)**

- a) Detailed study of Etiology, pathology, classification, clinical features and management of - jivha kantaka (vataja, pittaja and kaphaja)
- b) Brief Knowledge of Upajihva, Adhijihva, Alasa.
- c) Knowledge of Glossitis, Tongue Tie, Ranula, Benign and Malignant Tumors of tongue.

### **Talu Roga (Diseases of Palate)**

- a) Detailed study of Etiology, pathology, classification, clinical features and management of - Gala shundika, Talushosha, Talupaka
- b) Brief Knowledge of Talupupputa, Adhrusha, Kacchapa, Talvarbuda, Mamsasanghata.
- c) Knowledge of Cleft palate, palatitis, uvulitis and tumours of the palate.

### **Kantha and Gala gata Roga (Diseases of Pharynx & Larynx)**

Detailed study of Etiology, pathology, classification, clinical features and management of - Tundikeri, Kantha shaluka, Gilayu, Galaganda,

- Swrabhedha , Galavidradhi.
- Brief Knowledge of Rohini, Galashotha, Kantharbuda, Kanthavidradhi, Galarbuda Galaugham, Vrindam, Ekavrindam, Valaya, balasa , Shataghni, Swaraghna.
  - Detailed study of Etiology, pathology, classification, clinical features and management of - Pharyngitis, Laryngitis, Tonsillitis & Adenoiditis
  - Brief Knowledge of foreign body in the throat, Carcinoma of Larynx & Pharynx, Dysphagia Diphtheria & diseases of salivary glands.

Sarvasara Mukha Roga (Generalised mucosal affections of the oral cavity)

- Detailed study of Etiology, pathology, classification, clinical features and management of Sarvasar mukhapaka
- Brief Knowledge of urdhvaguda, putivaktrata, mukharbuda
- Detailed Knowledge of Stomatitis.

## VI Miscellaneous Diseases

National Programme for Prevention and Control of Deafness.

## PRACTICAL

### Content of Practical

Identification, Uses, Demonstration of surgical/non-surgical equipment/ instruments, materials used in shalaky chikitsa. Method of sterilization. Training of case taking, bedside clinics and case presentation.

Training in para- surgical procedures-

- Kshara karma
- Agnikarma
- Raktamokshana
- Training of ward procedures. Application of bandages, wound management
- Training of minor procedures (ashtavidha)
- Observation of surgical procedures in Shalaky

<b>Clinical Training</b>	04 Months (OPD, IPD OT and kriya kalpa)
<b>Distribution of marks</b>	
1) Long Case	30 Marks
2) Short Case	20 Marks
3) Identification of instruments	10Marks
quipments,medicines,etc	30 Marks
4) Viva – voce	10 Marks
5) Daily Record (Case record)	
<b>Total</b>	<b>100 Marks</b>

Reference Books:-

- |  |                                |
|--|--------------------------------|
| 1. Shalakya Tantra                           | Dr. Rama Nath Dwivedi          |
| 2. Shalakya Vigyan                           | Dr. Ravindra Chandra Choudhary |
| <hr/>  |                                |
| 3. Abhinava Netra Chikitsa                   | Acharya Vishva Nath Dwivedi    |
| 4. Netra Chikitsa Vigyan                     | Dr. Ravindra Chandra Choudhary |
| 5. Netra Roga Chikitsa                       | Dr. Munje                      |
| 6. Netra Roga Vigyan                         | Dr. Hans Raj                   |
| 7. Parson's Diseases of Eye                  |                                |
| 8. Diseases of ENT Log and Turner            |                                |
| 9. Shalakya Tantra                           | Shiv Nath Khanna               |
| 10. A text book of ophthalmology in Ayurveda | Dr. P.K.Shantha kumara         |
| 11. Shalakya Kriya Kalpa Vigyan              | Prof. K. S. Dhiman             |
| Useful portions of Charak, Sushrut, Vagbhata |                                |

## 4.5

### **Research methodology and Medical statistics**

Total Marks 50 (Part A-30 and Part B- 20)

#### PART – A –Research Methodology

1. Brief historical background of research in Ayurved and contemporary medical science  
Evidences of researches in ayurvedic classics
2. Etymology, definitions and synonyms (Anveshana, Gaveshana, Prayeshana, Anusandhan and Shodha) of the word Research
3. Research in Ayurved - Scope, need, importance, utility
4. Types of Research (familiarization of the terms)
  - a) Pure and Applied
  - b) Qualitative , Quantitative and Mixed  
Observational and interventional.
5. Research process (Importance of each steps in brief)
  - a. Selection of the topic
  - b. Review of the literature
  - c. Formulation of Hypothesis
  - d. Aims and Objectives
  - e. Materials and methods
  - f. Observations and results
  - g. Methods of communication of Research
6. Research tools – Role of the pramanas as research tools
7. The concept and importance of ethics in research
8. Concept of Evidence Based Medicine and Scientific Writing
9. Importance of IT in data mining and important research data portals concerned with Ayurved and contemporary medical science (DHARA , PubMed, Ayush Research Portal, Bioinformatics Center, Research Management Informatic System etc.)

#### Part – B Medical-Statistics

1. Definition, scope and importance of the Medical statistics
2. Common statistical terms and notations
  - a. Population
  - b. Sample
  - c. Data
  - d. Variable
  - e. Normal distribution
3. Collection and Presentation of data
  - a. Tabular
  - b. Graphical
  - c. Diagrammatical
4. Measures of location

- a. Average
  - b. Percentile
- Measures of Central Tendency
- a. Arithmetic mean
  - b. Median

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c. Mode

- 5. Variability and its measurement
  - a. Range
  - b. Standard deviation
  - c. Standard error
- 6. Introduction to probability and test of significance
- 7. Parametric and non parametric tests
- 8. Introduction to commonly used statistical soft-wares.

Reference books for Research methodology :

1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers' Distributors
2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nd.ed), Singapore, Pearson Education
4. Students guide to research methodology – Undergraduates. Alexandria Medical Students Association.
5. Health research methodology. A guide for training in research methods. 2nd edition. Manila, World Health Organization Regional Office for the Western Pacific, 2001.

Reference Books for statistics :

1. Health research methodology. A guide for training in research methods. 2nd edition. Manila, World Health Organization Regional Office for the Western Pacific, 2001.
2. Statistical methods in medical research. P.Armitage (Ed) Oxford Blackwell
3. Statistical methods . Snedecor GW and Cochran, WG
4. Altman, D. G. (1991). Practical statistics for medical research. London: ChapmanPrinciples of Medical Statistics by A. Bradford Hill
5. Interpretation and Uses of Medical Statistics by Leslie E Daly, Geoffrey J Bourke, James MC Gilvray.
6. Research in Ayurveda-M S Baghel
7. research methodology in ayurveda-V.J.Thakar,Gujarat Ayurved University
8. Ayurveda anusandhan paddhati-P.V.Sharma
- 9.Research methodology methods and statistical techniques- Santosh Gupta. Greenhouse SW.
- 10.The growth and future of biostatistics: (A view from the 1980s). Statistics in Medicine 2003; 22:3323–3335.
- 11.Knapp GR & Miller MC. Clinical epidemiology and Biostatistics, NMS series Antonisamy B, Christopher S & Samuel PP. Biostatistics : Principles and practice
- 12.Sundara Rao PSS & Richard J. An introduction to Biostatistics, PHI
- 13.Senn S (1997). Statistical Issues in Drug Development. Chichester: John Wiley & Sons.
- 14.Methods in Bio-statistics for Medical Students- BK Mahajan
- 15.Vaidyakeeya Sankhiki Shastra- Dr.S.S.Savrikar





## **School of Pharmacy (AVIPS)**



Shobhit University, Gangoh

**(Established by UP Shobhit University Act No. 3,  
2012)**

**School Of Pharmacy**

**Ordinances, Regulations & Syllabus**

**For**

**Master of Pharmacy (M.Pharm) 2 Year Programme  
Semester Pattern  
(w.e.f. session 2019-2020)**

**Approved by PCI and adopted in the  
year 2019 (13<sup>th</sup> Meeting ,Board of  
Studies)**

## CHAPTER -I:REGULATIONS

### **1. Short Title and Commencement**

These regulations shall be called as “The Revised Regulations for the Master of Pharmacy (M. Pharm.)Degree Program - Credit Based Semester System (CBSS) of the Pharmacy Council of India, New Delhi”. They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by the authorities of the university.

### **2. Minimum qualification for admission**

A Pass in the following examinations

a) B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks (aggregate of 4 years of B.Pharm.)

b) Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B.Pharm.)

### **3. Duration of the program**

The program of study for M.Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

### **4. Medium of instruction and examinations**

Medium of instruction and examination shall be in English.

### **5. Working days in each semester**

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from the month of December/January to May/June in every calendar year.

## 6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

## 7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly the credit associated with any of the other academic, co/extra- curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

### Credit assignment

#### Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by 1/2. Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

#### Minimum credit requirements

The minimum credit points required for the award of M. Pharm. degree is 95. However based on the credit points earned by the students under the head of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments, Research work, Discussions with the supervisor, Journal club and Co-Curricular activities over the duration of four semesters. The credits

are distributed semester-wise as shown in Table 14. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

## 8. Academic work

A regular record of attendance both in Theory, Practical, Seminar, Assignment, Journal club, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective courses.

## 9. Course of study

The specializations in M.Pharm program is given in Table 1.

**Table – 1: List of M.Pharm. Specializations and their Code**

S. No.	Specialization	Code
1.	Pharmaceutics	MPH
2.	Pharmaceutical Chemistry	MPC
3.	Pharmacology	MPL

The course of study for M.Pharm specializations shall include Semester wise Theory & Practical as given in Table – 2 to 11. The number of hours to be devoted to each theory and practical course in any semester shall not be less than that shown in Table – 2 to 11.

Table – 2: Course of study for M. Pharm. (Pharmaceutics)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
<b>Semester I</b>					
MPH101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPH102T	Drug Delivery System	4	4	4	100
MPH103T	Modern Pharmaceutics	4	4	4	100
MPH104T	Regulatory Affair	4	4	4	100
MPH105P	Pharmaceutics Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
<b>Semester II</b>					
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	4	4	4	100
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	4	4	4	100
MPH203T	Computer Aided Drug Delivery System	4	4	4	100
MPH204T	Cosmetic and Cosmeceuticals	4	4	4	100
MPH205P	Pharmaceutics Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 3: Course of study for M. Pharm. (Pharmaceutical Chemistry)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MPC101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPC1012T	Advanced Organic Chemistry -I	4	4	4	100
MPC103T	Advanced Medicinal chemistry	4	4	4	100
MPC104T	Chemistry of Natural Products	4	4	4	100
MPC105P	Pharmaceutical Chemistry Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650
Semester II					
MPC201T	Advanced Spectral Analysis	4	4	4	100
MPC202T	Advanced Organic Chemistry -II	4	4	4	100
MPC203T	Computer Aided Drug Design	4	4	4	100
MPC204T	Pharmaceutical Process Chemistry	4	4	4	100
MPC205P	Pharmaceutical Chemistry Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 4: Course of study for (Pharmacology)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPL 101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPL 102T	Advanced Pharmacology-I	4	4	4	100
MPL 103T	Pharmacological and Toxicological Screening Methods-I	4	4	4	100
MPL 104T	Cellular and Molecular Pharmacology	4	4	4	100
MPL 105P	Pharmacology Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPL 201T	Advanced Pharmacology II	4	4	4	100
MPL 202T	Pharmacological and Toxicological Screening Methods-II	4	4	4	100
MPL 203T	Principles of Drug Discovery	4	4	4	100
MPL 204T	Experimental Pharmacology practical- II	4	4	4	100
MPL 205P	Pharmacology Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650



Table – 5: Course of study for M. Pharm. III Semester  
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
MRM 301T	Research Methodology and Biostatistics*	4	4
-	Journal club	1	1
-	Discussion / Presentation (Proposal Presentation)	2	2
-	Research Work	28	14
Total		35	21

\* Non University Exam

Table – 6: Course of study for M. Pharm. IV Semester  
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
-	Journal Club	1	1
-	Research Work	31	16
-	Discussion/Final Presentation	3	3
Total		35	20

Table – 7: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities)	Minimum=02 Maximum=07*
Total Credit Points	Minimum=95 Maximum=100*

\*Credit Points for Co-curricular Activities

Table – 8: Guidelines for Awarding Credit Points for Co-curricular Activities

Name of the Activity	Maximum Credit Points Eligible / Activity
Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	01
Participation in international Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	02
Academic Award/Research Award from State Level/National Agencies	01
Academic Award/Research Award from International Agencies	02
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	01
Research / Review Publication in International Journals	02

Note: International Conference: Held Outside India International Journal:

The Editorial Board Outside India

\*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

## 10. Program Committee

1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.
2. The composition of the Programme Committee shall be as follows:  
A teacher at the cadre of Professor shall be the Chairperson; One Teacher from each M.Pharm specialization and four student representatives (two from each academic year), nominated by the Head of the institution.
3. Duties of the Programme Committee:
  - i. Periodically reviewing the progress of the classes.
  - ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
  - iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.

- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Programme Committee shall meet at least twice in a semester preferably at the end of each sessionalexam and before the end semester exam.

## **11. Examinations/Assessments**

The schemes for internal assessment and end semester examinations are given in Table – 9.

### **End semester examinations**

The End Semester Examinations for each theory and practical course through semesters I to IV shall be conducted by the respective university except for the subject with asterix symbol (\*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Tables – 9 : Schemes for internal assessments and end semester  
(Pharmaceutics- MPH)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
<b>SEMESTER I</b>								
MPH 101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPH 102T	Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH 103T	Modern Pharmaceutics	10	15	1 Hr	25	75	3 Hrs	100
MPH 104T	Regulatory Affair	10	15	1 Hr	25	75	3 Hrs	100
MPH 105P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
<b>SEMESTER II</b>								
MPH 201T	Molecular Pharmaceutics(Nano Tech and Targeted DDS)	10	15	1 Hr	25	75	3 Hrs	100
MPH 202T	Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MPH 203T	Computer Aided Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH	Cosmetic	10	15	1 Hr	25	75	3 Hrs	100

204T	and Cosmeceutic als							
MPH 205P	Pharmaceuti cs Practical I	20	30	6Hrs	50	100	6Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

table: 10 (Pharmaceutical Chemistry-MPC)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
<b>SEMESTER I</b>								
MPC101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPC102T	Advanced Organic Chemistry -I	10	15	1 Hr	25	75	3 Hrs	100
MPC103T	Advanced Medicinal chemistry	10	15	1 Hr	25	75	3 Hrs	100
MPC104T	Chemistry of Natural Products	10	15	1 Hr	25	75	3 Hrs	100
MPC105P	Pharmaceutical Chemistry Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
<b>SEMESTER II</b>								
MPC201T	Advanced Spectral Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPC202T	Advanced Organic Chemistry -II	10	15	1 Hr	25	75	3 Hrs	100
MPC203T	Computer Aided Drug Design	10	15	1 Hr	25	75	3 Hrs	100
MPC204T	Pharmaceutical Process Chemistry	10	15	1 Hr	25	75	3 Hrs	100
MPC205P	Pharmaceutic	20	30	6 Hrs	50	100	6	150

	al Chemistry Practical II						Hrs	
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

	Assurance							
MPA204T	Herbal and Cosmetic analysis	10	15	1 Hr	25	75	3Hrs	100
MPA205P	Pharmaceutical Analysis- II	20	30	6 Hrs	50	100	6Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 11: Schemes for internal assessments and end semester examinations(Pharmacology-MPL)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
<b>SEMESTER I</b>								
MPL10 1T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPL10 2T	Advanced Pharmacology-I	10	15	1 Hr	25	75	3 Hrs	100
MPL10 3T	Pharmacological and Toxicological Screening Methods-I	10	15	1 Hr	25	75	3 Hrs	100
MPL10 4T	Cellular and Molecular Pharmacology	10	15	1 Hr	25	75	3 Hrs	100
MPL10 5P	Experimental Pharmacology - I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
<b>SEMESTER II</b>								
MPL20 1T	Advanced Pharmacology II	10	15	1 Hr	25	75	3 Hrs	100
MPL10 2T	Pharmacological and Toxicological Screening Methods-II	10	15	1 Hr	25	75	3 Hrs	100
MPL20 3T	Principles of Drug Discovery	10	15	1 Hr	25	75	3 Hrs	100
MPL20 4T	Clinical research and pharmacovigilance	10	15	1 Hr	25	75	3 Hrs	100
MPL20 5P	Experimental Pharmacology - II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650



Tables – 12: Schemes for internal assessments and end semester examinations(Semester III&IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
<b>SEMESTER III</b>								
MRM301T	Research Methodology and Biostatistics*	10	15	1 Hr	25	75	3 Hrs	100
-	Journal club	-	-	-	25	-	-	25
-	Discussion Presentation / (Proposal Presentation)	-	-	-	50	-	-	50
-	Research work*	-	-	-	-	350	1 Hr	350
<b>Total</b>								525
<b>SEMESTER IV</b>								
-	Journal club	-	-	-	25	-	-	25
-	Discussion Presentation / (Proposal Presentation)	-	-	-	75	-	-	75
-	Research work and Colloquium	-	-	-	-	400	1 Hr	400
<b>Total</b>								500

\*Non University Examination

## Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table – 13: Scheme for awarding internal assessment: Continuous mode

Theory	
Criteria	Maximum Marks
Attendance (Refer Table – 28)	8
Student – Teacher interaction	2
Total	10
Practical	
Attendance (Refer Table – 28)	10
Based on Practical Records, Regular viva voce, etc.	10
Total	20

Table – 14: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	8	10
90 – 94	6	7.5
85 – 89	4	5
80 – 84	2	2.5
Less than 80	0	0

### 11.2.1. Sessional Exams

Two sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical sessional examinations is given in the table. The average marks of two sessional exams shall be computed for internal assessment as per the requirements given in tables.

## 12. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of M.Pharm programme if he/she secures at least 50% marks in that particular course including internal assessment.

## 13. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

#### 14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the sessional exam component of the internal assessment. The re-conduct of the sessional exam shall be completed before the commencement of next end semester theory examinations.

#### 15. Reexamination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in table 15. The exact dates of examinations shall be notified from time to time.

Table – 15: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I and III	November / December	May / June
II and IV	May / June	November / December

#### 16. Allowed to keep terms (ATKT):

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. ATKT rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I and II semesters till the III semester examinations. However, he/she shall not be eligible to attend the courses of IV semester until all the courses of I, II and III semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to IV semesters within the stipulated time period as per the norms.

Note: Grade AB should be considered as failed and treated as one head for deciding ATKT. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

#### 17. Grading of performances

##### Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – 16.

Table – 16: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

### 18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called ‘Semester Grade Point Average’ (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub> and C<sub>4</sub> and the student’s grade points in these courses

are G<sub>1</sub>, G<sub>2</sub>, G<sub>3</sub> and G<sub>4</sub>, respectively, and then students’ SGPA is equal to:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4}{C_1 + C_2 + C_3 + C_4}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4 * \text{ZERO}}{C_1 + C_2 + C_3 + C_4}$$

### 19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the IV semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all IV semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA

shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4}{C_1 + C_2 + C_3 + C_4}$$

where  $C_1, C_2, C_3, \dots$  is the total number of credits for semester I, II, III,  $\dots$  and  $S_1, S_2, S_3, \dots$  is the SGPA of semester I, II, III,  $\dots$ .

## 20. Declaration of class

The class shall be awarded on the basis of CGPA as follows: First Class with

Distinction = CGPA of 7.50 and above	= CGPA of 6.00 to 7.49
First Class	= CGPA of 5.00 to 5.99
Second Class	

## 21. Project work

All the students shall undertake a project under the supervision of a teacher in Semester III to IV and submit a report. 4 copies of the project report shall be submitted (typed & bound copy not less than 75 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). The projects shall be evaluated as per the criteria given below.

### Evaluation of Dissertation Book:

Objective(s) of the work done	50 Marks
Methodology adopted	150 Marks
Results and Discussions	250 Marks
Conclusions and Outcomes	50 Marks

<b>Total</b>	<b>500 Marks</b>
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### Evaluation of Presentation:

Presentation of work	100 Marks
Communication skills	50 Marks
Question and answer skills	100 Marks

<b>Total</b>	<b>250 Marks</b>
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## **22. Award of Ranks**

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the M.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the M. Pharm program in minimum prescribed number of years, (two years) for the award of Ranks.

## **23. Award of degree**

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

## **24. Duration for completion of the program of study**

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

## **25. Revaluation I Retotaling of answer papers**

There is no provision for revaluation of the answer papers in any examination. However, the candidates can apply for retotaling by paying prescribed fee.

## **26. Re-admission after break of study**

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee

**Course Programme-  
Pharmaceutics**

### **Program Educational Objectives (PEOs)**

Program Educational Objectives (PEOs) for a Master of Pharmacy (M.Pharm) with a focus on Pharmaceutics program typically outline the broad goals that graduates are expected to achieve in their professional careers and further education.

**PEO1 Comprehensive Understanding of Pharmaceutics:** Graduates will possess a thorough understanding of the principles and practices of pharmaceutical formulation, design, and delivery systems, including their biochemical and biopharmaceutical aspects.

**PEO2 Research and Development Expertise:** Graduates will engage in innovative research and development, contributing to the advancement of novel drug formulations and technologies that enhance therapeutic efficacy and safety.

**PEO3 Application of Advanced Analytical Techniques:** Graduates will demonstrate proficiency in employing advanced analytical techniques for the characterization and quality assessment of pharmaceutical products.

**PEO4 Regulatory Knowledge and Compliance:** Graduates will understand regulatory frameworks and guidelines related to pharmaceutical development, ensuring compliance throughout the drug development process.

**PEO5 Critical Thinking and Problem-Solving Skills:** Graduates will apply critical thinking and problem-solving skills to address complex challenges in drug formulation and delivery, optimizing therapeutic outcomes.

**PEO6 Collaborative Skills in Interdisciplinary Teams:** Graduates will effectively collaborate with healthcare professionals and researchers from diverse disciplines to enhance drug development and patient care.

**PEO7 Ethical and Professional Standards:** Graduates will uphold high ethical standards and professional integrity in their research and practice, prioritizing patient safety and the responsible conduct of research.

**PEO8 Effective Communication Skills:** Graduates will be able to communicate complex pharmaceutical concepts and research findings clearly and effectively to various stakeholders, including peers, regulatory agencies, and the public.

**PEO9 Global Health Awareness:** Graduates will understand global health issues and contribute to developing pharmaceutical solutions that improve access to essential medicines and enhance public health outcomes.



### Programme Specific Objectives (PSO's)

**PSO1 Advanced Pharmaceutical Knowledge:** Graduates will demonstrate a deep understanding of drug development processes, including formulation, synthesis, and quality control of pharmaceutical products.

**PSO2 Clinical Pharmacy Skills:** Graduates will apply clinical knowledge to assess patient medication regimens, provide pharmaceutical care, and contribute to interdisciplinary healthcare teams.

**PSO3 Research Methodology:** Graduates will be proficient in research methodologies, enabling them to design, conduct, and analyze pharmaceutical research effectively, including clinical trials and drug studies.

**PSO4 Pharmacokinetics and Pharmacodynamics:** Graduates will understand the principles of pharmacokinetics and pharmacodynamics, applying this knowledge to optimize drug therapy for diverse patient populations.

**PSO5 Regulatory Affairs Expertise:** Graduates will navigate regulatory frameworks and guidelines, ensuring compliance in the development and marketing of pharmaceutical products.

**PSO6 Formulation Development:** Graduates will be skilled in the development and evaluation of various dosage forms, utilizing modern techniques and technologies for innovative drug delivery systems.

**PSO7 Quality Assurance and Control:** Graduates will implement quality assurance and control measures in pharmaceutical manufacturing and laboratory settings, ensuring the safety and efficacy of products.

**PSO8 Patient Counseling and Education:** Graduates will effectively communicate medication-related information to patients, enhancing adherence and promoting safe medication use.

**PSO9 Ethical and Professional Responsibility:** Graduates will adhere to ethical guidelines and professional standards, promoting integrity and accountability in their pharmacy practice.

**PSO10 Interprofessional Collaboration:** Graduates will work collaboratively with healthcare professionals, understanding the roles of various team members in providing comprehensive patient care.

### (Programme Outcome Objectives (POO's))

**POO1 Pharmaceutical Knowledge Application:** Graduates will apply advanced knowledge of pharmaceuticals to develop, formulate, and evaluate pharmaceutical products effectively.

**POO2 Research Competence:** Graduates will demonstrate the ability to design and conduct independent research in pharmaceuticals, utilizing appropriate methodologies and analytical techniques.

**POO3 Formulation Development Skills:** Graduates will be skilled in developing various drug delivery systems, optimizing formulations for different routes of administration.

**POO4 Analytical Proficiency:** Graduates will utilize advanced analytical techniques to assess the quality and stability of pharmaceutical formulations, ensuring compliance with regulatory standards.

**POO5 Clinical Application:** Graduates will apply their knowledge of pharmacokinetics and pharmacodynamics to optimize drug therapy and improve patient outcomes.

**POO6 Regulatory Compliance:** Graduates will understand and navigate regulatory requirements and guidelines affecting pharmaceutical development and commercialization.

**POO7 Ethical Standards:** Graduates will uphold ethical principles in research and practice, ensuring patient safety and adherence to professional standards.

**POO8 Communication Skills:** Graduates will effectively communicate complex pharmaceutical concepts and research findings to a variety of audiences, including healthcare professionals and regulatory agencies.

**POO9 Collaborative Teamwork:** Graduates will work effectively in interdisciplinary teams, contributing to collaborative problem-solving and enhancing healthcare delivery.

**POO10 Commitment to Lifelong Learning:** Graduates will demonstrate a commitment to lifelong learning, actively engaging in professional development and staying updated on advancements in pharmaceuticals.

## PHARMACEUTICS(MPH)

### MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPH 101T)

#### Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

#### Objectives

After completion of course student is able to know,

- Chemicals and Excipients
- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

#### THEORY

60 HOURS

- |    |   |           |
|----|---|-----------|
| 1. | a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV- Visible spectroscopy.  | 11<br>Hrs |
|    | b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy  |           |
|    | c. Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.   |           |
|    | d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.  |           |
| 2  | NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and <sup>13</sup> C NMR. Applications of NMR spectroscopy. | 11<br>Hrs |

- |   |  |           |
|---|--|-----------|
| 3 | Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy   | 11<br>Hrs |
| 4 | Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following:<br>a) Paper chromatography b) Thin Layer chromatography<br>c) Ion exchange chromatography d) Column chromatography<br>e) Gas chromatography f) High Performance Liquid chromatography<br>g) Affinity chromatography   | 11<br>Hrs |
| 5 | a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following:<br>a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing<br>b. X ray Crystallography: Production of X rays, Different X ray diffraction methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X- ray diffraction. | 11<br>Hrs |
| 6 | Immunological assays : RIA (Radio immuno assay), ELISA, Bioluminescence assays.  |           |

#### REFERENCES

5 Hrs

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series

## DRUG DELIVERY SYSTEMS (MPH 102T)

### SCOPE

This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

### OBJECTIVES

Upon completion of the course, student shall be able to understand

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of delivering system
- The formulation and evaluation of Novel drug delivery systems..

### THEORY

60 Hrs

- |  |           |
|--|-----------|
| 1. Sustained Release(SR) and Controlled Release (CR) formulations: Introduction & basic concepts, advantages/ disadvantages, factors influencing, Physicochemical & biological approaches for SR/CR formulation, Mechanism of Drug Delivery from SR/CR formulation. Polymers: introduction, definition, classification, properties and application Dosage Forms for Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharmaceuticals, Telepharmacy. | 10<br>Hrs |
| 2. Rate Controlled Drug Delivery Systems: Principles & Fundamentals, Types, Activation; Modulated Drug Delivery Systems; Mechanically activated, pH activated, Enzyme activated, and Osmotic activated Drug Delivery Systems Feedback regulated Drug Delivery Systems; Principles & Fundamentals.  | 10<br>Hrs |
| 3. Gastro-Retentive Drug Delivery Systems: Principle, concepts advantages and disadvantages, Modulation of GI transit time approaches to extend GI transit. Buccal Drug Delivery Systems: Principle of muco adhesion, advantages and disadvantages, Mechanism of drug permeation, Methods of formulation and its evaluations.  | 10<br>Hrs |
| 4. Ocular Drug Delivery Systems: Barriers of drug permeation, Methods to overcome barriers.  | 06<br>Hrs |

5	Transdermal Drug Delivery Systems: Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and evaluation.	10 Hrs
6	Protein and Peptide Delivery: Barriers for protein delivery. Formulation and Evaluation of delivery systems of proteins and other macromolecules.	08 Hrs
7	Vaccine delivery systems: Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.	06 Hrs

#### REFERENCES

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by WileyInterscience Publication, John Wiley and Sons, Inc, New York! Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002

#### JOURNALS

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian drugs (IDMA)
3. Journal of controlled release (Elsevier Sciences) desirable
4. Drug Development and Industrial Pharmacy (Marcel & Decker) desirable

## MODERN PHARMACEUTICS (MPH 103T)

### Scope

Course designed to impart advanced knowledge and skills required to learn various aspects and concepts at pharmaceutical industries

### Objectives

Upon completion of the course, student shall be able to understand

- The elements of preformulation studies.
- The Active Pharmaceutical Ingredients and Generic drug Product development
- Industrial Management and GMP Considerations.
- Optimization Techniques & Pilot Plant Scale Up Techniques
- Stability Testing, sterilization process & packaging of dosage forms.

### THEORY

60 HRS

- |    |   |           |
|----|---|-----------|
| 1. | a. Preformation Concepts – Drug Excipient interactions - different methods, kinetics of stability, Stability testing. Theories of dispersion and pharmaceutical Dispersion (Emulsion and Suspension, SMEDDS) preparation and stability Large and small volume parental – physiological and formulation consideration, Manufacturing and evaluation.   | 10<br>Hrs |
|    | b. Optimization techniques in Pharmaceutical Formulation: Concept and parameters of optimization, Optimization techniques in pharmaceutical formulation and processing. Statistical design, Response surface method, Contour designs, Factorial designs and application in formulation  | 10<br>Hrs |
| 2  | Validation : Introduction to Pharmaceutical Validation, Scope & merits of Validation, Validation and calibration of Master plan, ICH & WHO guidelines for calibration and validation of equipments, Validation of specific dosage form, Types of validation. Government regulation, Manufacturing Process Model, URS, DQ, IQ, OQ & P.Q. of facilities.  | 10<br>Hrs |
| 3  | cGMP & Industrial Management: Objectives and policies of current good manufacturing practices, layout of buildings, services, equipments and their maintenance Production management: Production organization, , materials management, handling and transportation, inventory management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal relationship. Concept of Total Quality Management. | 10<br>Hrs |

- |   |  |           |
|---|--|-----------|
| 4 | Compression and compaction: Physics of tablet compression, compression, consolidation, effect of friction, distribution of forces, compaction profiles. Solubility.  | 10<br>Hrs |
| 5 | Study of consolidation parameters; Diffusion parameters, Dissolution parameters and Pharmacokinetic parameters, Heckel plots, Similarity factors – $f_2$ and $f_1$ , Higuchi and Peppas plot, Linearity Concept of significance, Standard deviation, Chi square test, students T-test, ANOVA test. | 10<br>Hrs |

#### REFERENCES

1. Theory and Practice of Industrial Pharmacy By Lachmann and Libermann
2. Pharmaceutical dosage forms: Tablets Vol. 1-3 by Leon Lachmann.
3. Pharmaceutical Dosage forms: Disperse systems, Vol, 1-2; By Leon Lachmann.
4. Pharmaceutical Dosage forms: Parenteral medications Vol. 1-2; By Leon Lachmann.
5. Modern Pharmaceutics; By Gillbert and S. Banker.
6. Remington's Pharmaceutical Sciences.
7. Advances in Pharmaceutical Sciences Vol. 1-5; By H.S. Bean & A.H. Beckett.
8. Physical Pharmacy; By Alfred Martin
9. Bentley's Textbook of Pharmaceutics – by Rawlins.
10. Good manufacturing practices for Pharmaceuticals: A plan for total quality control, Second edition; By Sidney H. Willig.
11. Quality Assurance Guide; By Organization of Pharmaceutical producers of India.
12. Drug formulation manual; By D.P.S. Kohli and D.H. Shah. Eastern publishers, New Delhi.
13. How to practice GMPs; By P.P. Sharma. Vandhana Publications, Agra.
14. Pharmaceutical Process Validation; By Fra. R. Berry and Robert A. Nash.
15. Pharmaceutical Preformulations; By J.J. Wells.
16. Applied production and operations management; By Evans, Anderson, Sweeney and Williams.
17. Encyclopaedia of Pharmaceutical technology, Vol I – III.



## REGULATORY AFFAIRS (MPH 104T)

### Scope

Course designed to impart advanced knowledge and skills required to learn the concept of generic drug and their development, various regulatory filings in different countries, different phases of clinical trials and submitting regulatory documents : filing process of IND, NDA and ANDA

- To know the approval process of
- To know the chemistry, manufacturing controls and their regulatory importance
- To learn the documentation requirements for
- To learn the importance and

### Objectives:

Upon completion of the course, it is expected that the students will be able to understand

- The Concepts of innovator and generic drugs, drug development process
- The Regulatory guidance's and guidelines for filing and approval process
- Preparation of Dossiers and their submission to regulatory agencies in different countries
- Post approval regulatory requirements for actives and drug products
- Submission of global documents in CTD/ eCTD formats
- Clinical trials requirements for approvals for conducting clinical trials
- Pharmacovigilance and process of monitoring in clinical trials.

### THEORY

60 Hrs

1. a. Documentation in Pharmaceutical industry: Master formula record, DMF (Drug Master File), distribution records. Generic drugs product development Introduction , Hatch- Waxman act and amendments, CFR (CODE OF FEDERAL REGULATION) ,drug product performance, in-vitro, ANDA regulatory approval process, NDA approval process, BE and drug product assessment, in –vivo, scale up process approval changes, post marketing surveillance, outsourcing BA and BE to CRO. 12 Hrs
- b. Regulatory requirement for product approval: API, biologics, novel, therapies obtaining NDA, ANDA for generic drugs ways and means of US registration for foreign drugs

2	CMC, post approval regulatory affairs. Regulation for combination products and medical devices. CTD and ECTD format, industry and FDA liaison. ICH - Guidelines of ICH-Q, S E, M. Regulatory requirements of EU, MHRA, TGA and ROW countries.	12 Hrs
3	Non clinical drug development: Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier, dossier (IMPD) and investigator brochure (IB).	12 Hrs
4	Clinical trials: Developing clinical trial protocols. Institutional review board/ independent ethics committee Formulation and working procedures informed Consent process and procedures. HIPAA- new, requirement to clinical study process, pharmacovigilance safety monitoring in clinical trials.	12 Hrs

## REFERENCES

1. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargeland IsaderKaufer, Marcel Dekker series, Vol.143
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185, Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons, Inc.
5. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics/edited By Douglas J. Pisano, David Mantus.
6. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
7. [www.ich.org/](http://www.ich.org/)
8. [www.fda.gov/](http://www.fda.gov/)
9. [europa.eu/index\\_en.htm](http://europa.eu/index_en.htm)
10. <https://www.tga.gov.au/tga-basics>

**PHARMACEUTICS PRACTICALS - I**  
**(MPH 105P)**

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry
7. To perform In-vitro dissolution profile of CR/ SR marketed formulation
8. Formulation and evaluation of sustained release matrix tablets
9. Formulation and evaluation osmotically controlled DDS
10. Preparation and evaluation of Floating DDS- hydro dynamically balanced DDS
11. Formulation and evaluation of Muco adhesive tablets.
12. Formulation and evaluation of trans dermal patches.
13. To carry out preformulation studies of tablets.
14. To study the effect of compressional force on tablets disintegration time.
15. To study Micromeritic properties of powders and granulation.
16. To study the effect of particle size on dissolution of a tablet.
17. To study the effect of binders on dissolution of a tablet.
18. To plot Heckal plot, Higuchi and peppas plot and determine similarity factors.

**MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY &  
TARGETED DDS) (NTDS)  
(MPH 201T)**

**Scope**

This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

**Objectives**

Upon completion of the course student shall be able to understand

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of NTDS
- The formulation and evaluation of novel drug delivery systems.

**THEORY**

60 Hrs

- |    |   |           |
|----|---|-----------|
| 1. | Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drug targeting. Tumor targeting and Brain specific delivery.  | 12<br>Hrs |
| 2. | Targeting Methods: introduction preparation and evaluation.<br>Nano Particles & Liposomes: Types, preparation and evaluation.   | 12<br>Hrs |
| 3. | Micro Capsules / Micro Spheres: Types, preparation and evaluation ,<br>Monoclonal Antibodies ; preparation and application, preparation and<br>application of Niosomes, Aquasomes, Phytosomes, Electrosomes.  | 12<br>Hrs |
| 4. | Pulmonary Drug Delivery Systems : Aerosols, propellents,<br>Containers Types, preparation and evaluation, Intra Nasal Route Delivery<br>systems; Types, preparation and evaluation.   | 12<br>Hrs |
| 5. | Nucleic acid based therapeutic delivery system : Gene therapy, introduction<br>(ex-vivo & in-vivo gene therapy). Potential target diseases for gene therapy<br>(inherited disorder and cancer). Gene expression systems (viral and nonviral gene<br>transfer). Liposomal gene delivery systems.<br>Biodistribution and Pharmacokinetics. knowledge of therapeutic antisense<br>molecules and aptamers as drugs of future. | 12<br>Hrs |

**REFERENCES**

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.
3. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).

## ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS (MPH 202T)

### Scope

This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of biopharmaceutics and pharmacokinetics are provided to help the students' to clarify the concepts.

### Objectives

Upon completion of this course it is expected that students will be able understand,

- The basic concepts in biopharmaceutics and pharmacokinetics.
- The use raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
- The critical evaluation of biopharmaceutic studies involving drug product equivalency.
- The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.
- The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic

### THEORY

60 Hrs

1. Drug Absorption from the Gastrointestinal Tract: Gastrointestinal tract, Mechanism of drug absorption, Factors affecting drug absorption, pH-partition theory of drug absorption. Formulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes-Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorption: role of the dosage form: Solution (elixir, syrup and solution) as a dosage form, Suspension as a dosage form, Capsule as a dosage form, Tablet as a dosage form, Dissolution methods, Formulation and processing factors, Correlation of in vivo data with in vitro dissolution data. Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH Microclimate Intracellular pH Environment, Tight-Junction Complex. 12 Hrs

- |   |   |           |
|---|---|-----------|
| 2 | Biopharmaceutic considerations in drug product design and In Vitro Drug Product Performance: Introduction, biopharmaceutic factors affecting drug bioavailability, rate-limiting steps in drug absorption, physicochemical nature of the drug formulation factors affecting drug product performance, in vitro: dissolution and drug release testing, compendial methods of dissolution, alternative methods of dissolution testing, meeting dissolution requirements, problems of variable control in dissolution testing performance of drug products. In vitro-in vivo correlation, dissolution profile comparisons, drug product stability, considerations in the design of a drug product.                       | 12<br>Hrs |
| 3 | Pharmacokinetics: Basic considerations, pharmacokinetic models, compartment modeling: one compartment model- IV bolus, IV infusion, extra-vascular. Multi compartment model: two compartment - model in brief, non-linear pharmacokinetics: cause of non-linearity, Michaelis – Menten equation, estimation of $k_{max}$ and $V_{max}$ . Drug interactions: introduction, the effect of protein-binding interactions, the effect of tissue-binding interactions, cytochrome p450-based drug interactions, drug interactions linked to transporters.   | 12<br>Hrs |
| 4 | Drug Product Performance, In Vivo: Bioavailability and Bioequivalence: drug product performance, purpose of bioavailability studies, relative and absolute availability. methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies, study designs, crossover study designs, evaluation of the data, bioequivalence example, study submission and drug review process. biopharmaceutics classification system, methods. Permeability: In-vitro, in-situ and In-vivo methods. generic biologics (biosimilar drug products), clinical significance of bioequivalence studies, special concerns in bioavailability and bioequivalence studies, generic substitution. | 12<br>Hrs |
| 5 | Application of Pharmacokinetics: Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Introduction to Pharmacokinetics and pharmacodynamic, drug interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs. Introduction, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy), Gene therapies.   | 12<br>Hrs |

## REFERENCES

1. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi, 4th edition, Philadelphia, Lea and Febiger, 1991
2. Biopharmaceutics and Pharmacokinetics, A. Treatise, D .M. Brahmarkar and Sunil B. Jaiswal., VallabPrakashan, Pitampura, Delhi
3. Applied Biopharmaceutics and Pharmacokinetics by Shargel. Land YuABC, 2<sup>nd</sup>edition, Connecticut Appleton Century Crofts, 1985
4. Textbook of Biopharmaceutics and Pharmacokinetics, Dr. Shobha Rani R. Hiremath, Prism Book
5. Pharmacokinetics by Milo Gibaldi and D. Perrier, 2nd edition, Marcel Dekker Inc., New York, 1982
6. Current Concepts in Pharmaceutical Sciences: Biopharmaceutics, Swarbrick. J, Lea and Febiger, Philadelphia, 1970
7. Clinical Pharmacokinetics, Concepts and Applications 3rd edition by Malcolm Rowland and Thom~ N. Tozer, Lea and Febiger, Philadelphia, 1995
8. Dissolution, Bioavailability and Bioequivalence, Abdou. H.M, Mack Publishing Company, Pennsylvania 1989
9. Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th edition, revised and expanded by Robert. E. Notari, Marcel Dekker Inc, New York and Basel, 1987.
10. Biopharmaceutics and Relevant Pharmacokinetics by John. G Wagner and M. Pamarowski, 1st edition, Drug Intelligence Publications, Hamilton, Illinois, 1971.
11. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G. Boylan, Marcel Dekker Inc, New York, 1996.
12. Basic Pharmacokinetics, 1<sup>st</sup> edition, Sunil S Jambhekar and Philip J Breen, pharmaceutical press, RPS Publishing, 2009.
13. Absorption and Drug Development- Solubility, Permeability, and Charge State, Alex Avdeef, John Wiley & Sons, Inc, 2003.

## COMPUTER AIDED DRUG DEVELOPMENT (MPH 203T)

### Scope

This course is designed to impart knowledge and skills necessary for computer Applications in pharmaceutical research and development who want to understand the application of computers across the entire drug research and development process. Basic theoretical discussions of the principles of more integrated and coherent use of computerized information (informatics) in the drug development process are provided to help the students to clarify the concepts.

### Objectives

Upon completion of this course it is expected that students will be able to understand,

- History of Computers in Pharmaceutical Research and Development
- Computational Modeling of Drug Disposition
- Computers in Preclinical Development
- Optimization Techniques in Pharmaceutical Formulation
- Computers in Market Analysis
- Computers in Clinical Development
- Artificial Intelligence (AI) and Robotics
- Computational fluid dynamics(CFD)

### THEORY

60 Hrs

1. a. Computers in Pharmaceutical Research and Development: 12  
A General Overview: History of Computers in Pharmaceutical Research and Development. Statistical modeling in Pharmaceutical research and development: Descriptive versus Mechanistic Modeling, Statistical Parameters, Estimation, Confidence Regions, Nonlinearity at the Optimum, Sensitivity Analysis, Optimal Design, Population Modeling Hrs  
b. Quality-by-Design In Pharmaceutical Development: Introduction, ICH Q8 guideline, Regulatory and industry views on QbD, Scientifically based QbD - examples of application.
2. Computational Modeling Of Drug Disposition: Introduction  
.Modeling Techniques: Drug Absorption, Solubility, Intestinal Permeation, Drug Distribution ,Drug Excretion, Active Transport; P-gp, BCRP, Nucleoside Transporters, hPEPT1, ASBT, OCT, OATP, BBB-Choline Transporter. 12 Hrs



- |   |  |           |
|---|--|-----------|
| 3 | Computer-aided formulation development:: Concept of optimization, Optimization parameters, Factorial design, Optimization technology & Screening design. Computers in Pharmaceutical Formulation: Development of pharmaceutical emulsions, microemulsion drug carriers Legal Protection of Innovative Uses of Computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis   | 12<br>Hrs |
| 4 | a. Computer-aided biopharmaceutical characterization: Gastrointestinal absorption simulation. Introduction, Theoretical background, Model construction, Parameter sensitivity analysis, Virtual trial, Fed vs. fasted state, In vitro dissolution and in vitro- in vivo correlation, Biowaiver considerations<br>b. Computer Simulations in Pharmacokinetics and Pharmacodynamics: Introduction, Computer Simulation: Whole Organism, Isolated Tissues, Organs, Cell, Proteins and Genes.<br>c. Computers in Clinical Development: Clinical Data Collection and Management, Regulation of Computer Systems | 12<br>Hrs |
| 5 | Artificial Intelligence (AI), Robotics and Computational fluid dynamics: General overview, Pharmaceutical Automation, Pharmaceutical applications, Advantages and Disadvantages. Current Challenges and Future Directions.   | 12<br>Hrs |

#### REFERENCES

1. Computer Applications in Pharmaceutical Research and Development, Sean Ekins, 2006, John Wiley & Sons.
2. Computer-Aided Applications in Pharmaceutical Technology, 1<sup>st</sup> Edition, Jelena Djuris, Woodhead Publishing
3. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James G. Boylan, Marcel Dekker Inc, New York, 1996.

## COSMETICS AND COSMECEUTICALS (MPH 204T)

### Scope

This course is designed to impart knowledge and skills necessary for the fundamental need for cosmetic and cosmeceutical products.

### Objectives

Upon completion of the course, the students shall be able to understand

- Key ingredients used in cosmetics and cosmeceuticals.
- Key building blocks for various formulations.
- Current technologies in the market
- Various key ingredients and basic science to develop cosmetics and cosmeceuticals
- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

### THEORY

60 Hrs

1. Cosmetics – Regulatory : Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for labeling of cosmetics Regulatory provisions relating to import of cosmetics, Misbranded and spurious cosmetics. Regulatory provisions relating to manufacture of cosmetics – Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties. 12 Hrs
- 2 Cosmetics - Biological aspects : Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips, hands, feet, nail, scalp, neck, body and under-arm. 12 Hrs
- 3 Formulation Building blocks: Building blocks for different product formulations of cosmetics/cosmeceuticals. Surfactants – Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits. Factors affecting microbial preservative efficacy. Building blocks for formulation of a moisturizing cream, vanishing cream, cold cream, shampoo and toothpaste. Soaps and syndet bars. 12 Hrs  
Perfumes; Classification of perfumes. Perfume ingredients listed as allergens in EU regulation.

- Controversial ingredients: Parabens, formaldehyde liberators, dioxane.
- |   |   |           |
|---|---|-----------|
| 4 | Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, body odor., dandruff, dental cavities, bleeding gums, mouth odor and sensitive teeth through cosmeceutical formulations. | 12<br>Hrs |
| 5 | Herbal Cosmetics : Herbal ingredients used in Hair care, skincare and oral care. Review of guidelines for herbal cosmetics by private bodies like Cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics.           | 12<br>Hrs |

#### REFERENCES

1. Harry's Cosmeticology. 8<sup>th</sup> edition.
2. Poucher's perfume cosmetics and Soaps, 10<sup>th</sup> edition.
3. Cosmetics - Formulation, Manufacture and quality control, P.P. Sharma, 4<sup>th</sup> edition
4. Handbook of cosmetic science and Technology A.O. Barel, M. Paye and H.I. Maibach. 3<sup>rd</sup> edition
5. Cosmetic and Toiletries recent suppliers catalogue.
6. CTFA directory.

**PHARMACEUTICS PRACTICALS - II**  
**(MPH 205P)**

1. To study the effect of temperature change , non solvent addition, incompatible polymer addition in microcapsules preparation
2. Preparation and evaluation of Alginate beads
3. Formulation and evaluation of gelatin /albumin microspheres
4. Formulation and evaluation of liposomes/niosomes
5. Formulation and evaluation of spherules
6. Improvement of dissolution characteristics of slightly soluble drug by Solid dispersion technique.
7. Comparison of dissolution of two different marketed products /brands
8. Protein binding studies of a highly protein bound drug & poorly protein bound drug
9. Bioavailability studies of Paracetamol in animals.
10. Pharmacokinetic and IVIVC data analysis by Winnoline<sup>R</sup> software
11. In vitro cell studies for permeability and metabolism
12. DoE Using Design Expert<sup>®</sup> Software
13. Formulation data analysis Using Design Expert<sup>®</sup> Software
14. Quality-by-Design in Pharmaceutical Development
15. Computer Simulations in Pharmacokinetics and Pharmacodynamics
16. Computational Modeling Of Drug Disposition
17. To develop Clinical Data Collection manual
18. To carry out Sensitivity Analysis, and Population Modeling.
19. Development and evaluation of Creams
20. Development and evaluation of Shampoo and Toothpaste base
21. To incorporate herbal and chemical actives to develop products
22. To address Dry skin, acne, blemish, Wrinkles, dandruff

**Course Programme-  
Pharmaceutical chemistry**

## **Program Educational Objectives (PEOs)**

Program Educational Objectives (PEOs) for a Master of Pharmacy (M.Pharm) program typically outline the broad goals that graduates are expected to achieve in their professional careers and further education. Here are some common PEOs for an M.Pharm program:

**PEO1 Professional Competence:** Graduates will demonstrate advanced knowledge and skills in pharmaceutical sciences, enabling them to contribute effectively in various sectors such as industry, academia, and healthcare.

**PEO2 Research and Innovation:** Graduates will engage in research activities, promoting innovation and development of new drug formulations, therapeutic approaches, and pharmaceutical technologies.

**PEO3 Leadership and Teamwork:** Graduates will exhibit leadership qualities and the ability to work collaboratively in multidisciplinary teams, enhancing their effectiveness in professional settings.

**PEO4 Ethical Practice:** Graduates will uphold ethical standards and practices in pharmacy, ensuring patient safety, regulatory compliance, and responsible conduct in research and practice.

**PEO5 Ethical Lifelong Learning:** Graduates will demonstrate a commitment to lifelong learning and professional development, staying updated with the latest advancements in the pharmaceutical field.

**PEO6 Ethical Community Engagement:** Graduates will engage with the community, promoting public health initiatives and contributing to the education of patients and healthcare professionals about medication use and safety.

**PEO7 Critical Thinking and Problem-Solving:** Graduates will apply critical thinking and analytical skills to address complex pharmaceutical problems, making informed decisions based on scientific evidence.

**PEO8 Regulatory Knowledge:** Graduates will possess a thorough understanding of regulatory frameworks governing pharmaceutical development, approval processes, and marketing, ensuring compliance in their practices.

**PEO9 Interdisciplinary Collaboration:** Graduates will effectively collaborate with healthcare professionals, researchers, and industry partners to enhance patient care and drive pharmaceutical innovation.

**PEO10 Communication Skills:** Graduates will demonstrate strong oral and written communication skills, effectively conveying complex pharmaceutical concepts to diverse audiences, including patients, colleagues, and regulatory bodies.

**PEO11 Pharmacovigilance and Safety:** Graduates will be equipped to monitor, evaluate, and manage drug safety, actively participating in pharmacovigilance activities to ensure the well-being of patients.

**PEO12 Global Perspective:** Graduates will develop a global perspective on healthcare and pharmaceutical practices, understanding the impact of cultural, economic, and policy factors on medication management.

## **Programme Specific Objectives (PSO's)**

**PSO1 Advanced Chemical Knowledge:** Graduates will demonstrate a thorough understanding of organic, inorganic, and medicinal chemistry principles as they apply to drug design and development.

**PSO2 Synthesis and Characterization:** Graduates will be skilled in the synthesis, purification, and characterization of pharmaceutical compounds using modern analytical techniques.

**PSO3 Drug Design and Development:** Graduates will apply knowledge of structure-activity relationships (SAR) and molecular modeling to design and develop new pharmaceutical agents.

**PSO4 Analytical Method Development:** Graduates will be proficient in developing and validating analytical methods for the quantitative and qualitative analysis of pharmaceutical substances.

**PSO5 Quality Assurance and Control:** Graduates will understand and implement quality assurance and control measures in pharmaceutical manufacturing processes to ensure product safety and efficacy.

**PSO6 Regulatory Affairs Knowledge:** Graduates will possess a comprehensive understanding of the regulatory frameworks governing the pharmaceutical industry, including drug approval processes and compliance requirements.

**PSO7 Interdisciplinary Collaboration:** Graduates will effectively collaborate with professionals in related fields, including pharmacology and pharmacognosy, to enhance drug development and therapeutic outcomes.

**PSO8 Research and Innovation:** Graduates will engage in innovative research projects, contributing to the field of pharmaceutical chemistry through publications and presentations.

**PSO9 Ethical Practice:** Graduates will adhere to ethical guidelines in research and pharmaceutical practice, ensuring integrity in all scientific endeavors.



### Programme Outcome Objectives (POO's)

**POO1 Knowledge Application:** Graduates will apply advanced knowledge of pharmaceutical sciences to solve complex problems in drug development, formulation, and patient care.

**POO2 Research Proficiency:** Graduates will demonstrate the ability to conduct independent research, critically analyze data, and contribute to scientific literature in the field of pharmacy.

**POO3 Clinical Judgment:** Graduates will make informed clinical decisions based on evidence-based practices, optimizing therapeutic outcomes for patients.

**POO4 Communication Skills:** Graduates will effectively communicate pharmaceutical information, both orally and in writing, to diverse audiences, including patients, healthcare professionals, and regulatory bodies.

**POO5 Ethical Standards:** Graduates will adhere to ethical principles in all aspects of pharmaceutical practice, ensuring patient safety and promoting public health.

**POO6 Team Collaboration:** Graduates will work effectively in interdisciplinary teams, contributing to comprehensive patient care and fostering collaboration among healthcare providers.

**POO7 Lifelong Learning:** Graduates will exhibit a commitment to lifelong learning, seeking out continuing education opportunities to stay updated with advancements in the pharmaceutical field.

**POO8 Regulatory Knowledge:** Graduates will understand and navigate the regulatory landscape governing pharmaceutical products, ensuring compliance with laws and guidelines.

**POO9 Patient-Centered Care:** Graduates will provide patient-centered pharmaceutical care, considering individual patient needs, preferences, and values in their practice.

**POO10 Innovation and Entrepreneurship:** Graduates will demonstrate the ability to innovate and explore entrepreneurial opportunities in the pharmaceutical industry, contributing to the development of new products and services.

## PHARMACEUTICAL CHEMISTRY (MPC)

### MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPC 101T)

#### Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

#### Objectives

After completion of course student is able to know about chemicals and excipients

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

#### THEORY

60 Hrs

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. 10 Hrs  
b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.  
c. Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analysed by fluorimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.  
d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.
2. NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and <sup>13</sup>C NMR. Applications of NMR spectroscopy. 10 Hrs

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|---|---|-----------|
| 3 | <p><b>Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.</b></p>   | 10<br>Hrs |
| 4 | <p><b>Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following:</b></p> <p>a) Thin Layer chromatography<br/> b) High Performance Thin Layer Chromatography<br/> c) Ion exchange chromatography<br/> d) Column chromatography<br/> e) Gas chromatography<br/> f) High Performance Liquid chromatography<br/> g) Ultra High Performance Liquid chromatography<br/> h) Affinity chromatography<br/> i) Gel Chromatography</p> | 10<br>Hrs |
| 5 | <p><b>a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following:</b></p> <p>a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing</p> <p><b>b) X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.</b></p>                                  | 10<br>Hrs |
| 6 | <p><b>a. Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry.</b></p> <p><b>b. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation</b></p> | 10<br>Hrs |

and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

#### REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5<sup>th</sup> edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods – Part B - J W Munson, Vol 11, Marcel Dekker Series
8. Spectroscopy of Organic Compounds, 2<sup>nd</sup> edn., P.S/Kalsi, Wiley eastern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3<sup>rd</sup> Edition, John Wiley & Sons, 1982.

**ADVANCED ORGANIC CHEMISTRY - I**  
**(MPC 102T)**

**Scope**

The subject is designed to provide in-depth knowledge about advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery.

**Objectives**

Upon completion of course, the student shall be to understand

- The principles and applications of retrosynthesis
- The mechanism & applications of various named reactions
- The concept of disconnection to develop synthetic routes for small target molecule.
- The various catalysts used in organic reactions
- The chemistry of heterocyclic compounds

**THEORY**

60 Hrs

**1. Basic Aspects of Organic Chemistry:**

12

1. Organic intermediates: Carbocations, carbanions, free radicals, carbenes and nitrenes. Their method of formation, stability and synthetic applications. Hrs
2. Types of reaction mechanisms and methods of determining them,
3. Detailed knowledge regarding the reactions, mechanisms and their relative reactivity and orientations.

**Addition reactions**

- a) Nucleophilic uni- and bimolecular reactions (SN1 and SN2)
- b) Elimination reactions (E1 & E2; Hoffman & Saytzeff's rule)
- c) Rearrangement reaction

**2 Study of mechanism and synthetic applications of following named Reactions:**

12

Ugi reaction, Brook rearrangement, Ullmann coupling reactions, Dieckmann Reaction, Doebner-Miller Reaction, Sandmeyer Reaction, Mitsunobu reaction, Mannich reaction, Vilsmeier-Haack Reaction, Sharpless asymmetric epoxidation, Baeyer-Villiger oxidation, Shapiro & Suzuki reaction, Ozonolysis and Michael addition reaction Hrs

- 3 **Synthetic Reagents & Applications:** 12  
Aluminiumisopropoxide, N-bromosuccinamide, diazomethane, 12  
dicyclohexylcarbodiimide, Wilkinson reagent, Wittig reagent. Osmium Hrs  
tetroxide, titanium chloride, diazopropane, diethyl azodicarboxylate,  
Triphenylphosphine, Benzotriazol-1-yloxy) tris (dimethylamino) phosphonium  
hexafluoro-phosphate (BOP).
- Protecting groups**
- Role of protection in organic synthesis
  - Protection for the hydroxyl group, including 1,2-and1,3-diols:ethers, esters,  
carbonates, cyclic acetals & ketals
  - Protection for the Carbonyl Group: Acetals and Ketals
  - Protection for the Carboxyl Group: amides and hydrazides,esters
  - Protection for the Amino Group and Amino acids: carbamatesand amides
- 4 **Heterocyclic Chemistry:** 12  
Organic Name reactions with their respective mechanism and application Hrs  
involved in synthesis of drugs containing five, six membered and fused  
hetrocyclics such as Debus-Radziszewski imidazole synthesis, Knorr Pyrazole  
Synthesis Pinner Pyrimidine Synthesis, Combes Quinoline Synthesis,  
Berntsen Acridine Synthesis, Smiles rearrangement and Traube purine  
synthesis.
- Synthesis of few representative drugs containing these hetrocyclic nucleus  
such as Ketoconazole, Metronidazole, Miconazole, celecoxib, antipyrin,  
Metamizole sodium, Terconazole, Alprazolam, Triamterene, Sulfamerazine,  
Trimethoprim, Hydroxychloroquine, Quinine, Chloroquine, Quinacrine,  
Amsacrine, Prochlorperazine, Promazine, Chlorpromazine, Theophylline ,  
Mercaptopurine and Thioguanine.
- 5 **Synthon approach and retrosynthesis applications**
- Basic principles, terminologies and advantages of retrosynthesis;  
guidelines for dissection of molecules. Functional group interconversion  
and addition (FGI and FGA) 12  
Hrs
  - C-X disconnections; C-C disconnections – alcohols and carbonyl  
compounds; 1,2-, 1,3-,1,4-, 1,5-, 1,6-difunctionalized compounds
  - Strategies for synthesis of three, four, five and six-membered ring.

## REFERENCES

1. "Advanced Organic chemistry, Reaction, Mechanisms and Structure", JMarch, John Wiley and Sons, New York.
2. "Mechanism and Structure in Organic Chemistry", ES Gould, Hold Rinchartand Winston, New York.
3. "Organic Chemistry" Clayden, Greeves, Warren and Woihers., OxfordUniversity Press 2001.
4. "Organic Chemistry" Vol I and II. I.L. Finar. ELBS, Pearson Education Lts, Dorling Kindersley 9India) Pvt. Ltd.,.
5. A guide to mechanisms in Organic Chemistry, Peter Skyes (OrientLongman, New Delhi).
6. Reactive Intermediates in Organic Chemistry, Tandom and Gowel, Oxford& IBH Publishers.
7. Combinational Chemistry – Synthesis and applications – Stephen RWilson & Anthony W Czarnik, Wiley – Blackwell.
8. Carey, Organic Chemistry, 5<sup>th</sup> Edition (Viva Books Pvt. Ltd.)
9. Organic Synthesis - The Disconnection Approach, S. Warren, Wily India
10. Principles of Organic Synthesis, ROC Norman and JM Coxan, NelsonThorns.
11. Organic Synthesis - Special Techniques. VK Ahluwalia and R Agarwal, Narosa Publishers.
12. Organic Reaction Mechanisms IV<sup>th</sup> Edtn, VK Ahluwalia and RK Parashar, Narosa Publishers.

## ADVANCED MEDICINAL CHEMISTRY (MPC 103T)

### Scope

The subject is designed to impart knowledge about recent advances in the field of medicinal chemistry at the molecular level including different techniques for the rational drug design.

### Objectives

At completion of this course it is expected that students will be able to understand

- Different stages of drug discovery
- Role of medicinal chemistry in drug research
- Different techniques for drug discovery
- Various strategies to design and develop new drug like molecules for biological targets
- Peptidomimetics

### THEORY

60 Hrs

1. Drug discovery: Stages of drug discovery, lead discovery; identification, validation and diversity of drug targets. 12 Hrs

Biological drug targets: Receptors, types, binding and activation, theories of drug receptor interaction, drug receptor interactions, agonists vs antagonists, artificial enzymes.

- 2 Prodrug Design and Analog design: 12 Hrs
- a) Prodrug design: Basic concept, Carrier linked prodrugs/ Bioprecursors, Prodrugs of functional group, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.
  - b) Combating drug resistance: Causes for drug resistance, strategies to combat drug resistance in antibiotics and anticancer therapy, Genetic principles of drug resistance.
  - c) Analog Design: Introduction, Classical & Non classical, Bioisosteric replacement strategies, rigid analogs,



alteration of chain branching, changes in ring size, ring position isomers, design of stereo isomers and geometric isomers, fragments of a lead molecule, variation in inter atomic distance.

- 3 a) Medicinal chemistry aspects of the following class of drugs 12  
Systematic study, SAR, Mechanism of action and synthesis of new Hrs  
generation molecules of following class of drugs:  
a) Anti-hypertensive drugs, Psychoactive drugs, Anticonvulsant drugs, H1 & H2  
receptor antagonist, COX1 & COX2 inhibitors, Adrenergic & Cholinergic  
agents, Antineoplastic and Antiviral agents.  
b) Stereochemistry and Drug action: Realization that stereo selectivity is a  
pre-requisite for evolution. Role of chirality in selective and specific  
therapeutic agents. Case studies, Enantio selectivity in drug adsorption,  
metabolism, distribution and elimination.
- 4 Rational Design of Enzyme Inhibitors 12  
Enzyme kinetics & Principles of Enzyme inhibitors, Enzyme inhibitors in Hrs  
medicine, Enzyme inhibitors in basic research, rational design of non-  
covalently and covalently binding enzyme inhibitors.
- 5 Peptidomimetics 12  
Therapeutic values of Peptidomimetics, design of peptidomimetics by Hrs  
manipulation of the amino acids, modification of the peptide backbone,  
incorporating conformational constraints locally or globally. Chemistry of  
prostaglandins, leukotrienes and thromboxones.

## REFERENCES

1. Medicinal Chemistry by Burger, Vol I –VI.
2. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, 12<sup>th</sup> Edition, Lppincott Williams & Wilkins, Woltes Kluwer (India) Pvt.Ltd, New Delhi.
3. Comprehensive Medicinal Chemistry – Corwin and Hansch.
4. Computational and structural approaches to drug design edited by Robert M Stroud and Janet. F Moore

5. Introduction to Quantitative Drug Design by Y.C. Martin.
6. Principles of Medicinal Chemistry by William Foye, 7<sup>th</sup> Edition, IppincottWilliams & Wilkins, Woltes Kluwer (India) Pvt.Ltd, New Delhi.
7. Drug Design Volumes by Arienes, Academic Press, Elsevier Publishers,Noida, Uttar Pradesh..
8. Principles of Drug Design by Smith.
9. The Organic Chemistry of the Drug Design and Drug action by RichardB.Silverman, II Edition, Elsevier Publishers, New Delhi.
- 10.An Introduction to Medicinal Chemistry, Graham L.Patrick, III Edition,Oxford University Press, USA.
- 11.Biopharmaceutics and pharmacokinetics, DM.Brahmankar, Sunil B.Jaiswal II Edition, 2014, Vallabh Prakashan, New Delhi.
- 12.Peptidomimetics in Organic and Medicinal Chemistry by Antonio Guarnaand Andrea Trabocchi, First edition, Wiley publishers.

# CHEMISTRY OF NATURAL PRODUCTS (MPC 104T)

## Scope

The subject is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds. It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.

## Objectives

At completion of this course it is expected that students will be able to understand-

- Different types of natural compounds and their chemistry and medicinal importance
- The importance of natural compounds as lead molecules for new drug discovery
- The concept of rDNA technology tool for new drug discovery
- General methods of structural elucidation of compounds of natural origin
- Isolation, purification and characterization of simple chemical constituents from natural source

## THEORY

60 Hrs

1. Study of Natural products as leads for new pharmaceuticals for the following class of drugs 12 Hrs
  - a) Drugs Affecting the Central Nervous System: Morphine Alkaloids
  - b) Anticancer Drugs: Paclitaxel and Docetaxel, Etoposide, and Teniposide
  - c) Cardiovascular Drugs: Lovastatin, Teprotide and Dicoumarol
  - d) Neuromuscular Blocking Drugs: Curare alkaloids
  - e) Anti-malarial drugs and Analogues
  - f) Chemistry of macrolid antibiotics (Erythromycin, Azithromycin, Roxithromycin, and Clarithromycin) and  $\beta$  - Lactam antibiotics (Cephalosporins and Carbapenem)
- 2 a) Alkaloids 12 Hrs  
General introduction, classification, isolation, purification, molecular modification and biological activity of alkaloids, general methods of structural determination of alkaloids, structural elucidation and stereochemistry of ephedrine, morphine, ergot, emetine and reserpine.

- b) Flavonoids**  
Introduction, isolation and purification of flavonoids, General methods of structural determination of flavonoids; Structural elucidation of quercetin.
- c) Steroids**  
General introduction, chemistry of sterols, sapogenin and cardiac glycosides. Stereochemistry and nomenclature of steroids, chemistry of contraceptive agents male & female sex hormones (Testosterone, Estradiol, Progesterone), adrenocorticoids (Cortisone), contraceptive agents and steroids (Vit – D).
- 3 a) Terpenoids** 12  
Hrs
- Classification, isolation, isoprene rule and general methods of structural elucidation of Terpenoids; Structural elucidation of drugs belonging to mono (citral, menthol, camphor), di (retinol, Phytol, taxol) and tri terpenoids (Squalene, Ginsenoside) carotinoids ( $\beta$  carotene).
- b) Vitamins**  
Chemistry and Physiological significance of Vitamin A, B1, B2, B12, C, E, Folic acid and Niacin.
- 4 a). Recombinant DNA technology and drug discovery** 12  
Hrs
- rDNA technology, hybridoma technology, New pharmaceuticals derived from biotechnology; Oligonucleotide therapy. Gene therapy: Introduction, Clinical application and recent advances in gene therapy, principles of RNA & DNA estimation
- b). Active constituent of certain crude drugs used in Indigenous system**  
Diabetic therapy – *Gymnema sylvest*re, *Salacia reticulata*, *Pterocarpus marsupium*, *Swertia chirata*, *Trigonella foenum graecum*; Liver dysfunction – *Phyllanthus niruri*; Antitumor – *Curcuma longa* Linn.
- 5 Structural Characterization of natural compounds** 12  
Hrs
- Structural characterization of natural compounds using IR, <sup>1</sup>HNMR, <sup>13</sup>CNMR and MS Spectroscopy of specific drugs e.g., Penicillin, Morphine, Camphor, Vit-D, Quercetin and *Digitalis* glycosides.

## REFERENCES

1. Modern Methods of Plant Analysis, Peech and M.V.Tracey, Springer –Verlag, Berlin, Heidelberg.
2. Phytochemistry Vol. I and II by Miller, Jan Nostrant Rein Hld.
3. Recent advances in Phytochemistry Vol. I to IV – Scikel Runeckles, Springer Science & Business Media.
4. Chemistry of natural products Vol I onwards IWPAC.
5. Natural Product Chemistry Nakanishi Gggolo, University Science Books, California.
6. Natural Product Chemistry “A laboratory guide” – Rapheal Khan.
7. The Alkaloid Chemistry and Physiology by RHF Manske, Academic Press.
8. Introduction to molecular Phytochemistry – CHJ Wells, Chapmanstall.
9. Organic Chemistry of Natural Products Vol I and II by Gurdeep and Chatwall, Himalaya Publishing House.
10. Organic Chemistry of Natural Products Vol I and II by O.P. Agarwal, Krishan Prakashan.
11. Organic Chemistry Vol I and II by I.L. Finar, Pearson education.
12. Elements of Biotechnology by P.K. Gupta, Rastogi Publishers.
13. Pharmaceutical Biotechnology by S.P.Vyas and V.K.Dixit, CBS Publishers.
14. Biotechnology by Purohit and Mathur, Agro-Bios, 13<sup>th</sup> edition.
15. Phytochemical methods of Harborne, Springer, Netherlands.
16. Burger's Medicinal Chemistry.

**PHARMACEUTICAL CHEMISTRY PRACTICAL - I**  
**(MPC 105P)**

1. Analysis of Pharmacopoeial compounds and their formulations by UV Vis spectrophotometer, RNA & DNA estimation
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on Column chromatography
4. Experiments based on HPLC
5. Experiments based on Gas Chromatography
6. Estimation of riboflavin/quinine sulphate by fluorimetry
7. Estimation of sodium/potassium by flame photometry

**To perform the following reactions of synthetic importance**

1. Purification of organic solvents, column chromatography
2. Claisen-schmidt reaction.
3. Benzylic acid rearrangement.
4. Beckmann rearrangement.
5. Hoffmann rearrangement
6. Mannich reaction
7. Synthesis of medicinally important compounds involving more than one step along with purification and Characterization using TLC, melting point and IR spectroscopy (4 experiments)
8. Estimation of elements and functional groups in organic natural compounds
9. Isolation, characterization like melting point, mixed melting point, molecular weight determination, functional group analysis, co-chromatographic technique for identification of isolated compounds and interpretation of UV and IR data.
10. Some typical degradation reactions to be carried on selected plant constituents

## ADVANCED SPECTRAL ANALYSIS (MPC 201T)

### Scope

This subject deals with various hyphenated analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are LC-MS, GC-MS, ATR-IR, DSC etc.

### Objectives

At completion of this course it is expected that students will be able to understand-

- Interpretation of the NMR, Mass and IR spectra of various organic compounds
- Theoretical and practical skills of the hyphenated instruments
- Identification of organic compounds

THEORY	60Hrs
1. UV and IR spectroscopy: Woodward – Fieser rule for 1,3-butadienes, cyclic dienes and $\alpha$ , $\beta$ -carbonyl compounds and interpretation of enones. ATR-IR, IR Interpretation of organic compounds.	12 Hrs
2. NMR spectroscopy: 1-D and 2-D NMR, NOESY and COSY, HECTOR, INADEQUATE techniques, Interpretation of organic compounds.	12 Hrs
3. Mass Spectroscopy  Mass fragmentation and its rules, Fragmentation of important functional groups like alcohols, amines, carbonyl groups and alkanes, Meta stable ions, McLafferty rearrangement, Ring rule, Isotopic peaks, Interpretation of organic compounds.	12 Hrs
4. Chromatography: Principle, Instrumentation and Applications of the following : a) GC-MS b) GC-AAS c) LC-MS d) LC-FTIR e) LC-NMR f) CE-MS g) High Performance Thin Layer chromatography h) Super critical fluid chromatography i) Ion Chromatography j) I-EC (Ion-Exclusion Chromatography) k) Flash chromatography	12 Hrs

- 5 a). **Thermal methods of analysis** 12  
Introduction, principle, instrumentation and application of DSC,DTA and Hrs  
TGA.
- b). **Raman Spectroscopy**  
Introduction, Principle, Instrumentation and Applications.
- c). **Radio immuno assay**  
Biological standardization , bioassay, ELISA, Radioimmunoassay of digitalis and insulin.

#### REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5<sup>th</sup> edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7<sup>th</sup> edition, CBS publishers.
4. Organic Spectroscopy - William Kemp, 3<sup>rd</sup> edition, ELBS, 1991.
5. Quantitative analysis of Pharmaceutical formulations by HPTLC - P D Sethi, CBS Publishers, New Delhi.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3<sup>rd</sup> Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series



**ADVANCED ORGANIC CHEMISTRY - II**  
**(MPC 202T)**

**Scope**

The subject is designed to provide in-depth knowledge about advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery.

**Objectives**

Upon completion of course, the student shall able to understand

- The principles and applications of Green chemistry
- The concept of peptide chemistry.
- The various catalysts used in organic reactions
- The concept of stereochemistry and asymmetric synthesis.

<b>THEORY</b>		<b>60 Hrs</b>
<b>1. Green Chemistry:</b>		<b>12</b>
a. Introduction, principles of green chemistry		<b>Hrs</b>
b. Microwave assisted reactions: Merit and demerits of its use, increased reaction rates, mechanism, superheating effects of microwave, effects of solvents in microwave assisted synthesis, microwave technology in process optimization, its applications in various organic reactions and heterocycles synthesis		
c. Ultrasound assisted reactions: Types of sonochemical reactions, homogenous, heterogeneous liquid-liquid and liquid-solid reactions, synthetic applications		
d. Continuous flow reactors: Working principle, advantages and synthetic applications.		
<b>2 Chemistry of peptides</b>		<b>12</b>
a. Coupling reactions in peptide synthesis		<b>Hrs</b>
b. Principles of solid phase peptide synthesis, t-BOC and FMOC protocols, various solid supports and linkers: Activation procedures, peptide bond formation, deprotection and cleavage from resin, low and high HF cleavage protocols, formation of free peptides and peptide amides, purification and case studies, site-specific chemical modifications of peptides		
c. Segment and sequential strategies for solution phase peptide synthesis with any two case studies		
d. Side reactions in peptide synthesis: Deletion peptides, side		

reactions initiated by proton abstraction, protonation, over- activation and side reactions of individual amino acids.

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|----------|--|-----------|
| <b>3</b> | <b>Photochemical Reactions</b><br>Basic principles of photochemical reactions. Photo-oxidation, photo-addition and photo-fragmentation.  | 12<br>Hrs |
|          | <b>Pericyclic reactions</b><br>Mechanism, Types of pericyclic reactions such as cyclo addition, electrocyclic reaction and sigmatropic rearrangement reactions with examples   |           |
| <b>4</b> | <b>Catalysis:</b><br>a. Types of catalysis, heterogeneous and homogenous catalysis, advantages and disadvantages<br>b. Heterogeneous catalysis – preparation, characterization, kinetics, supported catalysts, catalyst deactivation and regeneration, some examples of heterogeneous catalysis used in synthesis of drugs.<br>c. Homogenous catalysis, hydrogenation, hydroformylation, hydrocyanation, Wilkinson catalysts, chiral ligands and chiral induction, Ziegler-Natta catalysts, some examples of homogenous catalysis used in synthesis of drugs<br>d. Transition-metal and Organo-catalysis in organic synthesis:<br>Metal-catalyzed reactions<br>e. Biocatalysis: Use of enzymes in organic synthesis, immobilized enzymes/cells in organic reaction.<br>f. Phase transfer catalysis - theory and applications | 12<br>Hrs |
| <b>5</b> | <b>Stereochemistry &amp; Asymmetric Synthesis</b><br>a. Basic concepts in stereochemistry – optical activity, specific rotation, racemates and resolution of racemates, the Cahn, Ingold, Prelog (CIP) sequence rule, meso compounds, pseudo asymmetric centres, axes of symmetry, Fischers D and L notation, cis-trans isomerism, E and Z notation.<br>b. Methods of asymmetric synthesis using chiral pool, chiral auxiliaries and catalytic asymmetric synthesis, enantiopure separation and Stereo selective synthesis with examples.  | 12<br>Hrs |

## REFERENCES

1. "Advanced Organic chemistry, Reaction, mechanisms and structure", JMarch, John Wiley and sons, New York.
2. "Mechanism and structure in organic chemistry", ES Gould, Hold Rinchartand Winston,NewYork.
3. "Organic Chemistry" Clayden, Greeves, Warren and Woihers., Oxford University Press 2001.
4. "Organic Chemistry" Vol I and II. I.L. Finar. ELBS, Sixth ed., 1995.
5. Carey, Organic chemistry, 5th edition (Viva Books Pvt. Ltd.)
6. Organic synthesis-the disconnection approach, S. Warren, Wily India
7. Principles of organic synthesis, ROCNorman and JMCoxan, Nelson thorns
8. Organic synthesis- Special techniques VK Ahluwalia and R Aggarwal,Narosa Publishers.
9. Organic reaction mechanisms IV edtn, VK Ahluwalia and RK Parashar,Narosa Publishers.

## COMPUTER AIDED DRUG DESIGN (MPC 203T)

### Scope

The subject is designed to impart knowledge on the current state of the art techniques involved in computer assisted drug design.

### Objectives

At completion of this course it is expected that students will be able to understand

- Role of CADD in drug discovery
- Different CADD techniques and their applications
- Various strategies to design and develop new drug like molecules.
- Working with molecular modeling softwares to design new drug molecules
- The in silico virtual screening protocols

### Theory

60 Hrs

#### 1. Introduction to Computer Aided Drug Design (CADD)

12

Hrs

History, different techniques and applications.

#### Quantitative Structure Activity Relationships: Basics

History and development of QSAR: Physicochemical parameters and methods to calculate physicochemical parameters: Hammett equation and electronic parameters ( $\sigma$ ), lipophilicity effects and parameters ( $\log P$ ,  $\pi$ -substituent constant), steric effects (Taft steric and MR parameters) Experimental and theoretical approaches for the determination of these physicochemical parameters.

#### 2. Quantitative Structure Activity Relationships: Applications Hansch analysis, Free Wilson analysis and relationship between them, Advantages and disadvantages; Deriving 2D-QSAR equations. 3D-QSAR approaches and contour map analysis.

12

Hrs

Statistical methods used in QSAR analysis and importance of statistical parameters.

#### 3. Molecular Modeling and Docking

a) Molecular and Quantum Mechanics in drug design.

12

b) Energy Minimization Methods: comparison between global

Hrs

minimum conformation and bioactive conformation

- c) Molecular docking and drug receptor interactions: Rigid docking, flexible docking and extra-precision docking. Agents acting on enzymes such as DHFR, HMG-CoA reductase and HIV protease, choline esterase ( AchE & BchE)

4	<b>Molecular Properties and Drug Design</b>	12
	a) Prediction and analysis of ADMET properties of new molecules and its importance in drug design.	Hrs
	b) De novo drug design: Receptor/enzyme-interaction and its analysis, Receptor/enzyme cavity size prediction, predicting the functional components of cavities, Fragment based drug design.	
	c) Homology modeling and generation of 3D-structure of protein.	
5	<b>Pharmacophore Mapping and Virtual Screening</b>	12
	Concept of pharmacophore, pharmacophore mapping, identification of Pharmacophore features and Pharmacophore modeling; Conformational search used in pharmacophore mapping.	Hrs

In Silico Drug Design and Virtual Screening Techniques

Similarity based methods and Pharmacophore based screening, structure based In-silico virtual screening protocols.

## REFERENCES

1. Computational and structural approaches to drug discovery, Robert MStroud and Janet. F Moore, RCS Publishers.
2. Introduction to Quantitative Drug Design by Y.C. Martin, CRC Press, Taylor & Francis group..
3. Drug Design by Ariens Volume 1 to 10, Academic Press, 1975, ElsevierPublishers.
4. Principles of Drug Design by Smith and Williams, CRC Press, Taylor & Francis.
5. The Organic Chemistry of the Drug Design and Drug action by Richard B.Silverman, Elsevier Publishers.
6. Medicinal Chemistry by Burger, Wiley Publishing Co.

7. An Introduction to Medicinal Chemistry –Graham L. Patrick, OxfordUniversity Press.
8. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Ippincott Williams & Wilkins.
9. Comprehensive Medicinal Chemistry – Corwin and Hansch, PergamonPublishers.
10. Computational and structural approaches to drug design edited by Robert M Stroud and Janet. F Moore

# PHARMACEUTICAL PROCESS CHEMISTRY (MPC 204T)

## Scope

Process chemistry is often described as scale up reactions, taking them from small quantities created in the research lab to the larger quantities that are needed for further testing and then to even larger quantities required for commercial production. The goal of a process chemist is to develop synthetic routes that are safe, cost-effective, environmentally friendly, and efficient. The subject is designed to impart knowledge on the development and optimization of a synthetic route/s and the pilot plant procedure for the manufacture of Active Pharmaceutical Ingredients (APIs) and new chemical entities (NCEs) for the drug development phase.

## Objectives

At completion of this course it is expected that students will be able to understand

- The strategies of scale up process of APIs and intermediates
- The various unit operations and various reactions in process chemistry

## THEORY

60 Hrs

### 1. Process chemistry

12

Introduction, Synthetic strategy

Hrs

Stages of scale up process: Bench, pilot and large scale process. In-process control and validation of large scale process.

Case studies of some scale up process of APIs.

Impurities in API, types and their sources including genotoxic impurities

### 2 Unit operations

12

- a) Extraction: Liquid equilibria, extraction with reflux, extraction with agitation, counter current extraction.
- b) Filtration: Theory of filtration, pressure and vacuum filtration, centrifugal filtration,
- c) Distillation: azeotropic and steam distillation
- d) Evaporation: Types of evaporators, factors affecting evaporation.
- e) Crystallization: Crystallization from aqueous, non- aqueous solutions factors affecting crystallization, nucleation. Principle and general methods of Preparation of polymorphs, hydrates, solvates and amorphous APIs.

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|---|---|-----------|
| 3 | <b>Unit Processes - I</b><br>a) Nitration: Nitrating agents, Aromatic nitration, kinetics and mechanism of aromatic nitration, process equipment for technical nitration, mixed acid for nitration,<br>b) Halogenation: Kinetics of halogenations, types of halogenations, catalytic halogenations. Case study on industrial halogenation process.<br>c) Oxidation: Introduction, types of oxidative reactions, Liquid phase oxidation with oxidizing agents. Nonmetallic Oxidizing agents such as H <sub>2</sub> O <sub>2</sub> , sodium hypochlorite, Oxygen gas, ozonolysis.   | 12<br>Hrs |
| 4 | <b>Unit Processes - II</b><br>a) Reduction: Catalytic hydrogenation, Heterogeneous and homogeneous catalyst; Hydrogen transfer reactions, Metal hydrides. Case study on industrial reduction process.<br>b) Fermentation: Aerobic and anaerobic fermentation.<br>Production of<br>i. Antibiotics; Penicillin and Streptomycin,<br>ii. Vitamins: B <sub>2</sub> and B <sub>12</sub><br>iii. Statins: Lovastatin, Simvastatin<br>c) Reaction progress kinetic analysis<br>i. Streamlining reaction steps, route selection,<br>ii. Characteristics of expedient routes, characteristics of cost-effective routes, reagent selection, families of reagents useful for scale-up. | 12<br>Hrs |
| 5 | <b>Industrial Safety</b><br>a) MSDS (Material Safety Data Sheet), hazard labels of chemicals and Personal Protection Equipment (PPE)<br>b) Fire hazards, types of fire & fire extinguishers<br>c) Occupational Health & Safety Assessment Series 1800 (OHSAS-1800) and ISO-14001 (Environmental Management System), Effluents and its management  | 12<br>Hrs |



## REFERENCES

1. Process Chemistry in the Pharmaceutical Industry: Challenges in an Ever-Changing Climate-An Overview; K. Gadamasetti, CRC Press.
2. Pharmaceutical Manufacturing Encyclopedia, 3<sup>rd</sup> edition, Volume 2.
3. Medicinal Chemistry by Burger, 6<sup>th</sup> edition, Volume 1-8.
4. W.L. McCabe, J.C Smith, Peter Harriott. Unit operations of chemicalengineering, 7th edition, McGraw Hill
5. Polymorphism in Pharmaceutical Solids .Dekker Series Volume 95 Ed: HG Brittain (1999)
6. Regina M. Murphy: Introduction to Chemical Processes: Principles, Analysis, Synthesis
7. Peter J. Harrington: Pharmaceutical Process Chemistry for Synthesis: Rethinking the Routes to Scale-Up
8. P.H.Groggins: Unit processes in organic synthesis (MGH)
9. F.A.Henglein: Chemical Technology (Pergamon)
10. M.Gopal: Dryden's Outlines of Chemical Technology, WEP East-West Press
11. Clausen, Mattson: Principle of Industrial Chemistry, Wiley Publishing Co.,
12. Lowenheim & M.K. Moran: Industrial Chemicals
13. S.D. Shukla & G.N. Pandey: A text book of Chemical Technology Vol. II, Vikas Publishing House
14. J.K. Stille: Industrial Organic Chemistry (PH)
15. Shreve: Chemical Process, Mc Grawhill.
16. B.K. Sharma: Industrial Chemistry, Goel Publishing House
17. ICH Guidelines
18. United States Food and Drug Administration official website [www.fda.gov](http://www.fda.gov)

**PHARMACEUTICAL CHEMISTRY PRACTICALS – II**  
**(MPC 205P)**

1. Synthesis of organic compounds by adapting different approaches involving (3 experiments)
  - a) Oxidation
  - b) Reduction/hydrogenation
  - c) Nitration
2. Comparative study of synthesis of APIs/intermediates by different synthetic routes (2 experiments)
3. Assignments on regulatory requirements in API (2 experiments)
4. Comparison of absorption spectra by UV and Woodward – Fieser rule
5. Interpretation of organic compounds by FT-IR
6. Interpretation of organic compounds by NMR
7. Interpretation of organic compounds by MS
8. Determination of purity by DSC in pharmaceuticals
9. Identification of organic compounds using FT-IR, NMR, CNMR and Mass spectra
10. To carry out the preparation of following organic compounds
11. Preparation of 4-chlorobenzhydrylpiperazine. (an intermediate for cetirizine HCl).
12. Preparation of 4-iodotoluene from p-toluidine.
13. NaBH<sub>4</sub> reduction of vanillin to vanillyl alcohol
14. Preparation of umbelliferone by Pechmann reaction
15. Preparation of triphenyl imidazole
16. To perform the Microwave irradiated reactions of synthetic importance (Any two)
17. Determination of log P, MR, hydrogen bond donors and acceptors of selected drugs using softwares
18. Calculation of ADMET properties of drug molecules and its analysis using softwares  
Pharmacophore modeling
19. 2D-QSAR based experiments
20. 3D-QSAR based experiments
21. Docking study based experiment
22. Virtual screening based experiment

**Course Programme-  
Pharmacology**

## Program Educational Objectives (PEOs)

Program Educational Objectives (PEOs) for a Master of Pharmacy (M.Pharm) program typically outline the broad goals that graduates are expected to achieve in their professional careers and further education. Here are some common PEOs for an M.Pharm program:

**PEO1 Professional Competence:** Graduates will demonstrate advanced knowledge and skills in pharmaceutical sciences, enabling them to contribute effectively in various sectors such as industry, academia, and healthcare.

**PEO2 Research and Innovation:** Graduates will engage in research activities, promoting innovation and development of new drug formulations, therapeutic approaches, and pharmaceutical technologies.

**PEO3 Leadership and Teamwork:** Graduates will exhibit leadership qualities and the ability to work collaboratively in multidisciplinary teams, enhancing their effectiveness in professional settings.

**PEO4 Ethical Practice:** Graduates will uphold ethical standards and practices in pharmacy, ensuring patient safety, regulatory compliance, and responsible conduct in research and practice.

**PEO5 Ethical Lifelong Learning:** Graduates will demonstrate a commitment to lifelong learning and professional development, staying updated with the latest advancements in the pharmaceutical field.

**PEO6 Ethical Community Engagement:** Graduates will engage with the community, promoting public health initiatives and contributing to the education of patients and healthcare professionals about medication use and safety.

**PEO7 Critical Thinking and Problem-Solving:** Graduates will apply critical thinking and analytical skills to address complex pharmaceutical problems, making informed decisions based on scientific evidence.

**PEO8 Regulatory Knowledge:** Graduates will possess a thorough understanding of regulatory frameworks governing pharmaceutical development, approval processes, and marketing, ensuring compliance in their practices.

**PEO9 Interdisciplinary Collaboration:** Graduates will effectively collaborate with healthcare professionals, researchers, and industry partners to enhance patient care and drive pharmaceutical innovation.

**PEO10 Communication Skills:** Graduates will demonstrate strong oral and written communication skills, effectively conveying complex pharmaceutical concepts to diverse audiences, including patients, colleagues, and regulatory bodies.

**PEO11 Pharmacovigilance and Safety:** Graduates will be equipped to monitor, evaluate, and manage drug safety, actively participating in pharmacovigilance activities to ensure the well-being of patients.

**PEO12 Global Perspective:** Graduates will develop a global perspective on healthcare and pharmaceutical practices, understanding the impact of cultural, economic, and policy factors on medication management.

## Programme Specific Objectives (PSO's)

**PSO1 Advanced Pharmaceutical Knowledge:** Graduates will demonstrate a deep understanding of drug development processes, including formulation, synthesis, and quality control of pharmaceutical products.

**PSO2 Clinical Pharmacy Skills:** Graduates will apply clinical knowledge to assess patient medication regimens, provide pharmaceutical care, and contribute to interdisciplinary healthcare teams.

**PSO3 Research Methodology:** Graduates will be proficient in research methodologies, enabling them to design, conduct, and analyze pharmaceutical research effectively, including clinical trials and drug studies.

**PSO4 Pharmacokinetics and Pharmacodynamics:** Graduates will understand the principles of pharmacokinetics and pharmacodynamics, applying this knowledge to optimize drug therapy for diverse patient populations.

**PSO5 Regulatory Affairs Expertise:** Graduates will navigate regulatory frameworks and guidelines, ensuring compliance in the development and marketing of pharmaceutical products.

**PSO6 Formulation Development:** Graduates will be skilled in the development and evaluation of various dosage forms, utilizing modern techniques and technologies for innovative drug delivery systems.

**PSO7 Quality Assurance and Control:** Graduates will implement quality assurance and control measures in pharmaceutical manufacturing and laboratory settings, ensuring the safety and efficacy of products.

**PSO8 Patient Counseling and Education:** Graduates will effectively communicate medication-related information to patients, enhancing adherence and promoting safe medication use.

**PSO9 Ethical and Professional Responsibility:** Graduates will adhere to ethical guidelines and professional standards, promoting integrity and accountability in their pharmacy practice.

**PSO10 Interprofessional Collaboration:** Graduates will work collaboratively with healthcare professionals, understanding the roles of various team members in providing comprehensive patient care.

### **(Programme Outcome Objectives (POO's)**

**POO1 Knowledge of Drug Mechanisms:** Understand the pharmacokinetics and pharmacodynamics of various drug classes and how they interact with biological systems.

**POO2 Clinical Application:** Apply pharmacological principles in clinical settings to optimize drug therapy and improve patient outcomes.

**POO3 Safety and Efficacy:** Evaluate the safety, efficacy, and potential side effects of medications, including understanding drug interactions and contraindications.

**POO4 Research Skills:** Conduct and interpret pharmacological research, including the ability to critically analyze scientific literature and apply findings to practice.

**POO5 Ethical Considerations:** Understand ethical issues related to pharmacotherapy, including informed consent, drug regulation, and the implications of new therapies.

**POO6 Patient-Centered Care:** Develop communication skills to educate patients about their medications, including dosage, administration, and potential side effects.

**POO7 Interprofessional Collaboration:** Work effectively as part of a healthcare team to ensure comprehensive patient care and medication management.





## PHARMACOLOGY (MPL)

### MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPL 101T)

#### Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

#### Objectives

After completion of course student is able to know about,

- Chemicals and Excipients
- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

#### THEORY

60 Hrs

1. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. 10 Hrs  
IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.  
Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence (Characteristics of drugs that can be analysed by fluorimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.  
Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.
2. NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and <sup>13</sup>C NMR. Applications of NMR spectroscopy. 10 Hrs

- 3 Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy. 10 Hrs
- 4 Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: 10 Hrs
- j) Thin Layer chromatography
  - k) High Performance Thin Layer Chromatography
  - l) Ion exchange chromatography
  - m) Column chromatography
  - n) Gas chromatography
  - o) High Performance Liquid chromatography
  - p) Ultra High Performance Liquid chromatography
  - q) Affinity chromatography
  - r) Gel Chromatography
- 5 Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: 10 Hrs
- a) Paper electrophoresis
  - b) Gel electrophoresis
  - c) Capillary electrophoresis
  - d) Zone electrophoresis
  - e) Moving boundary electrophoresis
  - f) Iso electric focusing
- X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction. 10 Hrs
- 6 Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. 10 Hrs
- Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

## REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5<sup>th</sup> edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods – Part B - J W Munson, Vol 11, Marcel Dekker Series
8. Spectroscopy of Organic Compounds, 2<sup>nd</sup> edn., P.S/Kalsi, Wiley eastern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3<sup>rd</sup> Edition, John Wiley & Sons, 1982.

## ADVANCED PHARMACOLOGY - I (MPL 102T)

### Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved

### Objectives

Upon completion of the course the student shall be able to :

- Discuss the pathophysiology and pharmacotherapy of certain diseases
- Explain the mechanism of drug actions at cellular and molecular level
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

THEORY	60 Hrs
<b>1. General</b>	<b>Pharmacology 12 Hrs</b>
a. Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding.	
b. Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors, quantitation of drug receptors interaction and elicited effects.	
<b>2 Neurotransmission</b>	<b>12 Hrs</b>
a. General aspects and steps involved in neurotransmission.	
b. Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters- Adrenaline and Acetyl choline).	
c. Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters- histamine, serotonin, dopamine, GABA, glutamate and glycine).	
d. Non adrenergic non cholinergic transmission (NANC). Co-transmission	

## Systemic Pharmacology

A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in the following systems

### Autonomic Pharmacology

Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting

neuromuscular junction

12

### 3 Central nervous system Pharmacology

Hrs

General and local anesthetics

Sedatives and hypnotics, drugs used to treat anxiety.

Depression, psychosis, mania, epilepsy, neurodegenerative diseases.

Narcotic and non-narcotic analgesics.

12

### 4 Cardiovascular Pharmacology

Hrs

Diuretics, antihypertensives, antiischemics, anti-arrhythmics, drugs for heart failure and hyperlipidemia.

Hematinics, coagulants, anticoagulants, fibrinolytics and anti-platelet drugs

### 5 Autocoid Pharmacology

12

The physiological and pathological role of Histamine, Serotonin, Kinins

Hrs

Prostaglandins Opioid autocoids.

Pharmacology of antihistamines, 5HT antagonists.

## REFEERENCES

1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's
2. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
3. Basic and Clinical Pharmacology by B.G Katzung
4. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Graham Smith. Oxford textbook of Clinical Pharmacology.
7. Avery Drug Treatment
8. Dipiro Pharmacology, Pathophysiological approach.
9. Green Pathophysiology for Pharmacists.

10. Robbins & Cortan Pathologic Basis of Disease, 9<sup>th</sup> Ed. (Robbins Pathology)
11. A Complete Textbook of Medical Pharmacology by Dr. S.K. Srivastava published by APC Avichal Publishing Company
12. K.D. Tripathi. Essentials of Medical Pharmacology.
13. Modern Pharmacology with Clinical Applications, Craig Charles R. & Stitzel Robert E., Lippincott Publishers.
14. Clinical Pharmacokinetics & Pharmacodynamics : Concepts and Applications – Malcolm Rowland and Thomas N. Tozer, Wolters Kluwer, Lippincott Williams & Wilkins Publishers.
15. Applied biopharmaceutics and Pharmacokinetics, Pharmacodynamics and Drug metabolism for industrial scientists.
16. Modern Pharmacology, Craig CR. & Stitzel RE, Little Brown & Company.

**PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING  
METHODS - I  
(MPL 103T)**

**Scope**

This subject is designed to impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines, basic knowledge of various in-vitro and in-vivo preclinical evaluation processes

**Objectives**

Upon completion of the course the student shall be able to,

- Appraise the regulations and ethical requirement for the usage of experimental animals.
- Describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals
- Describe the various newer screening methods involved in the drug discovery process
- Appreciate and correlate the preclinical data to humans

**THEORY**

60 Hrs

**1. Laboratory Animals**

12

Common laboratory animals: Description, handling and applications of different species and strains of animals.

Hrs

Transgenic animals: Production, maintenance and applications Anaesthesia and euthanasia of experimental animals.

Maintenance and breeding of laboratory animals. CPCSEA guidelines to conduct experiments on animals

Good laboratory practice.

Bioassay-Principle, scope and limitations and methods

**2 Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models.**

12

Hrs

General principles of preclinical screening. CNS Pharmacology: behavioral and muscle coordination, CNS stimulants and

depressants, anxiolytics, anti-psychotics, anti epileptics andnootropics. Drugs for neurodegenerative diseases like Parkinsonism, Alzheimers and multiple sclerosis. Drugs acting on Autonomic Nervous System.

- 3 Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. 12 Hrs

Respiratory Pharmacology: anti-asthmatics, drugs for COPD and anti allergics. Reproductive Pharmacology: Aphrodisiacs and antifertility agents Analgesics, antiinflammatory and antipyretic agents. Gastrointestinal drugs: anti ulcer, anti - emetic, anti- diarrheal and laxatives.

- 4 Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. 12 Hrs

Cardiovascular Pharmacology: antihypertensives, antiarrhythmics, antianginal, antiatherosclerotic agents and diuretics. Drugs for metabolic disorders like anti-diabetic, antidyslipidemic agents. Anti cancer agents. Hepatoprotective screening methods.

- 5 Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. 12 Hrs

Immunomodulators, Immunosuppressants and immunostimulants

General principles of immunoassay: theoretical basis and optimization of immunoassay, heterogeneous and homogenous immunoassay systems. Immunoassay methods evaluation; protocol outline, objectives and preparation. Immunoassay for digoxin and insulin

Limitations of animal experimentation and alternate animal experiments.

Extrapolation of in vitro data to preclinical and preclinical to humans



## REFERENCES

1. Biological standardization by J.H. Burn D.J. Finney and I.G. Goodwin
2. Screening methods in Pharmacology by Robert Turner. A
3. Evaluation of drugs activities by Laurence and Bachrach
4. Methods in Pharmacology by Arnold Schwartz.
5. Fundamentals of experimental Pharmacology by M.N.Ghosh
6. Pharmacological experiment on intact preparations by Churchill Livingstone
7. Drug discovery and Evaluation by Vogel H.G.
8. Experimental Pharmacology by R.K.Goyal.
9. Preclinical evaluation of new drugs by S.K. Guta
10. Handbook of Experimental Pharmacology, SK.Kulkarni
11. Practical Pharmacology and Clinical Pharmacy, SK.Kulkarni, 3<sup>rd</sup> Edition.
12. David R.Gross. Animal Models in Cardiovascular Research, 2<sup>nd</sup> Edition, Kluwer Academic Publishers, London, UK.
13. Screening Methods in Pharmacology, Robert A.Turner.
14. Rodents for Pharmacological Experiments, Dr.Tapan Kumar chatterjee.
15. Practical Manual of Experimental and Clinical Pharmacology by BikashMedhi (Author), Ajay Prakash (Author)

## CELLULAR AND MOLECULAR PHARMACOLOGY (MPL 104T)

### Scope:

The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.

### Objectives:

Upon completion of the course, the student shall be able to,

- Explain the receptor signal transduction processes.
- Explain the molecular pathways affected by drugs.
- Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process.
- Demonstrate molecular biology techniques as applicable for pharmacology

THEORY	60 Hrs
1. Cell biology	12
Structure and functions of cell and its organelles	Hrs
Genome organization. Gene expression and its regulation, importance of siRNA and micro RNA, gene mapping and gene sequencing	
Cell cycles and its regulation.	
Cell death– events, regulators, intrinsic and extrinsic pathways of apoptosis.	
Necrosis and autophagy.	
2 Cell signaling	12
Intercellular and intracellular signaling pathways.	Hrs
Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors.	
Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-trisphosphate, (IP <sub>3</sub> ), NO, and diacylglycerol.	
Detailed study of following intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-activated protein kinase (MAPK) signaling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signaling pathway.	

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|---|---|-----------|
| 3 | <p><b>Principles and applications of genomic and proteomic tools</b><br/> DNA electrophoresis, PCR (reverse transcription and real time), Gene sequencing, micro array technique, SDS page, ELISA and western blotting,<br/> <b>Recombinant DNA technology and gene therapy</b><br/> Basic principles of recombinant DNA technology-Restriction enzymes, various types of vectors. Applications of recombinant DNA technology.<br/> Gene therapy- Various types of gene transfer techniques, clinical applications and recent advances in gene therapy.</p> | 12<br>Hrs |
| 4 | <p><b>Pharmacogenomics</b><br/> Gene mapping and cloning of disease gene.<br/> Genetic variation and its role in health/ pharmacology Polymorphisms affecting drug metabolism<br/> Genetic variation in drug transporters<br/> Genetic variation in G protein coupled receptors<br/> Applications of proteomics science: Genomics, proteomics, metabolomics, functionomics, nutrigenomics Immunotherapeutics<br/> Types of immunotherapeutics, humanisation antibody therapy,<br/> Immunotherapeutics in clinical practice</p>                              | 12<br>Hrs |
| 5 | <p>a. <b>Cell culture techniques</b><br/> Basic equipments used in cell culture lab. Cell culture media, various types of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of cells and their application.<br/> Principles and applications of cell viability assays, glucose uptake assay, Calcium influx assays<br/> Principles and applications of flow cytometry</p> <p>b. <b>Biosimilars</b></p>  | 12<br>Hrs |

**REFERENCES:**

1. The Cell, A Molecular Approach. Geoffrey M Cooper.
2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L. Wong
3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
5. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L. Miller
6. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
7. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
8. Current protocols in molecular biology vol I to VI edited by Frederick M. Ausubel et la.

**PHARMACOLOGICAL PRACTICAL - I**  
**(MPL 105P)**

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry

**Handling of laboratory animals.**

1. Various routes of drug administration.
2. Techniques of blood sampling, anesthesia and euthanasia of experimental animals.
3. Functional observation battery tests (modified Irwin test)
4. Evaluation of CNS stimulant, depressant, anxiogenics and anxiolytic, anticonvulsant activity.
5. Evaluation of analgesic, anti-inflammatory, local anesthetic, mydriatic and miotic activity.
6. Evaluation of diuretic activity.
7. Evaluation of antiulcer activity by pylorus ligation method.
8. Oral glucose tolerance test.
9. Isolation and identification of DNA from various sources (Bacteria, Cauliflower, onion, Goat liver).
10. Isolation of RNA from yeast
11. Estimation of proteins by Bradford/Lowry's in biological samples.
12. Estimation of RNA/DNA by UV Spectroscopy
13. Gene amplification by PCR.
14. Protein quantification Western Blotting.
15. Enzyme based in-vitro assays (MPO, AChEs,  $\alpha$  amylase,  $\alpha$  glucosidase).
16. Cell viability assays (MTT/Trypan blue/SRB).
17. DNA fragmentation assay by agarose gel electrophoresis.
18. DNA damage study by Comet assay.
19. Apoptosis determination by fluorescent imaging studies.
20. Pharmacokinetic studies and data analysis of drugs given by different routes of administration using softwares
21. Enzyme inhibition and induction activity
22. Extraction of drug from various biological samples and estimation of drug in biological fluids using different analytical techniques (UV)
23. Extraction of drug from various biological samples and estimation of drug in biological fluids using different analytical techniques (HPLC)

## REFERENCES

1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,
2. Fundamentals of experimental Pharmacology by M.N.Ghosh
3. Handbook of Experimental Pharmacology by S.K. Kulkarni.
4. Drug discovery and Evaluation by Vogel H.G.
5. Spectrometric Identification of Organic compounds - Robert M Silverstein,
6. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman,
7. Vogel's Text book of quantitative chemical analysis - Jeffery, Basset, Mendham, Denney,
8. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L.Mille
9. Basic Cell Culture (Practical Approach ) by J. M. Davis (Editor)
10. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
11. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi(Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd

## ADVANCED PHARMACOLOGY - II (MPL 201T)

### Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, the subject helps the student to understand the concepts of drug action and mechanism involved

### Objectives

Upon completion of the course the student shall be able to:

- Explain the mechanism of drug actions at cellular and molecular level
- Discuss the Pathophysiology and pharmacotherapy of certain diseases
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

THEORY	60 Hrs
<p><b>1. Endocrine Pharmacology</b> Molecular and cellular mechanism of action of hormones such as growth hormone, prolactin, thyroid, insulin and sex hormones Anti-thyroid drugs, Oral hypoglycemic agents, Oral contraceptives, Corticosteroids. Drugs affecting calcium regulation</p>	12 Hrs
<p><b>2 Chemotherapy</b> Cellular and molecular mechanism of actions and resistance of antimicrobial agents such as <math>\beta</math>-lactams, aminoglycosides, quinolones, Macrolide antibiotics. Antifungal, antiviral, and anti-TB drugs.</p>	12 Hrs
<p><b>3 Chemotherapy</b> Drugs used in Protozoal Infections Drugs used in the treatment of Helminthiasis <b>Chemotherapy of cancer Immunopharmacology</b> Cellular and biochemical mediators of inflammation and immuneresponse. Allergic or hypersensitivity reactions. Pharmacotherapy of asthma and COPD. Immunosuppressants and Immunostimulants</p>	12 Hrs

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|---|---|-----------|
| 4 | <b>GIT Pharmacology</b><br>Antiulcer drugs, Prokinetics, antiemetics, anti-diarrheals and drugs for constipation and irritable bowel syndrome.<br><b>Chronopharmacology</b><br>Biological and circadian rhythms, applications of chronotherapy in various diseases like cardiovascular disease, diabetes, asthma and peptic ulcer                         | 12<br>Hrs |
| 5 | <b>Free radicals Pharmacology</b><br>Generation of free radicals, role of free radicals in etiopathology of various diseases such as diabetes, neurodegenerative diseases and cancer. Protective activity of certain important antioxidant<br><b>Recent Advances in Treatment:</b><br>Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus | 12<br>Hrs |

#### REFERENCES

1. The Pharmacological basis of therapeutics- Goodman and Gilman's
2. Principles of Pharmacology. The Pathophysiologic basis of drug therapy by David E Golan et al.
3. Basic and Clinical Pharmacology by B.G -Katzung
4. Pharmacology by H.P. Rang and M.M. Dale.
5. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
6. Text book of Therapeutics, drug and disease management by E T. Herfindal and Gourley.
7. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C. Yu.
8. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists
9. Robbins & Cotran Pathologic Basis of Disease, 9<sup>th</sup> Ed. (Robbins Pathology)
10. A Complete Textbook of Medical Pharmacology by Dr. S.K. Srivastava published by APC Avichal Publishing Company.
11. K.D. Tripathi. Essentials of Medical Pharmacology
12. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers

**PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING  
METHODS-II  
(MPL 202T)**

**Scope:**

This subject imparts knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity. This knowledge will make the student competent in regulatory toxicological evaluation.

**Objectives:**

Upon completion of the course, the student shall be able to,

- Explain the various types of toxicity studies.
- Appreciate the importance of ethical and regulatory requirements for toxicity studies.
- Demonstrate the practical skills required to conduct the preclinical toxicity studies.

	THEORY	60 Hrs
1.	Basic definition and types of toxicology (general, mechanistic, regulatory and descriptive) Regulatory guidelines for conducting toxicity studies OECD, ICH, EPA and Schedule Y OECD principles of Good laboratory practice (GLP) History, concept and its importance in drug development	12 Hrs
2.	Acute, sub-acute and chronic- oral, dermal and inhalational studies as per OECD guidelines. Acute eye irritation, skin sensitization, dermal irritation & dermal toxicity studies. Test item characterization- importance and methods in regulatory toxicology studies	12 Hrs
3.	Reproductive toxicology studies, Male reproductive toxicity studies, female reproductive studies (segment I and segment III), teratogenicity studies (segment II) Genotoxicity studies (Ames Test, in vitro and in vivo Micronucleus and Chromosomal aberrations studies) In vivo carcinogenicity studies	12 Hrs
4.	IND enabling studies (IND studies)- Definition of IND, importance of IND, industry perspective, list of studies needed for IND submission.	12 Hrs



Safety pharmacology studies- origin, concepts and importance of safety pharmacology.

Tier1- CVS, CNS and respiratory safety pharmacology, HERG assay. Tier2- GI, renal and other studies

- 5 Toxicokinetics- Toxicokinetic evaluation in preclinical studies, saturation kinetics 12  
Importance and applications of toxicokinetic studies. Hrs  
Alternative methods to animal toxicity testing.

#### REFERENCES

1. Hand book on GLP, Quality practices for regulated non-clinical research and development (<http://www.who.int/tdr/publications/documents/glp-handbook.pdf>).
2. Schedule Y Guideline: drugs and cosmetics (second amendment) rules, 2005, ministry of health and family welfare (department of health) New Delhi
3. Drugs from discovery to approval by Rick NG.
4. Animal Models in Toxicology, 3<sup>rd</sup> Edition, Lower and Bryan
5. OECD test guidelines.
6. Principles of toxicology by Karen E. Stine, Thomas M. Brown.
7. Guidance for Industry M3(R2) Nonclinical Safety Studies for the Conduct of Human Clinical Trials and Marketing Authorization for Pharmaceuticals (<http://www.fda.gov/downloads/drugs/guidancecomplianceregulatoryinformation/guidances/ucm073246.pdf>)

## PRINCIPLES OF DRUG DISCOVERY (MPL 203T)

### Scope:

The subject imparts basic knowledge of drug discovery process. This information will make the student competent in drug discovery process

### Objectives:

Upon completion of the course, the student shall be able to,

- Explain the various stages of drug discovery.
- Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
- Explain various targets for drug discovery.
- Explain various lead seeking method and lead optimization
- Appreciate the importance of the role of computer aided drug design in drug discovery

THEORY	60 Hrs
1. An overview of modern drug discovery process: Target identification, target validation, lead identification and lead Optimization. Economics of drug discovery. Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.	12 Hrs
2 Lead Identification- combinatorial chemistry & high throughput screening, in silico lead discovery techniques, Assay development for hit identification. Protein structure Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modeling methods. Application of NMR and X-ray crystallography in protein structure prediction	12 Hrs
3 Rational Drug Design Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches	12 Hrs

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|---|--|-----------|
|   | Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,   |           |
| 4 | Molecular docking: Rigid docking, flexible docking, manualdocking; Docking based screening. De novo drug design. Quantitative analysis of Structure Activity Relationship<br>History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis and relationship between them.   | 12<br>Hrs |
| 5 | QSAR Statistical methods – regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA<br>Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design | 12<br>Hrs |

#### REFERENCES

1. MouldySioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targetsand Treatment Options. 2007Humana Press Inc.
2. Darryl León. Scott MarkellIn. Silico Technologies in Drug Target Identification and Validation. 2006 by Taylor and Francis Group, LLC.
3. Johanna K. DiStefano. Disease Gene Identification. Methods andProtocols. Springer New York Dordrecht Heidelberg London.
4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methodsand Principles in Medicinal Chemistry. Publisher Wiley-VCH
5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
6. Abby L . Parrill. M . Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series; American Chemical Society: Washington, DC, 1999.
7. J. Rick Turner. New drug development design, methodology and, analysis. John Wiley & Sons, Inc., New Jersey.

## CLINICAL RESEARCH AND PHARMACOVIGILANCE (MPL 204T)

### Scope:

This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of Pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in Pre-clinical, Clinical phases of Drug development and post market surveillance.

### Objectives:

Upon completion of the course, the student shall be able to,

- Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance

THEORY	60 Hrs
<p>1. <b>Regulatory Perspectives of Clinical Trials:</b>            Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines            Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant-Schedule Y, ICMR            Informed Consent Process: Structure and content of an Informed Consent Process            Ethical principles governing informed consent process</p>	12 Hrs
<p>2. <b>Clinical Trials: Types and Design</b>            Experimental Study- RCT and Non RCT,            Observation Study: Cohort, Case Control, Cross sectional            Clinical Trial Study Team            Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management</p>	12 Hrs

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|---|--|-----------|
| 3 | <p>Clinical Trial Documentation- Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring- Safety Monitoring in CT</p> <p>Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. Predictability and preventability assessment, Management of adverse drug reactions; Terminologies of ADR.</p>  | 12<br>Hrs |
| 4 | <p>Basic aspects, terminologies and establishment of pharmacovigilance</p> <p>History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, Establishing pharmacovigilance centres in Hospitals, Industry and National programmes related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance</p>   | 12<br>Hrs |
| 5 | <p>Methods, ADR reporting and tools used in Pharmacovigilance</p> <p>International classification of diseases, International Non-proprietary names for drugs, Passive and Active surveillance, Comparative observational studies, Targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety data.</p> | 12<br>Hrs |
| 6 | <p>Pharmacoepidemiology, pharmacoconomics, safety pharmacology</p>   | 12<br>Hrs |

#### REFERENCES

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health;2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.

3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

**PHARMACOLOGICAL PRACTICAL - II**  
**(MPL 205P)**

1. To record the DRC of agonist using suitable isolated tissues preparation.
2. To study the effects of antagonist/potentiating agents on DRC of agonist using suitable isolated tissue preparation.
3. To determine the strength of unknown sample by matching bioassay by using suitable tissue preparation.
4. To determine the strength of unknown sample by interpolation bioassay by using suitable tissue preparation.
5. To determine the strength of unknown sample by bracketing bioassay by using suitable tissue preparation.
6. To determine the strength of unknown sample by multiple point bioassay by using suitable tissue preparation.
7. Estimation of  $PA_2$  values of various antagonists using suitable isolated tissue preparations.
8. To study the effects of various drugs on isolated heart preparations.
9. Recording of rat BP, heart rate and ECG.
10. Recording of rat ECG
11. Drug absorption studies by averted rat ileum preparation.
12. Acute oral toxicity studies as per OECD guidelines.
13. Acute dermal toxicity studies as per OECD guidelines.
14. Repeated dose toxicity studies- Serum biochemical, haematological, urine analysis, functional observation tests and histological studies.
15. Drug mutagenicity study using mice bone-marrow chromosomal aberration test.
16. Protocol design for clinical trial. (3 Nos.)
17. Design of ADR monitoring protocol.
18. In-silico docking studies. (2 Nos.)
19. In-silico pharmacophore based screening.
20. In-silico QSAR studies.
21. ADR reporting

**REFERENCES**

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakami
3. Text book of in-vitro practical Pharmacology by Ian Kitchen
4. Bioassay Techniques for Drug Development by Atta-ur-Rahman, Iqbalchoudhary and William Thomsen
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists.

Semester III  
MRM 301T - Research Methodology & Biostatistics

UNIT – I

General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.

UNIT – II

Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests (students “t” test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxon rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.

UNIT – III

Medical Research: History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.

UNIT – IV

CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.

UNIT – V

Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care







# Shobhit University, Gangoh

(Established by UP Shobhit University Act No. 3, 2012)

## School Of Pharmacy

### Ordinances, Regulations & Syllabus

For

**Bachelor of Pharmacy (B.Pharm) 4 Year Programme Semester  
Pattern  
(w.e.f.session2013-14)**

**Approved by Pharmacy Council of India and  
adopted in the year 2013, 1<sup>st</sup> Meeting, Board of  
Studies.**

[Frame under Regulation 6,7 & 8 of the Bachelor of Pharmacy (B. Pharm)]

## **CHAPTER- I: REGULATIONS**

### **1. Short Title and Commencement**

These regulations shall be called as “The Revised Regulations for the B. Pharm. Degree Program (CBCS)of the Pharmacy Council of India, New Delhi”. They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by Pharmacy Council of India.

### **2. Minimum qualification for admission**

#### **First year B. Pharm:**

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

#### **2.2. B. Pharm lateral entry (to third semester):**

A pass in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

### **3. Duration of the program**

The course of study for B.Pharm shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

### **4. Medium of instruction and examinations**

Medium of instruction and examination shall be in English.

### **5. Working days in each semester**

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year.

### **6. Attendance and progress**

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

## **7. Program/Course credit structure**

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

### **Credit assignment**

#### **Theory and Laboratory courses**

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and /or tutorial (T) hours, and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and tutorial hours, and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

#### **Minimum credit requirements**

The minimum credit points required for award of a B. Pharm. degree is 208. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Project over the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

The lateral entry students shall get 52 credit points transferred from their D. Pharm program. Such students shall take up additional remedial courses of 'Communication Skills' (Theory and Practical) and 'Computer Applications in Pharmacy' (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

## **8. Academic work**

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

### 9. Course of study

The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to VIII. The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table – I to VIII.

**Table-I: Course of study for semester I**

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I–Theory	3	1	4
BP102T	Pharmaceutical Analysis I–Theory	3	1	4
BP103T	Pharmaceutics I–Theory	3	1	4
BP104T	Pharmaceutical Inorganic Chemistry–Theory	3	1	4
BP105T/ BP105TA/ BP105TB/ BP105TC	Communication skills–Theory*/English Grammar and Creative Writing/Speaking and Presentation Skills/ Life Management and Soft Skills	2	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics–Theory*	2	-	2
BP107P	Human Anatomy and Physiology–Practical	4	-	2
BP108P	Pharmaceutical Analysis I–Practical	4	-	2
BP109P	Pharmaceutics I–Practical	4	-	2
BP110P	Pharmaceutical Inorganic Chemistry–Practical	4	-	2
BP111P/ BP111PA/ BP111PB/ BP111PC	Communication skills–Practical*/ English Grammar and Creative Writing/Speaking and Presentation Skills/ Life Management and Soft Skills	2	-	1
BP112RBP	Remedial Biology–Practical*	2	-	1
<b>Total</b>		<b>32/34<sup>\$</sup>/36<sup>#</sup></b>	<b>4</b>	<b>27/29<sup>\$</sup>/30<sup>#</sup></b>

<sup>#</sup>Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

<sup>\$</sup>Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

\* Non University Examination (NUE)

**Table-II: Course of study for semester II**

<b>Course Code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP201T	Human Anatomy and Physiology II – Theory	3	1	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	3	1	4
BP203T	Biochemistry – Theory	3	1	4
BP204T	Pathophysiology – Theory	3	1	4
BP205T	Computer Applications in Pharmacy – Theory *	3	-	3
BP206T	Environmental sciences – Theory *	3	-	3
BP207P	Human Anatomy and Physiology II –Practical	4	-	2
BP208P	Pharmaceutical Organic Chemistry I– Practical	4	-	2
BP209P	Biochemistry – Practical	4	-	2
BP210P	Computer Applications in Pharmacy – Practical*	2	-	1
<b>Total</b>		<b>32</b>	<b>4</b>	<b>29</b>

\*Non University Examination (NUE)

**Table-III: Course of study for semester III**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP301T	Pharmaceutical Organic Chemistry II – Theory	3	1	4
BP302T	Physical Pharmaceutics I – Theory	3	1	4
BP303T	Pharmaceutical Microbiology – Theory	3	1	4
BP304T	Pharmaceutical Engineering – Theory	3	1	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	-	2
BP306P	Physical Pharmaceutics I – Practical	4	-	2
BP307P	Pharmaceutical Microbiology – Practical	4	-	2
BP 308P	Pharmaceutical Engineering –Practical	4	-	2
<b>Total</b>		<b>28</b>	<b>4</b>	<b>24</b>

**Table-IV: Course of study for semester IV**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP401T	Pharmaceutical Organic Chemistry III– Theory	3	1	4
BP402T	Medicinal Chemistry I – Theory	3	1	4
BP403T	Physical Pharmaceutics II – Theory	3	1	4
BP404T	Pharmacology I – Theory	3	1	4
BP405T	Pharmacognosy and Phytochemistry I– Theory	3	1	4
BP406P	Medicinal Chemistry I – Practical	4	-	2
BP407P	Physical Pharmaceutics II – Practical	4		2
BP408P	Pharmacology I – Practical	4	-	2
BP409P	Pharmacognosy and Phytochemistry I – Practical	4	-	2
<b>Total</b>		<b>31</b>	<b>5</b>	<b>28</b>

**Table-V: Course of study for semester V**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP501T	Medicinal Chemistry II – Theory	3	1	4
BP502T	Industrial PharmacyI– Theory	3	1	4
BP503T	Pharmacology II – Theory	3	1	4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3	1	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	1	4
BP506P	Industrial PharmacyI – Practical	4	-	2
BP507P	Pharmacology II – Practical	4	-	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	-	2
<b>Total</b>		<b>27</b>	<b>5</b>	<b>26</b>

**Table-VI: Course of study for semester VI**

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP601T	Medicinal Chemistry III – Theory	3	1	4
BP602T	Pharmacology III – Theory	3	1	4
BP603T	Herbal Drug Technology – Theory	3	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4
BP605T	Pharmaceutical Biotechnology – Theory	3	1	4
BP606T	Quality Assurance –Theory	3	1	4
BP607P	Medicinal chemistry III – Practical	4	-	2
BP608P	Pharmacology III – Practical	4	-	2
BP609P	Herbal Drug Technology – Practical	4	-	2
<b>Total</b>		<b>30</b>	<b>6</b>	<b>30</b>

**Table-VII: Course of study for semester VII**

Course code	Name of the course	No. of hours	Tutorial	Credit Points
BP701T	Instrumental Methods of Analysis–Theory	3	1	4
BP702T	Industrial Pharmacy II–Theory	3	1	4
BP703T	Pharmacy Practice–Theory	3	1	4
BP704T	Novel Drug Delivery System –Theory	3	1	4
BP705P	Instrumental Methods of Analysis–Practical	4	-	2
BP706PS/ BP706PSA/ BP706PSB/ BP706PSC	Practice School*/Skill Enhancement Course Practical (Qualifying course) Data Analysis / Computer Programming / Python Programming.	12	-	6
<b>Total</b>		<b>28</b>	<b>5</b>	<b>24</b>

\* Non University Examination (NUE)



**Table-VIII: Course of study for semester VIII**

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3	1	4
BP802T	Social and Preventive Pharmacy	3	1	4
BP803ET	Pharma Marketing Management	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardization of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Advanced Instrumentation Techniques			
BP812ET	Dietary Supplements and Nutraceuticals			
BP813PW	Project Work	12	-	6
<b>Total</b>		<b>24</b>	<b>4</b>	<b>22</b>

**Table-IX: Semester wise credits distribution**

Semester	Credit Points
I	27/29 <sup>§</sup> /30 <sup>#</sup>
II	29
III	26
IV	28
V	26
VI	26
VII	24
VIII	22
Extracurricular/ Co curricular activities	01*
<b>Total credit points for the program</b>	<b>209/211<sup>§</sup>/212<sup>#</sup></b>

\* The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

<sup>§</sup>Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics course.

<sup>#</sup>Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology course.

## **10. Program Committee**

1. The B. Pharm. program shall have a Program Committee constituted by the Head of the institution in consultation with all the Heads of the departments.
2. The composition of the Program Committee shall be as follows:

A senior teacher shall be the Chairperson; One Teacher from each department handling B.Pharm courses; and four student representatives of the program (one from each academic year), nominated by the Head of the institution.

3. Duties of the Program Committee:
  - i. Periodically reviewing the progress of the classes.
  - ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
  - iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
  - iv. Communicating its recommendation to the Head of the institution on academic matters.
  - v. The Program Committee shall meet at least thrice in a semester preferably at the end of each Sessionalexam (Internal Assessment) and before the end semester exam.

## **11. Examinations/Assessments**

The scheme for internal assessment and end semester examinations is given in Table – X.

### **End semester examinations**

The End Semester Examinations for each theory and practical course through semesters I to VIII shall be conducted by the university except for the subjects with asterix symbol (\*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

**Tables-X: Schemes for internal assessments and end semester examinations semester wise**

**Semester I**

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP101T	Human Anatomy and Physiology I- Theory	10	15	1 Hr	25	75	3 Hrs	100
BP102T	Pharmaceutical Analysis I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP103T	Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP105T	Communication skills – Theory *	5	10	1 Hr	15	35	1.5 Hrs	50
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory*	5	10	1 Hr	15	35	1.5 Hrs	50
BP107P	Human Anatomy and Physiology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP108P	Pharmaceutical Analysis I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP109P	Pharmaceutics I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP110P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP111P	Communication skills – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
BP112RBP	Remedial Biology – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
<b>Total</b>		<b>70/75<sup>§</sup>/80<sup>#</sup></b>	<b>115/125<sup>§</sup>/130<sup>#</sup></b>	<b>23/24<sup>§</sup>/26<sup>#</sup> Hrs</b>	<b>185/200<sup>§</sup>/210<sup>#</sup></b>	<b>490/525<sup>§</sup>/ 540<sup>#</sup></b>	<b>31.5/33<sup>§</sup>/ 35<sup>#</sup> Hrs</b>	<b>675/725<sup>§</sup>/ 750<sup>#</sup></b>

<sup>#</sup>Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

<sup>§</sup>Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

\* Non University Examination (NUE)

## Semester II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP201T	Human Anatomy and Physiology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP202T	Pharmaceutical Organic Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP203T	Biochemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP204T	Pathophysiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP205T	Computer Applications in Pharmacy – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP206T	Environmental sciences – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP207P	Human Anatomy and Physiology II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP208P	Pharmaceutical Organic Chemistry I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP209P	Biochemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP210P	Computer Applications in Pharmacy – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
<b>Total</b>		<b>80</b>	<b>125</b>	<b>20 Hrs</b>	<b>205</b>	<b>520</b>	<b>30 Hrs</b>	<b>725</b>

\* The subject experts at college level shall conduct examinations

### Semester III

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP302T	Physical Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr	15	35	4 Hrs	50
<b>Total</b>		<b>60</b>	<b>100</b>	<b>20</b>	<b>160</b>	<b>440</b>	<b>28Hrs</b>	<b>600</b>

### Semester IV

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP404T	Pharmacology I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP405T	Pharmacognosy I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP406P	Medicinal Chemistry I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP407P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP408P	Pharmacology I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP409P	Pharmacognosy I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
<b>Total</b>		<b>70</b>	<b>115</b>	<b>21 Hrs</b>	<b>185</b>	<b>515</b>	<b>31 Hrs</b>	<b>700</b>

### Semester V

Course code	Name of the course	Internal Assessment			End Semester Exams		Total Marks	
		Continuous Mode	Sessional Exams		Total	Marks		Duration
			Marks	Duration				
BP501T	Medicinal Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP502T	Industrial PharmacyI– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP503T	Pharmacology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP504T	Pharmacognosy II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP505T	Pharmaceutical Jurisprudence – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP506P	Industrial PharmacyI– Practical	5	10	4 Hr	15	35	4 Hrs	50
BP507P	Pharmacology II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP508P	Pharmacognosy II – Practical	5	10	4 Hr	15	35	4 Hrs	50
<b>Total</b>		<b>65</b>	<b>105</b>	<b>17 Hr</b>	<b>170</b>	<b>480</b>	<b>27 Hrs</b>	<b>650</b>

### Semester VI

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP601T	Medicinal Chemistry III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP602T	Pharmacology III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP603T	Herbal Drug Technology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP605T	Pharmaceutical Biotechnology– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP606T	Quality Assurance– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP607P	Medicinal chemistry III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP608P	Pharmacology III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP609P	Herbal Drug Technology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
<b>Total</b>		<b>75</b>	<b>120</b>	<b>18 Hrs</b>	<b>195</b>	<b>555</b>	<b>30 Hrs</b>	<b>750</b>



## Semester VII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP701T	Instrumental Methods of Analysis – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP702T	Industrial Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP703T	Pharmacy Practice – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP704T	Novel Drug Delivery System – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP705 P	Instrumental Methods of Analysis – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP706 PS	Practice School*	25	-	-	25	125	5 Hrs	150
<b>Total</b>		<b>70</b>	<b>70</b>	<b>8Hrs</b>	<b>140</b>	<b>460</b>	<b>21 Hrs</b>	<b>600</b>

\* The subject experts at college level shall conduct examinations

### Semester VIII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP801T	Biostatistics and Research Methodology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP802T	Social and Preventive Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP803ET	Pharmaceutical Marketing – Theory	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 = 200
BP804ET	Pharmaceutical Regulatory Science – Theory							
BP805ET	Pharmacovigilance – Theory							
BP806ET	Quality Control and Standardization of Herbals – Theory							
BP807ET	Computer Aided Drug Design – Theory							
BP808ET	Cell and Molecular Biology – Theory							
BP809ET	Cosmetic Science – Theory							
BP810ET	Experimental Pharmacology – Theory							
BP811ET	Advanced Instrumentation Techniques – Theory							
BP812PW	Project Work	-	-	-	-	150	4 Hrs	150

<b>Total</b>	<b>40</b>	<b>60</b>	<b>4 Hrs</b>	<b>100</b>	<b>450</b>	<b>16 Hrs</b>	<b>550</b>
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**Internal assessment: Continuous mode**

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

**Table-XI: Scheme for awarding internal assessment: Continuous mode**

<b>Theory</b>		
<b>Criteria</b>	<b>Maximum Marks</b>	
Attendance (Refer Table – XII)	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5
<b>Total</b>	<b>10</b>	<b>5</b>
<b>Practical</b>		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
<b>Total</b>	<b>5</b>	

**Table- XII: Guidelines for the allotment of marks for attendance**

<b>Percentage of Attendance</b>	<b>Theory</b>	<b>Practical</b>
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

**11.2.1. Sessional Exams**

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in tables – X.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

**Question paper pattern for theory Sessional examinations****For subjects having University examination**

I. Multiple Choice Questions (MCQs) = 10 x 1 = 10

OR

Objective Type Questions (5 x 2) = 05 x 2 = 10

(Answer all the questions)

I. Long Answers (Answer 1 out of 2) = 1 x 10 = 10

II. Short Answers (Answer 2 out of 3) = 2 x 5 = 10

Total = -----  
30 marks

**For subjects having Non University Examination**

I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 4 out of 6)	=	4 x 5 = 20
		-----
Total	=	30 marks
		-----

**Question paper pattern for practical sessional examinations**

I. Synopsis	=	10
II. Experiments	=	25
III. Viva voce	=	05
		-----
Total	=	40 marks
		-----

**12. Promotion and award of grades**

A student shall be declared PASS and eligible for getting grade in a course of B.Pharm. program if he/she secures at least 50% marks in that particular course including internal assessment. For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

**13. Carry forward of marks**

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

**14. Improvement of internal assessment**

A student shall have the opportunity to improve his/her performance only once in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

**15. Re-examination of end semester examinations**

Reexamination of end semester examination shall be conducted as per the schedule given in table XIII. The exact dates of examinations shall be notified from time to time.

**Table-XIII: Tentative schedule of end semester examinations**

Semester	For Regular Candidates	For Failed Candidates
I, III, V and VII	November / December	May / June
II, IV, VI and VIII	May / June	November / December

**Question paper pattern for end semester theory examinations**

**For 75 marks paper**

I. Multiple Choice Questions(MCQs)	=	20 x 1	=	20
OR				OR
Objective Type Questions (10 x 2)	=	10 x 2	=	20
(Answer all the questions)				
II. Long Answers (Answer 2 out of 3)	=	2 x 10	=	20
III. Short Answers (Answer 7 out of 9)	=	7 x 5	=	35

Total = 75 marks

**For 50 marks paper**

I. Long Answers (Answer 2 out of 3)	=	2 x 10	=	20
II. Short Answers (Answer 6 out of 8)	=	6 x 5	=	30

Total = 50 marks

**For 35 marks paper**

I. Long Answers (Answer 1 out of 2)	=	1 x 10	=	10
II. Short Answers (Answer 5 out of 7)	=	5 x 5	=	25

Total = 35 marks

**Question paper pattern for end semester practical examinations**

I. Synopsis	=	5
II. Experiments	=	25
III. Viva voce	=	5

Total = 35 marks

**16. Academic Progression:**

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. Academic progression rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I, II and III semesters till the IV semester examinations. However, he/she shall not be eligible to attend the courses of V semester until all the courses of I and II semesters are successfully completed.

A student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of I, II, III and IV semesters are successfully completed.

A student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of I, II, III, IV, V and VI semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified in 26.

A lateral entry student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of III and IV semesters are successfully completed.

A lateral entry student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of III, IV, V and VI semesters are successfully completed.

A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified in 26.

Any student who has given more than 4 chances for successful completion of I / III semester courses and more than 3 chances for successful completion of II / IV semester courses shall be permitted to attend V / VII semester classes ONLY during the subsequent academic year as the case may be. In simpler terms there shall NOT be any ODD BATCH for any semester.

Note: Grade AB should be considered as failed and treated as one head for deciding academic progression. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

### 17. Grading of performances

#### Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – XII.

**Table – XII: Letter grades and grade points equivalent to Percentage of marks and performances**

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the saidevaluation/examination in due course.

### 18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called ‘Semester Grade Point Average’ (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses(Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student’s grade points in these courses are G1, G2, G3, G4 and G5, respectively, and then students’ SGPA is equal to:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4* \text{ZERO} + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

**19. Cumulative Grade Point Average (CGPA)**

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6 + C_7S_7 + C_8S_8}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8}$$

where C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>,... is the total number of credits for semester I,II,III,... and S<sub>1</sub>,S<sub>2</sub>, S<sub>3</sub>,...is the SGPA of semester I,II,III,....

**20. Declaration of class**

The class shall be awarded on the basis of CGPA as follows:

- First Class with Distinction = CGPA of 7.50 and above
- First Class = CGPA of 6.00 to 7.49
- Second Class = CGPA of 5.00 to 5.99

**21. Project work**

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below.



***Evaluation of Dissertation Book:***

Objective(s) of the work done	15 Marks
Methodology adopted	20 Marks
Results and Discussions	20 Marks
Conclusions and Outcomes	20 Marks

**Total** 75 Marks

***Evaluation of Presentation:***

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks

**Total** 75 Marks

*Explanation:* The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.

**22. Industrial training (Desirable)**

Every candidate shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc. After the Semester – VI and before the commencement of Semester – VII, and shall submit satisfactory report of such work and certificate duly signed by the authority of training organization to the head of the institute.

**23. Practice School**

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college level and grade point shall be awarded.

**24. Award of Ranks**

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the B.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the B. Pharm program in minimum prescribed number of years, (four years) for the award of Ranks.

**25. Award of degree**

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

**26. Duration for completion of the program of study**

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

**27. Re-admission after break of study**

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

No condonation is allowed for the candidate who has more than 2 years of break up period and he/she has to rejoin the program by paying the required fees.

## **Programme Educational Objectives (PEOs)**

**PEO1 Applying principles and technologies:** Graduates should be able to apply principles and technologies to develop, formulate, and manufacture drugs and pharmaceuticals.

**PEO2 Serving society:** Graduates should be able to use medications and devices appropriately to achieve optimal therapeutic outcomes.

**PEO3 Promoting leadership and ethics:** Graduates should be able to demonstrate leadership and entrepreneurship qualities, as well as professional ethics and human values.

**PEO4 Lifelong learning :** Graduates should be able to absorb new technologies and continue learning throughout their lives.

**PEO5 Communicating effectively:** Graduates should be able to communicate well with other healthcare professionals.

**PEO6 Meeting industry needs:** Graduates should be able to meet the needs of the pharmaceutical industry and provide clinical services to the community.

**PEO7 Academic excellence:** Graduates should have knowledge of fundamental principles and their applications in pharmaceutical sciences and technology.

**PEO8 Technical competence:** Graduates should have strong fundamental concepts and high technical competence in pharmaceutical sciences.

**PEO9 Professional Competence:** Graduates will demonstrate the knowledge and skills necessary to practice pharmacy effectively in various healthcare settings, ensuring safe and effective medication use.

**PEO10 Patient-Centered Care:** Graduates will provide high-quality, patient-centered care, including medication management, counseling, and health promotion, to improve patient outcomes.

**PEO11 Inter-professional Collaboration:** Graduates will work collaboratively within interdisciplinary healthcare teams to optimize patient care and contribute to public health initiatives.

### **Programme Specific Objectives (PSO's)**

**PSO1 Pharmaceutical Care Skills:** Students will demonstrate the ability to assess patient medication needs, develop individualized care plans, and implement appropriate therapeutic interventions.

**PSO2 Drug Development and Management:** Students will gain knowledge in drug formulation, development processes, and the management of pharmaceutical products throughout their lifecycle.

**PSO3 Clinical Knowledge Application:** Students will apply pharmacological principles and clinical knowledge to evaluate and optimize drug therapy in diverse patient populations.

**PSO4 Regulatory and Compliance Understanding:** Students will understand the regulatory frameworks governing pharmacy practice, including drug approval processes, safety, and quality assurance.

**PSO5 Communication Proficiency:** Students will develop effective communication skills to counsel patients, collaborate with healthcare professionals, and convey complex information clearly.

**PSO6 Health Promotion and Disease Prevention:** Students will engage in public health initiatives, providing education on disease prevention and health promotion strategies.

**PSO7 Research and Evidence-Based Practice:** Students will engage in research activities and apply evidence-based practices to inform clinical decisions and improve patient outcomes.

**PSO8 Ethical Decision-Making:** Students will learn to navigate ethical dilemmas in pharmacy practice, demonstrating professional judgment and integrity.

### **Programme Outcome Objectives (POO's)**

**POO1 Clinical Competence:** Graduates will be able to conduct comprehensive medication reviews, assess patient health needs, and design effective therapeutic regimens.

**POO2 Pharmaceutical Knowledge:** Graduates will possess a thorough understanding of pharmacology, pharmacotherapy, drug interactions, and the mechanisms of drug action.

**POO3 Ethical Practice:** Graduates will demonstrate professionalism and ethical behavior in all aspects of pharmacy practice, including patient interactions and professional relationships.

**POO4 Communication Skills:** Graduates will effectively communicate with patients, caregivers, and healthcare team members, ensuring clarity and understanding of medication information.

**POO5 Critical Thinking and Problem Solving:** Graduates will apply critical thinking skills to analyze patient data, identify medication-related problems, and develop appropriate solutions.

**POO6 Research and Evidence-Based Practice:** Graduates will be able to conduct research, critically evaluate scientific literature, and apply evidence-based guidelines in clinical practice.

**PO07 Interprofessional Collaboration:** Graduates will work effectively within interdisciplinary teams to enhance patient care and contribute to overall healthcare delivery.

**PO08 Lifelong Learning:** Graduates will demonstrate a commitment to continuous professional development and lifelong learning in the rapidly evolving field of pharmacy.

**PO09 Public Health Awareness:** Graduates will engage in community health initiatives, promoting wellness and preventive care through education and outreach.

## **CHAPTER - II: SYLLABUS**

## **Semester I**

## **BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)**

**45 Hours**

**Scope:** This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

**Objectives:** Upon completion of this course the student should be able to

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

### **Course Content:**

#### **Unit I**

**10 hours**

- **Introduction to human body**

Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

- **Cellular level of organization**

Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

- **Tissue level of organization**

Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

#### **Unit II**

**10 hours**

- **Integumentary system**

Structure and functions of skin

- **Skeletal system**

Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system

Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction



- **Joints**

Structural and functional classification, types of joints movements and its articulation

**Unit III**

**10 hours**

- **Body fluids and blood**

- Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.

- **Lymphatic system**

Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

**Unit IV**

**08 hours**

**Peripheral nervous system:**

Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system.

Origin and functions of spinal and cranial nerves.

- **Special senses**

Structure and functions of eye, ear, nose and tongue and their disorders.

**Unit V**

**07 hours**

- **Cardiovascular system**

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

## **BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)**

**4 Hours/week**

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

### **Recommended Books (Latest Editions)**

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & WilkinsCo, Riverview,MI USA
4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.

6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

**Reference Books (Latest Editions)**

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

## BP102T. PHARMACEUTICAL ANALYSIS (Theory)

45 Hours

**Scope:** This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

**Objectives:** Upon completion of the course student shall be able to

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- develop analytical skills

### Course Content:

#### UNIT-I

10 Hours

(a) **Pharmaceutical analysis**- Definition and scope

- i) Different techniques of analysis
- ii) Methods of expressing concentration
- iii) Primary and secondary standards.
- iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

(b) **Errors:** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

(c) Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

#### UNIT-II

10 Hours

- **Acid base titration:** Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves
- **Non aqueous titration:** Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

#### UNIT-III

10 Hours

- **Precipitation titrations:** Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.
- **Complexometric titration:** Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.
- **Gravimetry:** Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.
- Basic Principles ,methods and application of diazotisation titration.

## **UNIT-IV**

**08 Hours**

### **Redox titrations**

(a) Concepts of oxidation and reduction

(b) Types of redox titrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

## **UNIT-V**

**07 Hours**

### **• Electrochemical methods of analysis**

- **Conductometry**- Introduction, Conductivity cell, Conductometric titrations, applications.
- **Potentiometry** - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.
- **Polarography** - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

## **BP108P. PHARMACEUTICAL ANALYSIS (Practical)**

**4 Hours / Week**

### **I Limit Test of the following**

- (1) Chloride
- (2) Sulphate
- (3) Iron
- (4) Arsenic

### **II Preparation and standardization of**

- (1) Sodium hydroxide
- (2) Sulphuric acid
- (3) Sodium thiosulfate
- (4) Potassium permanganate
- (5) Ceric ammonium sulphate

### **III Assay of the following compounds along with Standardization of Titrant**

- (1) Ammonium chloride by acid base titration
- (2) Ferrous sulphate by Cerimetry
- (3) Copper sulphate by Iodometry
- (4) Calcium gluconate by complexometry
- (5) Hydrogen peroxide by Permanganometry
- (6) Sodium benzoate by non-aqueous titration
- (7) Sodium Chloride by precipitation titration

### **IV Determination of Normality by electro-analytical methods**

- (1) Conductometric titration of strong acid against strong base
- (2) Conductometric titration of strong acid and weak acid against strong base
- (3) Potentiometric titration of strong acid against strong base

### **Recommended Books: (Latest Editions)**

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

## BP103T. PHARMACEUTICS- I (Theory)

45 Hours

**Scope:** This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

**Objectives:** Upon completion of this course the student should be able to:

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

### Course Content:

#### UNIT – I

10 Hours

- **Historical background and development of profession of pharmacy:** History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.
- **Dosage forms:** Introduction to dosage forms, classification and definitions
- **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.
- **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

#### UNIT – II

10 Hours

- **Pharmaceutical calculations:** Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.
- **Powders:** Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.
- **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

### UNIT – III

**08 Hours**

- **Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.
- **Biphasic liquids:**
- **Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.
- **Emulsions:** Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

### UNIT – IV

**08 Hours**

- **Suppositories:** Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.
- **Pharmaceutical incompatibilities:** Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

### UNIT – V

**07 Hours**

- **Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosage forms



**1. Syrups**

- a) Syrup IP'66
- b) Compound syrup of Ferrous Phosphate BPC'68

**2. Elixirs**

- a) Piperazine citrate elixir
- b) Paracetamol pediatric elixir

**3. Linctus**

- a) Terpin Hydrate Linctus IP'66
- b) Iodine Throat Paint (Mandles Paint)

**4. Solutions**

- a) Strong solution of ammonium acetate
- b) Cresol with soap solution
- c) Lugol's solution

**5. Suspensions**

- a) Calamine lotion
- b) Magnesium Hydroxide mixture
- c) Aluminium Hydroxide gel

**6. Emulsions**

- a) Turpentine Liniment
- b) Liquid paraffin emulsion

**7. Powders and Granules**

- a) ORS powder (WHO)
- b) Effervescent granules
- c) Dusting powder
- d) Divided powders

**8. Suppositories**

- a) Glycero gelatin suppository
- b) Cocoa butter suppository
- c) Zinc Oxide suppository

**8. Semisolids**

- a) Sulphur ointment
- b) Non staining-iodine ointment with methyl salicylate
- c) Carbopal gel

**9. Gargles and Mouthwashes**

- a) Iodine gargle
- b) Chlorhexidine mouthwash

**Recommended Books: (Latest Editions)**

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

## BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

45 Hours

**Scope:** This subject deals with the monographs of inorganic drugs and pharmaceuticals.

**Objectives:** Upon completion of course student shall be able to

- know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- understand the medicinal and pharmaceutical importance of inorganic compounds

### Course Content:

#### UNIT I

10 Hours

- **Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate

**General methods of preparation,** assay for the compounds superscripted with **asterisk (\*)**, properties and medicinal uses of inorganic compounds belonging to the following classes

#### UNIT II

10 Hours

- **Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.
- **Major extra and intracellular electrolytes:** Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride\*, Potassium chloride, Calcium gluconate\* and Oral Rehydration Salt (ORS), Physiological acid base balance.
- **Dental products:** Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

#### UNIT III

10 Hours

- **Gastrointestinal agents**

**Acidifiers:** Ammonium chloride\* and Dil. HCl

**Antacid:** Ideal properties of antacids, combinations of antacids, Sodium

Bicarbonate\*, Aluminum hydroxide gel, Magnesium hydroxide mixture

**Cathartics:** Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

**Antimicrobials:** Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide\*, Chlorinated lime\*, Iodine and its preparations

#### UNIT IV

**08 Hours**

- **Miscellaneous compounds**

**Expectorants:** Potassium iodide, Ammonium chloride\*.

**Emetics:** Copper sulphate\*, Sodium potassium tartarate

**Haematinics:** Ferrous sulphate\*, Ferrous gluconate

**Poison and Antidote:** Sodium thiosulphate\*, Activated charcoal, Sodium nitrite<sup>333</sup>

**Astringents:** Zinc Sulphate, Potash Alum

#### UNIT V

**07 Hours**

- **Radiopharmaceuticals:** Radio activity, Measurement of radioactivity, Properties of  $\alpha$ ,  $\beta$ ,  $\gamma$  radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide  $I^{131}$ , Storage conditions, precautions & pharmaceutical application of radioactive substances.

## BP110P. PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)

4 Hours / Week

- I **Limit tests for following ions**
  - Limit test for Chlorides and Sulphates
  - Modified limit test for Chlorides and Sulphates
  - Limit test for Iron
  - Limit test for Heavy metals
  - Limit test for Lead
  - Limit test for Arsenic
- II **Identification test**
  - Magnesium hydroxide
  - Ferrous sulphate
  - Sodium bicarbonate
  - Calcium gluconate
  - Copper sulphate
- III **Test for purity**
  - Swelling power of Bentonite
  - Neutralizing capacity of aluminum hydroxide gel
  - Determination of potassium iodate and iodine in potassium Iodide
- IV **Preparation of inorganic pharmaceuticals**
  - Boric acid
  - Potash alum
  - Ferrous sulphate

### Recommended Books (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4<sup>th</sup> edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3<sup>rd</sup> Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia

## **BP105T.COMMUNICATION SKILLS (Theory)**

**30 Hours**

**Scope:** This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

### **Objectives:**

Upon completion of the course the student shall be able to

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

### **Course content:**

#### **UNIT – I**

**07 Hours**

- **Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context
- **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers
- **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

#### **UNIT – II**

**07 Hours**

- **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication
- **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

### UNIT – III

07 Hours

- **Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations
- **Effective Written Communication:** Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication
- **Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

### UNIT – IV

05 Hours

- **Interview Skills:** Purpose of an interview, Do's and Don't's of an interview
- **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

### UNIT – V

04 Hours

- **Group Discussion:** Introduction, Communication skills in group discussion, Do's and Don't's of group discussion

## English Grammar and Creative Writing (BP105T-A)

### CO: COURSE OBJECTIVES

**CO-1 Understanding of Grammar:** Students will demonstrate a solid understanding of English grammar rules and conventions, including sentence structure, punctuation, and usage.

**CO-2 Application of Grammar in Writing:** Students will effectively apply grammatical concepts to enhance clarity and coherence in their writing, ensuring their work is polished and professional.

**CO-3 Creative Expression:** Students will develop their unique voice and style in creative writing, experimenting with different genres and forms, such as poetry, short stories, and narrative essays.

**CO-4 Revision and Editing Skills:** Students will engage in the revision process, applying constructive feedback to improve their writing and develop skills in self-editing.

**CO-5 Critical Reading Skills:** Students will analyze various texts, recognizing the use of grammar, style, and narrative techniques, and articulating their effects on meaning and reader engagement.

**CO-6: Presentation Skills:** Students will present their creative work to peers, articulating their writing choices and engaging with audience feedback.

## Course Contents

### UnitI: Proficiency in English Grammar

- Understand the fundamental rules of English grammar, including sentence structure, verb tenses, punctuation, and usage.
- Apply grammatical concepts in writing and speaking with accuracy and clarity.

### UnitII: Development of Writing Skills

- Develop clear and effective writing techniques for different purposes, such as descriptive, narrative, expository, and persuasive writing.
- Organize and structure ideas cohesively in paragraphs and essays.

### UnitIII: Creativity in Writing

- Explore and express creativity through various forms of writing like short stories, poetry, and essays.
- Experiment with different literary styles, tones, and voices to enhance personal expression.

### UnitIV: Understanding of Literary Techniques

- Recognize and apply literary devices such as metaphors, similes, imagery, symbolism, and personification in creative writing.
- Analyze and appreciate the use of these devices in literature and use them to improve personal writing.

### UnitV: Enhanced Reading and Interpretation Skills

- Read and interpret various literary and non-literary texts to understand different styles, perspectives, and techniques.
- Engage critically with texts to enhance understanding and application of grammar rules.

### UnitVI: Confidence in Communication

- Gain confidence in expressing ideas, opinions, and creative thoughts through well-structured, grammatically correct writing.
- Develop oral communication skills through discussions, presentations, and creative recitations.

### Suggested Readings:

- *Wren & Martin's High School English Grammar and Composition" by P.C. Wren and H. Martin*

*A comprehensive guide to grammar rules, sentence structure, and composition that is widely used in academic courses.*

- *"English Grammar in Use" by Raymond Murphy*



*A popular self-study grammar reference book, ideal for intermediate learners to clarify grammatical concepts.*

• *"Practical English Usage" by Michael Swan*  
*An authoritative reference book covering problem areas in English grammar and usage.*

• *"The Elements of Style" by William Strunk Jr. and E.B. White*  
*A concise handbook on writing style, grammar, and clarity in writing.*

#### **COURSE OUTCOMES-**

**COs-1** Students will develop the ability to write clearly and concisely for a variety of purposes, including essays, reports, and formal communications.

**COs-2** Students will be able to understand and apply advanced grammar rules, including sentence structures, punctuation, verb usage, and tenses.

**COs-3** Students will develop skills in self-editing and revising drafts to improve grammar, clarity, and overall style. And learn the peer-review process and incorporate constructive feedback to refine writing.

**COs-4** Students will develop skills to gain confidence in articulating thoughts and ideas in written form, particularly in creative genres.

#### **Speaking and Presentation Skills (BP105T-B)**

##### **CO: COURSE OBJECTIVES**

**CO-1** Learn about improve the ability to articulate thoughts clearly and confidently in various contexts, including discussions, debates, and presentations.

**CO-2** Learn techniques to manage speech anxiety and develop a strong stage presence. Build confidence in delivering speeches or presentations to an audience, with emphasis on clarity, organization, and engagement.

**CO-3** Learn to structure a presentation logically with a clear introduction, body, and conclusion to communicate messages effectively.

**CO-4** Develop an understanding of how to tailor presentations and speeches according to the needs, expectations, and interests of different audiences. And learn the strategies to engage the audience through storytelling, questions, and visual aids.

**CO-5** Learn to improve body language, facial expressions, eye contact, and gestures to complement verbal communication and create a stronger impact.

#### ***Course Contents***

##### **Unit I: Develop Effective Oral Communication**

- Improve the ability to articulate thoughts clearly and confidently in various contexts, including discussions, debates, and presentations.
- Enhance fluency, pronunciation, and diction for effective verbal communication.

- Build confidence in delivering speeches or presentations to an audience, with emphasis on clarity, organization, and engagement.
- Learn techniques to manage speech anxiety and develop a strong stage presence.

### **Unit II: Master the Art of Public Speaking**

- Build confidence in delivering speeches or presentations to an audience, with emphasis on clarity, organization, and engagement.
- Learn techniques to manage speech anxiety and develop a strong stage presence.

### **Unit III: Structure and Organize Presentations**

- Learn to structure a presentation logically with a clear introduction, body, and conclusion to communicate messages effectively.
- Focus on the use of transitions, signposting, and summary techniques to guide audiences through content seamlessly.

### **Unit IV: Audience Analysis and Engagement**

- Develop an understanding of how to tailor presentations and speeches according to the needs, expectations, and interests of different audiences.
- Learn strategies to engage the audience through storytelling, questions, and visual aids.

### **Unit V: Handle Q&A Sessions and Impromptu Speaking**

- Learn techniques for handling questions confidently and effectively during Q&A sessions, discussions, or after presentations.
- Practice impromptu speaking to improve the ability to think and respond quickly and coherently in unplanned scenarios.

### **Suggested Readings:**

**Public Speaking: An Audience-Centered Approach** by Steven A. Beebe and Susan J. Beebe

This book emphasizes the importance of understanding the audience while preparing and delivering speeches.

**"Speak With No Fear: Go from a Nervous, Nauseated, and Sweaty Speaker to an Excited, Energized, and Passionate Presenter"** by Mike Acker

Provides practical tips and strategies for overcoming fear and anxiety in public speaking.

## **COURSE OUTCOMES**

**COs-1** Students will develop the ability to communicate ideas clearly and confidently in various speaking situations, including formal and informal contexts. And also to improve pronunciation, and fluency in spoken English.

**COs-2** Learn to engage an audience effectively, maintain attention, and deliver impactful presentations. Develop the ability to tailor communication to different audiences, understanding the importance of audience demographics, interests, and feedback.

**COs-3** Build confidence to speak in front of large or small groups, handling nerves and overcoming the fear of public speaking. Gain practical experience through various public speaking activities and assignments that boost self-assurance.

**COs-4** Develop skills in delivering persuasive and informative speeches, including the use of evidence, logic, and emotional appeal. Learn how to construct well-reasoned arguments and present them convincingly to an audience.

**COs-5** Learn to manage speaking time efficiently, adhering to time limits while ensuring all key points are addressed. Develop the ability to adjust content and pace according to time constraints without sacrificing clarity or effectiveness.

### **Additional Benefits:**

- Improved teamwork and collaboration through group presentations.
- Enhanced critical thinking and problem-solving abilities when addressing audience questions or unexpected issues during presentations.

## **Life Management and Soft Skills (BP105T-C)**

### **CO: COURSE OBJECTIVES**

**CO-1** Enhance self-awareness by understanding personal strengths, weaknesses, values, and emotions. Improve emotional intelligence to better manage stress, emotions, and interpersonal relationships.

**CO-2** Develop organizational skills to balance personal, academic, and professional responsibilities effectively. Learn techniques to manage time efficiently, prioritize tasks, and set realistic goals.

**CO-3** Improve the ability to work collaboratively with others, including in team settings, by fostering cooperation, adaptability, and conflict resolution. Strengthen interpersonal skills to build strong, respectful relationships with peers, colleagues, and mentors.

**CO-4** Develop the ability to solve problems creatively, assess risks, and evaluate options effectively. Learn critical thinking and analytical skills to approach challenges logically and make informed decisions.

**CO-5** Understand the key principles of leadership and develop skills to inspire, motivate, and guide others. Learn influencing techniques to build trust, persuade effectively, and lead with empathy and confidence.

**CO-6** Develop a strong work ethic, accountability, and professionalism in both academic and workplace settings. Understand the importance of integrity, ethics, and responsibility in personal and professional life.

**CO-7** Explore career opportunities and develop strategies for career planning, setting short-term and long-term

goals. Learn how to prepare resumes, cover letters, and practice interview skills for job readiness.

## Course Contents

### Unit I: Introduction to Life Management and Soft Skills

- **Definition and Importance**  
Understanding the concept of life management and soft skills, and why they are crucial for personal and professional success.
- **Key Areas of Life Management**  
Time management, stress management, decision-making, and problem-solving skills.

### Unit II: Time Management

- **Principles of Time Management**  
Prioritizing tasks, setting goals, and creating effective schedules.
- **Time-Management Tools and Techniques**  
Using planners, to-do lists, digital tools, and calendars to manage time efficiently.
- **Work-Life Balance**  
Techniques for balancing personal and professional responsibilities.

### Unit III: Interpersonal Skills

- **Building Positive Relationships**  
Developing trust, empathy, and respect in personal and professional relationships.
- **Teamwork and Collaboration**  
Understanding the dynamics of working in teams, effective collaboration, and conflict resolution.
- **Networking and Social Skills**  
Building professional networks, improving social skills, and expanding connections.

### Unit IV: Interview and Job-Readiness Skills

- **Preparing for Interviews**  
Resume building, preparing for common interview questions, and conducting mock interviews.
- **Workplace Adaptation**  
Adjusting to new work environments, understanding corporate culture, and integrating into teams smoothly.

### Unit V Professional Etiquette and Workplace Skills

- **Professionalism in the Workplace**  
Maintaining a positive attitude, dressing appropriately, and upholding workplace etiquette.
- **Business Etiquette**  
Understanding professional conduct in meetings, email communication, and corporate environments.
- **Workplace Ethics and Integrity**  
Importance of ethical behavior and maintaining integrity in professional settings.

### Suggested Readings:

1. **"Emotional Intelligence: Why It Can Matter More Than IQ"** by Daniel Goleman  
A foundational book that explores the concept of emotional intelligence (EQ) and how it impacts personal and professional success.
2. **"The Seven Habits of Highly Effective People"** by Stephen R. Covey  
A classic on personal and professional effectiveness, focusing on habit formation, self-management, and interpersonal relations.
3. **"Difficult Conversations: How to Discuss What Matters Most"** by Douglas Stone, Bruce Patton, and Sheila Heen. A practical guide for navigating challenging conversations, resolving conflicts, and maintaining strong relationships

**4. The Art of Thinking Clearly"** by Rolf Dobelli .Focuses on cognitive biases and common errors in thinking, helping individuals make better decisions in both personal and professional contexts.

### **COURSE OUTCOMES**

**COs-1** Apply problem-solving techniques to resolve conflicts and challenges both in personal and professional contexts. Develop critical thinking skills to analyze situations and make informed decisions.

**COs-2** Strengthen both verbal and non-verbal communication skills for clear, confident, and effective interaction. Develop listening skills to engage in meaningful conversations and foster positive relationships.

**COs-3** Understand the importance of professionalism, work ethics, and integrity in the workplace. Learn business etiquette, including dress code, behavior, and professional interactions in various contexts.

**COs-4** Gain confidence in delivering speeches, presentations, and engaging in public discussions. Learn how to organize ideas, articulate thoughts clearly, and present effectively to different audiences.

**COs-5** Learn to set realistic, achievable personal and professional goals using the SMART (Specific, Measurable, Achievable, Relevant, Time-bound) framework.

## **BP111P.COMMUNICATION SKILLS (Practical)**

**2 Hours / week**

The following learning modules are to be conducted using wordsworth<sup>®</sup> English language lab software

### **Basic communication covering the following topics**

Meeting People

Asking Questions

Making Friends

What did you do?

Do's and Dont's

### **Pronunciations covering the following topics**

Pronunciation (Consonant Sounds)

Pronunciation and Nouns

Pronunciation (Vowel Sounds)

### **Advanced Learning**

Listening Comprehension / Direct and Indirect Speech

Figures of Speech

Effective Communication

Writing Skills

Effective Writing

Interview Handling Skills

E-Mail etiquette

Presentation Skills

### **Recommended Books: (Latest Edition)**

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2<sup>nd</sup> Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1<sup>st</sup> Edition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1<sup>st</sup> Edition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1<sup>st</sup> Edition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5<sup>th</sup> Edition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2<sup>nd</sup> Edition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1<sup>st</sup> Edition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1<sup>st</sup> Edition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4<sup>th</sup> Edition, Pan Mac Millan, 2009
12. Bringing out the best in people, Aubrey Daniels, 2<sup>nd</sup> Edition, Mc Graw Hill, 1999

### **English Grammar and Creative Writing (BP111P-A) Practical**

#### **CO: COURSE OBJECTIVES**

**CO-1** Ensure a solid understanding of English grammar, including sentence structure, verb tenses, punctuation, parts of speech, and syntax. Students will demonstrate correct usage of grammar in written and spoken communication.

**CO-2** Students will be able to write clear, coherent, and structured essays, stories, and reports. Introduce and practice various writing techniques, such as descriptive writing, narrative structure, and persuasive writing.

**CO-3** Foster creative thinking and the ability to express ideas imaginatively through written language. Enhance students' ability to read and analyze various forms of written texts for structure, grammar, and style.

**CO-4** Improve overall communication skills, both written and oral, for different audiences and purposes. Encourage students to develop their unique voice and style in writing.

#### **Practical:**

1. **Writing Prompts:** Daily or weekly writing exercises to foster creativity.
2. **Workshops:** Collaborative peer reviews and group critiques.
3. **Assignments:** Submission of short stories, essays, or poetry with revisions based on feedback.
4. **Journaling:** Regular personal writing journals to track progress, reflections, and ideas.
5. **Quizzes and Tests:** Focused on grammar, vocabulary, and punctuation.
6. **Creative Projects:** Submission of polished pieces of creative writing (stories, poems, or essays).
7. **Class Participation:** Engagement in peer reviews, discussions, and workshops.

## **COURSE OUTCOMES**

**COs-1** Students will demonstrate a comprehensive understanding of English grammar, including sentence structure, syntax, punctuation, and usage rules. This will aid in improving both written and spoken communication skills.

**COs-2** Students will develop the ability to craft original works of fiction, poetry, and other creative writing forms by exploring various techniques such as characterization, plot development, and narrative voice.

**COs-3** Through the analysis of literary works and creative writing exercises, students will enhance their critical thinking and analytical abilities, helping them understand the subtleties of language and meaning.

**COs-4** Students will learn to communicate their ideas clearly, coherently, and persuasively in writing, both in creative formats (stories, poems, etc.) and more structured forms (essays, reports).

**COs-5** Students will gain skills in self-editing and peer editing, learning how to refine and improve their drafts through multiple revisions and constructive feedback from peers and instructors.

**COs-6** Students will be exposed to various literary genres and forms, fostering an appreciation for diverse writing styles and approaches in literature and creative writing.

**COs-7** By experimenting with different genres and writing techniques, students will be able to discover and refine their personal writing style and voice.

### **Speaking and Presentation Skills (BP111P-B) Practical**

#### **CO: COURSE OBJECTIVES**

**CO-1** Enhance students to improve clarity, tone, and articulation for effective verbal communication. Practice structuring coherent and concise spoken messages.

**CO-2** Build confidence in speaking before an audience. And to overcome common speech-related anxieties.

**CO-3** Learn to design and deliver engaging and professional presentations.

**CO-4** Develop strategies for maintaining audience interest and attention. Practice appropriate non-verbal cues to reinforce spoken messages.

**CO-5** Learn how to integrate slides, charts, graphs, and other visual tools seamlessly into presentations. Practice peer review and learn from others' speaking techniques.

**CO-6** Practice adhering to time limits while maintaining content quality and flow. Organize presentation content effectively to fit within allotted time.

#### **Practical:**

1. **Confidence Building:** Overcoming stage fright and anxiety.
2. **Vocal Techniques:** Projection, tone modulation, clarity, and articulation.
3. **Body Language:** Posture, gestures, eye contact, and facial expressions.
4. **Audience Engagement:** Interacting with and addressing the audience's needs.
5. **Visual Aids:** Using PowerPoint, info graphics, and other visual tools effectively.
6. **Group Discussions:** Techniques for leading and contributing to group conversations.



7. **Debates:** Structuring arguments, listening actively, and providing counterpoints.
8. **Interviews and Networking:** Practicing one-on-one professional communication, including mock interviews
9. **Online Presentations:** Practicing virtual communication platforms such as Zoom, Google Meet, or Microsoft Teams.

## **COURSE OUTCOMES**

**COs-1** Students will develop the ability to articulate ideas clearly and confidently in both spoken and written formats, using appropriate communication techniques.

**COs-2** Students will demonstrate proficiency in public speaking by delivering structured and impactful presentations, taking into account audience needs and context.

**COs-3** Students will learn to use both verbal and non-verbal cues effectively to enhance their communication, including body language, eye contact, and tone.

**COs-4** Students will gain experience in incorporating various visual aids (PowerPoint, charts, props, etc.) into their presentations to improve clarity and engagement.

**COs-5** Students will be able to respond to questions and manage discussions confidently, handling both expected and unexpected queries during and after presentations.

**COs-6** Students will learn techniques to engage the audience, ensuring active participation and maintaining attention throughout their presentations.

**COs-7** Students will practice structuring presentations to fit within given time limits, focusing on key points and delivering concise messages without rushing.

### **Suggested Readings:**

- **"The Art of Public Speaking" by Dale Carnegie** A classic that covers the fundamentals of effective public speaking, providing techniques for confidence-building, engagement, and audience connection.
- **"Presentation Zen: Simple Ideas on Presentation Design and Delivery" by Garr Reynolds** Focuses on creating presentations that are visually engaging and effectively delivered. This book covers everything from slide design to storytelling techniques.
- **"The Quick and Easy Way to Effective Speaking" by Dale Carnegie** Another excellent resource from Dale Carnegie that provides actionable advice for improving public speaking through practice and understanding audience psychology.

## **Life Management and Soft Skills (BP111PC) Practical**

### **COURSE OBJECTIVES**

**CO-1** To promote self-awareness and personal growth by encouraging self-reflection and introspection. To help students understand their strengths, weaknesses, and areas of improvement.

**CO-2** To improve students' communication, collaboration, and relationship-building skills. And to develop effective teamwork and leadership skills by working in diverse groups.

**CO-3** To introduce students to techniques for managing stress and resolving conflicts constructively.

**CO-4** To improve professional etiquette, work ethics, and adaptability in diverse work environments. And to help students develop essential skills like presentation, negotiation, and public speaking.

**CO-5** To teach students strategies to maintain mental and physical health while managing various life domains.

### **Practical:**

1. Create a daily and weekly schedule for better productivity.
  2. Deliver a short presentation or speech
  3. Break down long-term goals into actionable steps.
  4. Keep a journal on stress triggers and how you manage them.
  5. Reflect on team dynamics, leadership roles, and collaboration methods.
  6. Solve a problem using critical thinking and a structured approach.
  7. Attend a networking event or connect with professionals on LinkedIn.
  8. Develop a personal development plan (PDP) for improving skills over time.
  9. Create a plan to better manage work, studies, and personal time.
- **Workshops:** To practice interpersonal skills, presentations, and team collaboration.
  - **Group Discussions:** To simulate real-life workplace scenarios and team interactions.
  - **Presentations:** Practicing public speaking and confidence building.

### **COURSE OUTCOMES**

**COs-1** Develop self-awareness, including strengths, weaknesses, emotional intelligence, and personal goals. Learn how to manage time, stress, and personal resources effectively.

**COs-2** Enhance verbal and non-verbal communication skills, including listening, articulation, public speaking, and presentation techniques.

**COs-3** Students will strengthen interpersonal skills such as teamwork, collaboration, conflict resolution, and empathy to build effective relationships in personal and professional settings.

**COs-4** Students will understand leadership dynamics and acquire skills to work in teams, including leadership, delegation, motivation, and conflict resolution in group activities.

**COs-5** Students will be able to develop skills for setting realistic career goals, understanding career paths, and creating strategies for career advancement, including personal branding and networking.

**COs-6** Students will learn techniques to engage the audience, ensuring active participation and maintaining attention throughout their presentations.

**COs-7** Learn about professional behavior, workplace ethics, and etiquette, such as dressing, communication in formal settings, and adherence to ethical guidelines in professional environments.

### **Suggested Readings:**

- *Emotional Intelligence: Why It Can Matter More Than IQ* by Daniel Goleman
- *Getting Things Done: The Art of Stress-Free Productivity* by David Allen
- *The Relaxation and Stress Reduction Workbook* by Martha Davis, Elizabeth Robbins Eshelman, and Matthew McKay
- *The 7 Habits of Highly Effective People* by Stephen R. Covey



## **BP 106RBT.REMEDIAL BIOLOGY (Theory)**

**30 Hours**

**Scope:** To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

**Objectives:** Upon completion of the course, the student shall be able to

- know the classification and salient features of five kingdoms of life
- understand the basic components of anatomy & physiology of plant
- know understand the basic components of anatomy & physiology animal with special reference to human

### **UNIT I**

**07 Hours**

#### **Living world:**

- Definition and characters of living organisms
- Diversity in the living world
- Binomial nomenclature
- Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus,

#### **Morphology of Flowering plants**

- Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.
- General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledones.

### **UNIT II**

**07 Hours**

#### **Body fluids and circulation**

- Composition of blood, blood groups, coagulation of blood
- Composition and functions of lymph
- Human circulatory system
- Structure of human heart and blood vessels
- Cardiac cycle, cardiac output and ECG

#### **Digestion and Absorption**

- Human alimentary canal and digestive glands
- Role of digestive enzymes
- Digestion, absorption and assimilation of digested food

#### **Breathing and respiration**

- Human respiratory system
- Mechanism of breathing and its regulation
- Exchange of gases, transport of gases and regulation of respiration
- Respiratory volumes

### **UNIT III**

**07 Hours**

#### **Excretory products and their elimination**

- Modes of excretion
- Human excretory system- structure and function
- Urine formation
- Rennin angiotensin system

#### **Neural control and coordination**

- Definition and classification of nervous system
- Structure of a neuron
- Generation and conduction of nerve impulse
- Structure of brain and spinal cord
- Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

#### **Chemical coordination and regulation**

- Endocrine glands and their secretions
- Functions of hormones secreted by endocrine glands

#### **Human reproduction**

- Parts of female reproductive system
- Parts of male reproductive system
- Spermatogenesis and Oogenesis
- Menstrual cycle

### **UNIT IV**

**05 Hours**

#### **Plants and mineral nutrition:**

- Essential mineral, macro and micronutrients
- Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

#### **Photosynthesis**

- Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

### **UNIT V**

**04 Hours**

**Plant respiration:**Respiration, glycolysis, fermentation (anaerobic).

#### **Plant growth and development**

- Phases and rate of plant growth, Condition of growth,Introduction to plant growth regulators

#### **Cell - The unit of life**

- Structure and functions of cell and cell organelles.Cell division

#### **Tissues**

- Definition, types of tissues, location and functions.

**Text Books**

- a. Text book of Biology by S. B. Gokhale
- b. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

**Reference Books**

- a. A Text book of Biology by B.V. Sreenivasa Naidu
- b. A Text book of Biology by Naidu and Murthy
- c. Botany for Degree students By A.C.Dutta.
- d.Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthkrishnan.
- e. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate

## **BP112RBP.REMEDIAL BIOLOGY (Practical)**

**30 Hours**

1. Introduction to experiments in biology
  - a) Study of Microscope
  - b) Section cutting techniques
  - c) Mounting and staining
  - d) Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues pertinent to Stem, Root  
Leaf, seed, fruit and flower
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

### **Reference Books**

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava.
3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi

## BP 106RMT.REMEDIAL MATHEMATICS (Theory)

30 Hours

**Scope:** This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

**Objectives:** Upon completion of the course the student shall be able to:-

1. Know the theory and their application in Pharmacy
2. Solve the different types of problems by applying theory
3. Appreciate the important application of mathematics in Pharmacy

### Course Content:

#### UNIT – I

06 Hours

##### • Partial fraction

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

##### • Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

##### • Function:

Real Valued function, Classification of real valued functions,

##### • Limits and continuity :

Introduction, Limit of a function, Definition of limit of a function ( $\epsilon - \delta$ ) definition),  $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$ ,  $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$ ,

#### UNIT –II

06 Hours

##### • Matrices and Determinant:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley-Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations



### UNIT – III

06 Hours

#### • Calculus

**Differentiation** : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of  $x^n$  w.r.t  $x$ , where  $n$  is any rational number, Derivative of  $e^x$ , Derivative of  $\log_e x$ , Derivative of  $a^x$ , Derivative of trigonometric functions from first principles (**without Proof**), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application

### UNIT – IV

06 Hours

#### • Analytical Geometry

**Introduction:** Signs of the Coordinates, Distance formula,

**Straight Line** : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line

#### **Integration:**

Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

### UNIT-V

06 Hours

- **Differential Equations** : Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, **Application in solving Pharmacokinetic equations**
- **Laplace Transform** : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, **Application in solving Chemical kinetics and Pharmacokinetics equations**

### Recommended Books (Latest Edition)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr.B.S.Grewal

## **Semester II**

## **BP 201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)**

**45 Hours**

**Scope:** This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

**Objectives:** Upon completion of this course the student should be able to:

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

### **Course Content:**

#### **Unit I**

**10 hours**

- **Nervous system**

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

#### **Unit II**

**06 hours**

- **Digestive system**

Anatomy of GI Tract with special reference to anatomy and functions of stomach, ( Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine

and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

- **Energetics**

Formation and role of ATP, Creatinine Phosphate and BMR.

### **Unit III**

- **Respiratory system** **10 hours**

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration

Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

- **Urinary system**

Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

### **Unit IV**

**10 hours**

- **Endocrine system**

Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

### **Unit V**

**09 hours**

- **Reproductive system**

Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition

- **Introduction to genetics**

Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance

## **BP 207 P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)**

**4 Hours/week**

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. To study the integumentary and special senses using specimen, models, etc.,
2. To study the nervous system using specimen, models, etc.,
3. To study the endocrine system using specimen, models, etc
4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feedback mechanism.
  
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

### **Recommended Books (Latest Editions)**

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA

4. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

**Reference Books:**

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

## BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY –I (Theory)

45 Hours

**Scope:** This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

**Objectives:** Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. identify/confirm the identification of organic compound

### Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (\*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

### UNIT-I

07 Hours

- **Classification, nomenclature and isomerism**

Classification of Organic Compounds

Common and IUPAC systems of nomenclature of organic compounds

(up to 10 Carbons open chain and carbocyclic compounds)

Structural isomerisms in organic compounds

### UNIT-II 10 Hours

- **Alkanes\*, Alkenes\* and Conjugated dienes\***

SP<sup>3</sup> hybridization in alkanes, Halogenation of alkanes, uses of paraffins.

Stabilities of alkenes, SP<sup>2</sup> hybridization in alkenes

E<sub>1</sub> and E<sub>2</sub> reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E<sub>1</sub> versus E<sub>2</sub> reactions, Factors affecting E<sub>1</sub> and E<sub>2</sub> reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

### UNIT-III 10 Hours

- **Alkyl halides\***

SN<sub>1</sub> and SN<sub>2</sub> reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

SN<sub>1</sub> versus SN<sub>2</sub> reactions, Factors affecting SN<sub>1</sub> and SN<sub>2</sub> reactions

Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

- **Alcohols\***- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

#### **UNIT-IV 10 Hours**

- **Carbonyl compounds\* (Aldehydes and ketones)**

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

#### **UNIT-V**

**08 Hours**

- **Carboxylic acids\***

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

- **Aliphatic amines\*** - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine



## **BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY -I (Practical)**

**4 Hours / week**

1. Systematic qualitative analysis of unknown organic compounds like
  1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
  2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
  3. Solubility test
  4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
  5. Melting point/Boiling point of organic compounds
  6. Identification of the unknown compound from the literature using melting point/ boiling point.
  7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
  8. Minimum 5 unknown organic compounds to be analysed systematically.
2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

### **Recommended Books (Latest Editions)**

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwalia/Chatwal.

## BP203 T. BIOCHEMISTRY (Theory)

45 Hours

**Scope:** Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

**Objectives:** Upon completion of course student shall be able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

### Course Content:

#### UNIT I

08 Hours

- **Biomolecules**

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

- **Bioenergetics**

Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP

#### UNIT II

10 Hours

- **Carbohydrate metabolism**

Glycolysis – Pathway, energetics and significance

Citric acid cycle- Pathway, energetics and significance

HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency

Glycogen metabolism Pathways and glycogen storage diseases (GSD)

Gluconeogenesis- Pathway and its significance

Hormonal regulation of blood glucose level and Diabetes mellitus

- **Biological oxidation**

Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate level phosphorylation

Inhibitors ETC and oxidative phosphorylation/Uncouplers

**UNIT III**

**10 Hours**

• **Lipid metabolism**

β-Oxidation of saturated fatty acid (Palmitic acid)

Formation and utilization of ketone bodies; ketoacidosis

De novo synthesis of fatty acids (Palmitic acid)

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

- **Amino acid metabolism**

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alpeptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme; hyperbilirubinemia and jaundice

#### **UNIT IV**

**10 Hours**

- **Nucleic acid metabolism and genetic information transfer**

Biosynthesis of purine and pyrimidine nucleotides

Catabolism of purine nucleotides and Hyperuricemia and Gout disease

Organization of mammalian genome

Structure of DNA and RNA and their functions

DNA replication (semi conservative model)

Transcription or RNA synthesis

Genetic code, Translation or Protein synthesis and inhibitors

## UNIT V

07 Hours

- **Enzymes**

Introduction, properties, nomenclature and IUB classification of enzymes

Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)

Enzyme inhibitors with examples

Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation

Therapeutic and diagnostic applications of enzymes and isoenzymes

Coenzymes –Structure and biochemical functions

### BP 209 P. BIOCHEMISTRY (Practical)

4 Hours / Week

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

### **Recommended Books (Latest Editions)**

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

### **BP 204T.PATHOPHYSIOLOGY (THEORY)**

**45Hours**

**Scope:** Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

**Objectives:** Upon completion of the subject student shall be able to –

1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

#### **Course content:**

#### **Unit I**

**10Hours**

**Basic principles of Cell injury and Adaptation:**

Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance

**Basic mechanism involved in the process of inflammation and repair:**

Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis

**Unit II**

**10Hours**

**Cardiovascular System:**

Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)

**Respiratory system:** Asthma, Chronic obstructive airways diseases.

**Renal system:** Acute and chronic renal failure .

**Unit II**

**10Hours**

**Haematological Diseases:**

Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia

**Endocrine system:** Diabetes, thyroid diseases, disorders of sex hormones

**Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.

**Gastrointestinal system:** Peptic Ulcer

**Unit IV**

**8 Hours**

Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.

**Disease of bones and joints:** Rheumatoid arthritis, osteoporosis and gout

**Principles of cancer:** classification, etiology and pathogenesis of cancer

**Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis, Gout

**Principles of Cancer:** Classification, etiology and pathogenesis of Cancer

**Unit V**

**7 Hours**

**Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis

Urinary tract infections

**Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhoea

**Recommended Books (Latest Editions)**

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6<sup>th</sup> edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12<sup>th</sup> edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12<sup>th</sup> ed; united states;
5. William and Wilkins, Baltimore; 1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21<sup>st</sup> edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12<sup>th</sup> edition; WB Saunders Company; 2010.
8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9<sup>th</sup> edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6<sup>th</sup> edition; Philadelphia; WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3<sup>rd</sup> edition; London; Churchill Livingstone publication; 2003.

#### **Recommended Journals**

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.



## BP205 T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hrs (2 Hrs/Week)

**Scope:** This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

**Objectives:** Upon completion of the course the student shall be able to

1. know the various types of application of computers in pharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

### Course content:

#### UNIT – I

06 hours

**Number system:** Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division

**Concept of Information Systems and Software :** Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

#### UNIT –II

06 hours

**Web technologies:** Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

#### UNIT – III

06 hours

**Application of computers in Pharmacy** – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring

Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

**UNIT – IV**

**06 hours**

**Bioinformatics:** Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

**UNIT-V**

**06 hours**

**Computers as data analysis in Preclinical development:**

Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMMS)

### **BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)**

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

#### **Recommended books (Latest edition):**

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

## **BP 206 T. ENVIRONMENTAL SCIENCES (Theory)**

**30 hours**

**Scope:**Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

**Objectives:** Upon completion of the course the student shall be able to:

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

### **Course content:**

#### **Unit-I**

**10hours**

The Multidisciplinary nature of environmental studies

Natural Resources

Renewable and non-renewable resources:

Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

#### **Unit-II**

**10hours**

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

#### **Unit- III**

**10hours**

Environmental Pollution: Air pollution; Water pollution; Soil pollution

**Recommended Books (Latest edition):**

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clarendon Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment

## **SEMESTER III**

## BP301T. PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory)

45 Hours

**Scope:** This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

**Objectives:** Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. prepare organic compounds

### Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (\*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

#### UNIT I

10 Hours

- **Benzene and its derivatives**

- A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule
- B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.
- C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction
- D. Structure and uses of DDT, Saccharin, BHC and Chloramine

#### UNIT II

10 Hours

- **Phenols\*** - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols
- **Aromatic Amines\*** - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts
- **Aromatic Acids\*** -Acidity, effect of substituents on acidity and important reactions of benzoic acid.

#### UNIT III

10 Hours

- **Fats and Oils**
  - a. Fatty acids – reactions.

- b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
- c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

**UNIT IV**

**08 Hours**

- **Polynuclear hydrocarbons:**

- a. Synthesis, reactions
- b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

**UNIT V**

**07 Hours**

- **Cyclo alkanes\***

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only



## BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)

4 Hrs/week

- I Experiments involving laboratory techniques
- Recrystallization
  - Steam distillation
- II Determination of following oil values (including standardization of reagents)
- Acid value
  - Saponification value
  - Iodine value
- III Preparation of compounds**
- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
  - 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/
  - Acetanilide by halogenation (Bromination) reaction.
  - 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
  - Benzoic acid from Benzyl chloride by oxidation reaction.
  - Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
  - 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions.
  - Benzil from Benzoin by oxidation reaction.
  - Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction
  - Cinnamic acid from Benzaldehyde by Perkin reaction
  - *P*-Iodo benzoic acid from *P*-amino benzoic acid

### Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.

8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

**BP302T. PHYSICAL PHARMACEUTICS-I (Theory)**

**45Hours**

**Scope:** The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

**Objectives:** Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

**Course Content:**

**UNIT-I**

**10 Hours**

**Solubility of drugs:** Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

**UNIT-II**

**10Hours**

**States of Matter and properties of matter:** State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism.

**Physicochemical properties of drug molecules:** Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

**UNIT-III**

**08 Hours**

**Surface and interfacial phenomenon:** Liquid interface, surface & interfacial tensions,

surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

#### **UNIT-IV**

**08Hours**

**Complexation and protein binding:** Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

#### **UNIT-V**

**07 Hours**

**pH, buffers and Isotonic solutions:** Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

**BP306P. PHYSICAL PHARMACEUTICS – I (Practical)**

**4 Hrs/week**

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl<sub>4</sub> and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

**Recommended Books: (Latest Editions)**

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene, Parott.
3. Tutorial Pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
9. Physical Pharmaceutics by C.V.S. Subramanyam
10. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar

## **BP 303 T. PHARMACEUTICAL MICROBIOLOGY (Theory)**

**45Hours**

### **Scope:**

- Study of all categories of microorganisms especially for the production of alcohol antibiotics, vaccines, vitamins enzymes etc..

**Objectives:** Upon completion of the subject student shall be able to;

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterilization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

### **Course content:**

#### **Unit I**

**10 Hours**

Introduction, history of microbiology, its branches, scope and its importance.

Introduction to Prokaryotes and Eukaryotes

Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count).

Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.

#### **Unit II**

**10 Hours**

Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC).

Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization.

Evaluation of the efficiency of sterilization methods.

Equipments employed in large scale sterilization.

Sterility indicators.

### **Unit III**

**10 Hours**

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.

Classification and mode of action of disinfectants

Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions

Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

### **Unit IV**

**08 Hours**

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.

Assessment of a new antibiotic.

### **Unit V**

**07Hours**

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

## **BP 307P.PHARMACEUTICAL MICROBIOLOGY (Practical)**

**4 Hrs/week**

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

### **Recommended Books (Latest edition)**

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4<sup>th</sup> edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Pepler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

## BP 304 T. PHARMACEUTICAL ENGINEERING (Theory)

45 Hours

**Scope:** This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

**Objectives:** Upon completion of the course student shall be able:

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

### Course content:

#### UNIT-I

10 Hours

- **Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.
- **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.
- **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

#### UNIT-II

10 Hours

- **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.



- **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.
- **Distillation:** Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

### UNIT- III

**08 Hours**

- **Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.
- **Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

### UNIT-IV

**08 Hours**

- **Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.
- **Centrifugation:** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

### UNIT- V

**07 Hours**

- **Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

**Recommended Books: (Latest Editions)**

1. Introduction to chemical engineering – Walter L Badger & Julius Banchemo, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – McCabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceuticals- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

## **BP308P - PHARMACEUTICAL ENGINEERING (Practical)**

**4 Hours/week**

- I. Determination of radiation constant of brass, iron, unpainted and painted glass.
- II. Steam distillation – To calculate the efficiency of steam distillation.
- III. To determine the overall heat transfer coefficient by heat exchanger.
- IV. Construction of drying curves (for calcium carbonate and starch).
- V. Determination of moisture content and loss on drying.
- VI. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.
- VII. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
- VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
- IX. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
- X. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
- XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity
- XII. To study the effect of time on the Rate of Crystallization.
- XIII. To calculate the uniformity Index for given sample by using Double Cone Blender.

## **SEMESTER IV**

## **BP401T. PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory)**

**45 Hours**

**Scope:** This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

**Objectives:** At the end of the course, the student shall be able to

1. understand the methods of preparation and properties of organic compounds
2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. know the medicinal uses and other applications of organic compounds

### **Course Content:**

**Note: To emphasize on definition, types, mechanisms, examples, uses/applications**

#### **UNIT-I**

**10 Hours**

##### **Stereo isomerism**

Optical isomerism –

Optical activity, enantiomerism, diastereoisomerism, meso compounds

Elements of symmetry, chiral and achiral molecules

DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers

Reactions of chiral molecules

Racemic modification and resolution of racemic mixture.

Asymmetric synthesis: partial and absolute

#### **UNIT-II**

**10 Hours**

Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems)

Methods of determination of configuration of geometrical isomers.

Conformational isomerism in Ethane, n-Butane and Cyclohexane.

Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.

Stereospecific and stereoselective reactions

#### **UNIT-III**

**10 Hours**

**Heterocyclic compounds:**

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives

Pyrrole, Furan, and Thiophene

Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene

**UNIT-IV****8 Hours**

Synthesis, reactions and medicinal uses of following compounds/derivatives

Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine

Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

**UNIT-V****07 Hours****Reactions of synthetic importance**

Metal hydride reduction ( $\text{NaBH}_4$  and  $\text{LiAlH}_4$ ), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.

Oppenauer-oxidation and Dakin reaction.

Beckmanns rearrangement and Schmidt rearrangement.

Claisen-Schmidt condensation

**Recommended Books (Latest Editions)**

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist

## BP402T. MEDICINAL CHEMISTRY – I (Theory)

45 Hours

**Scope:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Objectives:** Upon completion of the course the student shall be able to

1. understand the chemistry of drugs with respect to their pharmacological activity
2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. know the Structural Activity Relationship (SAR) of different class of drugs
4. write the chemical synthesis of some drugs

### Course Content:

**Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (\*)**

#### UNIT- I

10 Hours

##### Introduction to Medicinal Chemistry

##### History and development of medicinal chemistry

##### Physicochemical properties in relation to biological action

Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

##### Drug metabolism

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects.

#### UNIT- II

10 Hours

##### Drugs acting on Autonomic Nervous System

##### Adrenergic Neurotransmitters:

Biosynthesis and catabolism of catecholamine.

Adrenergic receptors (Alpha & Beta) and their distribution.

##### Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine\*, Dopamine,

Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol\*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

- Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
- Agents with mixed mechanism: Ephedrine, Metaraminol.

#### **Adrenergic Antagonists:**

**Alpha adrenergic blockers:** Tolazoline\*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

**Beta adrenergic blockers:** SAR of beta blockers, Propranolol\*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

### **UNIT-III**

**10 Hours**

#### **Cholinergic neurotransmitters:**

Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

#### **Parasympathomimetic agents: SAR of Parasympathomimetic agents**

**Direct acting agents:** Acetylcholine, Carbachol\*, Bethanechol, Methacholine, Pilocarpine.

**Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible):** Physostigmine, Neostigmine\*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorophate, Echothiophate iodide, Parathione, Malathion.

**Cholinesterase reactivator:** Pralidoxime chloride.

#### **Cholinergic Blocking agents: SAR of cholinolytic agents**

**Solanaceous alkaloids and analogues:** Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide\*.

**Synthetic cholinergic blocking agents:** Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride\*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride\*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

### **UNIT- IV**

**08 Hours**

#### **Drugs acting on Central Nervous System**



### **A. Sedatives and Hypnotics:**

**Benzodiazepines:** SAR of Benzodiazepines, Chlordiazepoxide, Diazepam\*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

**Barbiturates:** SAR of barbiturates, Barbitol\*, Phenobarbital, Mephobarbital, Amobarbital, Butobarbital, Pentobarbital, Secobarbital

#### **Miscellaneous:**

Amides & imides: Glutethimide.

Alcohol & their carbamate derivatives: Meprobamate, Ethchlorvynol.

Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

### **B. Antipsychotics**

**Phenothiazines:** SAR of Phenothiazines - Promazine hydrochloride, Chlorpromazine hydrochloride\*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

**Ring Analogues of Phenothiazines:** Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

**Fluro buterophenones:** Haloperidol, Droperidol, Risperidone.

**Beta amino ketones:** Molindone hydrochloride.

**Benzamides:** Sulpieride.

**C. Anticonvulsants:** SAR of Anticonvulsants, mechanism of anticonvulsant action

**Barbiturates:** Phenobarbitone, Methobarbital. **Hydantoins:**

Phenytoin\*, Mephentyoin, Ethotoin **Oxazolidine diones:**

Trimethadione, Paramethadione **Succinimides:**

Phensuximide, Methsuximide, Ethosuximide\* **Urea and**

**monoacylureas:** Phenacemide, Carbamazepine\*

**Benzodiazepines:** Clonazepam

**Miscellaneous:** Primidone, Valproic acid, Gabapentin, Felbamate

**UNIT – V**

**07 Hours**

**Drugs acting on Central Nervous System**

**General anesthetics:**

**Inhalation anesthetics:** Halothane\*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

**Ultra short acting barbiturates:** Methohexital sodium\*, Thiopental sodium, Thiopental sodium.

**Dissociative anesthetics:** Ketamine hydrochloride.\*

**Narcotic and non-narcotic analgesics**

**Morphine and related drugs:** SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate\*, Methadone hydrochloride\*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

**Narcotic antagonists:** Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

**Anti-inflammatory agents:** Sodium salicylate, Aspirin, Mefenamic acid\*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepiac, Diclofenac, Ketorolac, Ibuprofen\*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

## **BP406P. MEDICINAL CHEMISTRY – I (Practical)**

**4 Hours/Week**

### **I Preparation of drugs/ intermediates**

- 1 1,3-pyrazole
- 2 1,3-oxazole
- 3 Benzimidazole
- 4 Benztriazole
- 5 2,3- diphenyl quinoxaline
- 6 Benzocaine
- 7 Phenytoin
- 8 Phenothiazine
- 9 Barbiturate

### **II Assay of drugs**

- 1 Chlorpromazine
- 2 Phenobarbitone
- 3 Atropine
- 4 Ibuprofen
- 5 Aspirin
- 6 Furosemide

### **III Determination of Partition coefficient for any two drugs**

#### **Recommended Books (Latest Editions)**

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.

7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

## BP 403 T. PHYSICAL PHARMACEUTICS-II (Theory)

45Hours

**Scope:** The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

**Objectives:** Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

### Course Content:

#### UNIT-I

07 Hours

**Colloidal dispersions:** Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action.

#### UNIT-II

10 Hours

**Rheology:** Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

**Deformation of solids:** Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

#### UNIT-III

10 Hours

**Coarse dispersion:** Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

#### **UNIT-IV**

**10Hours**

**Micromeretics:** Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

#### **UNIT-V**

**10 Hours**

**Drug stability:** Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

## **BP 407P. PHYSICAL PHARMACEUTICS- II (Practical)**

**3 Hrs/week**

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

### **Recommended Books: (Latest Editions)**

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceuticals by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

## **BP 404 T. PHARMACOLOGY-I (Theory)**

**45 Hrs**

**Scope:** The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

**Objectives:** Upon completion of this course the student should be able to

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

### **Course Content:**

#### **UNIT-I**

**08 hours**

##### **1. General Pharmacology**

- a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists( competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.
- b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

#### **UNIT-II**

**12 Hours**

##### **General Pharmacology**

- a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
- b. Adverse drug reactions.
- c. Drug interactions (pharmacokinetic and pharmacodynamic)
- d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.



**UNIT-III****10 Hours****2. Pharmacology of drugs acting on peripheral nervous system**

- a. Organization and function of ANS.
- b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.
- c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.
- d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
- e. Local anesthetic agents.
- f. Drugs used in myasthenia gravis and glaucoma

**UNIT-IV****08 Hours****3. Pharmacology of drugs acting on central nervous system**

- a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
- b. General anesthetics and pre-anesthetics.
- c. Sedatives, hypnotics and centrally acting muscle relaxants.
- d. Anti-epileptics
- e. Alcohols and disulfiram

**UNIT-V****07 Hours****3. Pharmacology of drugs acting on central nervous system**

- a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.
- b. Drugs used in Parkinsons disease and Alzheimer's disease.
- c. CNS stimulants and nootropics.
- d. Opioid analgesics and antagonists
- e. Drug addiction, drug abuse, tolerance and dependence.

## **BP 408 P.PHARMACOLOGY-I (Practical)**

**4Hrs/Week**

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

*Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos*

### **Recommended Books (Latest Editions)**

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology

6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

## **BP 405 T.PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory)**

**45 Hours**

**Scope:** The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

**Objectives:** Upon completion of the course, the student shall be able

1. to know the techniques in the cultivation and production of crude drugs
2. to know the crude drugs, their uses and chemical nature
3. know the evaluation techniques for the herbal drugs
4. to carry out the microscopic and morphological evaluation of crude drugs

### **Course Content:**

#### **UNIT-I**

**10 Hours**

##### **Introduction to Pharmacognosy:**

- (a) Definition, history, scope and development of Pharmacognosy
- (b) Sources of Drugs – Plants, Animals, Marine & Tissue culture
- (c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

##### **Classification of drugs:**

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

##### **Quality control of Drugs of Natural Origin:**

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

#### **UNIT-II**

**10 Hours**

##### **Cultivation, Collection, Processing and storage of drugs of natural origin:**

Cultivation and Collection of drugs of natural origin  
Factors influencing cultivation of medicinal plants.  
Plant hormones and their applications.  
Polyploidy, mutation and hybridization with reference to medicinal plants

##### **Conservation of medicinal plants**

#### **UNIT-III**

**07 Hours**

##### **Plant tissue culture:**

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy.

Edible vaccines

#### **UNIT IV**

**10 Hours**

##### **Pharmacognosy in various systems of medicine:**

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

##### **Introduction to secondary metabolites:**

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

#### **UNIT V**

**08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

##### **Plant Products:**

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

##### **Primary metabolites:**

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

**Carbohydrates:** Acacia, Agar, Tragacanth, Honey

**Proteins and Enzymes :** Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

**Lipids(Waxes, fats, fixed oils) :** Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

##### **Marine Drugs:**

Novel medicinal agents from marine sources



**BP408 P. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical)**

**4 Hours/Week**

1. Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and palisade ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

**Recommended Books: (Latest Editions)**

1. W.C.Evans, Trease and Evans Pharmacognosy, 16<sup>th</sup> edition, W.B. Saunders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9<sup>th</sup> Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37<sup>th</sup> Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), 1<sup>st</sup> Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

**SEMESTER V**



## BP501T. MEDICINAL CHEMISTRY – II (Theory)

45 Hours

**Scope:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Objectives:** Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

### Course Content:

**Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (\*)**

#### UNIT- I

10 Hours

**Antihistaminic agents:** Histamine, receptors and their distribution in the humanbody

**H<sub>1</sub>-antagonists:** Diphenhydramine hydrochloride\*, Dimenhydrinate, Doxylamines succinate, Clemastine fumarate, Diphenylpyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride\*, Phenidamine tartarate, Promethazine hydrochloride\*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

**H<sub>2</sub>-antagonists:** Cimetidine\*, Famotidine, Ranitidin.

**Gastric Proton pump inhibitors:** Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

**Anti-neoplastic agents:**

**Alkylating agents:** Meclorothamine\*, Cyclophosphamide, Melphalan,

Chlorambucil, Busulfan, Thiotepa

**Antimetabolites:** Mercaptopurine\*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate\*, Azathioprine

**Antibiotics:** Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

**Plant products:** Etoposide, Vinblastin sulphate, Vincristin sulphate

**Miscellaneous:** Cisplatin, Mitotane.

## UNIT – II

**10 Hours**

### **Anti-anginal:**

**Vasodilators:** Amyl nitrite, Nitroglycerin\*, Pentaerythritol tetranitrate, Isosorbide dinitrite\*, Dipyridamole.

**Calcium channel blockers:** Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

### **Diuretics:**

Carbonic anhydrase inhibitors: Acetazolamide\*, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide\*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,

Loop diuretics: Furosemide\*, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.

Osmotic Diuretics: Mannitol

**Anti-hypertensive Agents:** Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,\* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

## UNIT- III

**10 Hours**

**Anti-arrhythmic Drugs:** Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate\*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcaïnide hydrochloride, Amiodarone, Sotalol.

**Anti-hyperlipidemic agents:** Clofibrate, Lovastatin, Cholesteramine and Cholestipol

**Coagulant & Anticoagulants:** Menadione, Acetomenadione, Warfarin\*, Anisindione, clopidogrel

**Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.



**UNIT- IV****08 Hours****Drugs acting on Endocrine system**

Nomenclature, Stereochemistry and metabolism of steroids

**Sex hormones:** Testosterone, Nandralone, Progesterones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.

**Drugs for erectile dysfunction:** Sildenafil, Tadalafil.

**Oral contraceptives:** Mifepristone, Norgestril, Levonorgestrol

**Corticosteroids:** Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

**Thyroid and antithyroid drugs:** L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

**UNIT – V****07 Hours****Antidiabetic agents:**

Insulin and its preparations

Sulfonyl ureas: Tolbutamide\*, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone.

Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acarbose, Voglibose.

**Local Anesthetics: SAR of Local anesthetics**

**Benzoic Acid derivatives;** Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

**Amino Benzoic acid derivatives:** Benzocaine\*, Butamben, Procaine\*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

**Lidocaine/Anilide derivatives:** Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

**Miscellaneous:** Phenacaine, Dipiperodon, Dibucaine.\*

**Recommended Books (Latest Editions)**

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1 to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.



## BP 502 T. Industrial PharmacyI (Theory)

**45 Hours**

**Scope:** Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

**Objectives:** Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

### Course content:

**3 hours/ week**

#### UNIT-I

**07 Hours**

**Preformulation Studies:** Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

*a. Physical properties:* Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism

*b. Chemical Properties:* Hydrolysis, oxidation, reduction, racemisation, polymerization

BCS classification of drugs & its significant

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

#### UNIT-II

**10 Hours**

##### Tablets:

- a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.
- b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.
- c. Quality control tests: In process and finished product tests

**Liquid orals:** Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

### UNIT-III

08 Hours

#### Capsules:

- a. **Hard gelatin capsules:** Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.
- b. **Soft gelatin capsules:** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

**Pellets:** Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

### UNIT-IV

10 Hours

#### Parenteral Products:

- a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity
- b. Production procedure, production facilities and controls, aseptic processing
- c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.
- d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

**Ophthalmic Preparations:** Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

### UNIT-V

10 Hours

**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

**Pharmaceutical Aerosols:** Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

**Packaging Materials Science:** Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

## **BP 506 P. Industrial PharmacyI (Practical)**

**4 Hours/week**

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

### **Recommended Books: (Latest Editions)**

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5<sup>th</sup>edition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.



## BP503.T. PHARMACOLOGY-II (Theory)

45 Hours

**Scope:** This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

**Objectives:** Upon completion of this course the student should be able to

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

### Course Content:

#### UNIT-I

10hours

##### 1. Pharmacology of drugs acting on cardio vascular system

- a. Introduction to hemodynamic and electrophysiology of heart.
- b. Drugs used in congestive heart failure
- c. Anti-hypertensive drugs.
- d. Anti-anginal drugs.
- e. Anti-arrhythmic drugs.
- f. Anti-hyperlipidemic drugs.

#### UNIT-II

10hours

##### 1. Pharmacology of drugs acting on cardio vascular system

- a. Drug used in the therapy of shock.
- b. Hematinics, coagulants and anticoagulants.
- c. Fibrinolytics and anti-platelet drugs
- d. Plasma volume expanders

##### 2. Pharmacology of drugs acting on urinary system

- a. Diuretics
- b. Anti-diuretics.

#### UNIT-III

10hours

##### 3. Autocoids and related drugs

- a. Introduction to autocoids and classification
- b. Histamine, 5-HT and their antagonists.
- c. Prostaglandins, Thromboxanes and Leukotrienes.
- d. Angiotensin, Bradykinin and Substance P.
- e. Non-steroidal anti-inflammatory agents
- f. Anti-gout drugs
- g. Antirheumatic drugs

**UNIT-IV****08hours****5. Pharmacology of drugs acting on endocrine system**

- a. Basic concepts in endocrine pharmacology.
- b. Anterior Pituitary hormones- analogues and their inhibitors.
- c. Thyroid hormones- analogues and their inhibitors.
- d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.
- d. Insulin, Oral Hypoglycemic agents and glucagon.
- e. ACTH and corticosteroids.

**UNIT-V****07hours****5. Pharmacology of drugs acting on endocrine system**

- a. Androgens and Anabolic steroids.
- b. Estrogens, progesterone and oral contraceptives.
- c. Drugs acting on the uterus.

**6. Bioassay**

- a. Principles and applications of bioassay.
- b. Types of bioassay
- c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT

## BP 507 P. PHARMACOLOGY-II (Practical)

4Hrs/Week

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of  $PA_2$  value of prazosin using rat anococcygeus muscle (by Schild's plot method).
12. Determination of  $PD_2$  value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

*Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos*

### Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.



## BP504 T. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

45Hours

**Scope:** The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

**Objectives:** Upon completion of the course, the student shall be able

1. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. to understand the preparation and development of herbal formulation.
3. to understand the herbal drug interactions
4. to carryout isolation and identification of phytoconstituents

### Course Content:

#### UNIT-I

7 Hours

##### Metabolic pathways in higher plants and their determination

- a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.
- b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

#### UNIT-II

14 Hours

General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites:

**Alkaloids:** Vinca, Rauwolfia, Belladonna, Opium,

**Phenylpropanoids and Flavonoids:** Lignans, Tea, Ruta

**Steroids, Cardiac Glycosides & Triterpenoids:** Liquorice, Dioscorea, Digitalis

**Volatile oils:** Mentha, Clove, Cinnamon, Fennel, Coriander,

**Tannins:** Catechu, Pterocarpus

**Resins:** Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony

**Glycosides:** Senna, Aloes, Bitter Almond

**Iridoids, Other terpenoids & Naphthaquinones:** Gentian, Artemisia, taxus, carotenoids

#### UNIT-III

06 Hours

Isolation, Identification and Analysis of Phytoconstituents

- a) Terpenoids: Menthol, Citral, Artemisin
- b) Glycosides: Glycyrrhetic acid & Rutin
- c) Alkaloids: Atropine, Quinine, Reserpine, Caffeine
- d) Resins: Podophyllotoxin, Curcumin

#### UNIT-IV

10 Hours

Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

#### UNIT V

8 Hours

##### Basics of Phytochemistry

Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

**BP 508 P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)**

**4 Hours/Week**

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
  - a. Caffeine - from tea dust.
  - b. Diosgenin from Dioscorea
  - c. Atropine from Belladonna
  - d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstituents by TLC
6. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

**Recommended Books: (Latest Editions)**

1. W.C.Evans, Trease and Evans Pharmacognosy, 16<sup>th</sup> edition, W.B. Saunders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37<sup>th</sup> Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), 1<sup>st</sup> Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, 1<sup>st</sup> edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.



## **BP 505 T. PHARMACEUTICAL JURISPRUDENCE (Theory)**

**45 Hours**

**Scope:** This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

**Objectives:** Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

### **Course Content:**

#### **UNIT-I**

**10 Hours**

##### **Drugs and Cosmetics Act, 1940 and its rules 1945:**

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties.

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

#### **UNIT-II**

**10 Hours**

##### **Drugs and Cosmetics Act, 1940 and its rules 1945.**

Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

#### **UNIT-III**

**10 Hours**

- **Pharmacy Act –1948:** Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and



## Penalties

- **Medicinal and Toilet Preparation Act –1955:** Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.
- **Narcotic Drugs and Psychotropic substances Act-1985 and Rules:** Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

## UNIT-IV

**08 Hours**

- **Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties
- **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties
- **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

## UNIT-V

**07 Hours**

- **Pharmaceutical Legislations** – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee
- **Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath
- **Medical Termination of Pregnancy Act**
- **Right to Information Act**
- **Introduction to Intellectual Property Rights (IPR)**

### **Recommended books: (Latest Edition)**

1. Forensic Pharmacy by B. Suresh

2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9. Bare Acts of the said laws published by Government. Reference books (Theory)

**SEMESTER VI**

## BP601T. MEDICINAL CHEMISTRY – III (Theory)

45 Hours

**Scope:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.

**Objectives:** Upon completion of the course student shall be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

### Course Content:

**Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (\*)**

#### UNIT – I

10 Hours

##### Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

**$\beta$ -Lactam antibiotics:** Penicillin, Cephalosporins,  $\beta$ - Lactamase inhibitors, Monobactams

**Aminoglycosides:** Streptomycin, Neomycin, Kanamycin

**Tetracyclines:** Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

#### UNIT – II

10 Hours

##### Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

**Macrolide:** Erythromycin Clarithromycin, Azithromycin.

**Miscellaneous:** Chloramphenicol\*, Clindamycin.

**Prodrugs:** Basic concepts and application of prodrugs design.

**Antimalarials:** Etiology of malaria.

**Quinolines:** SAR, Quinine sulphate, Chloroquine\*, Amodiaquine, Primaquine phosphate, Pamaquine\*, Quinacrine hydrochloride, Mefloquine.

**Biguanides and dihydro triazines:** Cycloguanil pamoate, Proguanil.

**Miscellaneous:** Pyrimethamine, Artesunate, Artemether, Atovaquone.

### UNIT – III

**10 Hours**

#### **Anti-tubercular Agents**

**Synthetic anti tubercular agents:** Isoniazid\*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.\*

**Anti tubercular antibiotics:** Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate.

#### **Urinary tract anti-infective agents**

**Quinolones:** SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin\*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

**Miscellaneous:** Furazolidine, Nitrofurantoin\*, Methanamine.

#### **Antiviral agents:**

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir\*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

### UNIT – IV

**08 Hours**

#### **Antifungal agents:**

**Antifungal antibiotics:** Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

**Synthetic Antifungal agents:** Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconazole, Miconazole\*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate\*.

**Anti-protozoal Agents:** Metronidazole\*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

**Anthelmintics:** Diethylcarbamazine citrate\*, Thiabendazole, Mebendazole\*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.

### **Sulphonamides and Sulfones**

Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfoxazole, Sulphamethizine, Sulfacetamide\*, Sulphapyridine, Sulfamethoxazole\*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

**Folate reductase inhibitors:** Trimethoprim\*, Cotrimoxazole.

**Sulfones:** Dapsone\*.

## **UNIT – V**

**07 Hours**

### **Introduction to Drug Design**

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammett's electronic parameter, Taft's steric parameter and Hansch analysis.

Pharmacophore modeling and docking techniques.

**Combinatorial Chemistry:** Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

## BP607P. MEDICINAL CHEMISTRY- III (Practical)

4 Hours / week

### **I Preparation of drugs and intermediates**

- 1 Sulphanilamide
- 2 7-Hydroxy, 4-methyl coumarin
- 3 Chlorobutanol
- 4 Triphenyl imidazole
- 5 Tolbutamide
- 6 Hexamine

### **II Assay of drugs**

- 1 Isonicotinic acid hydrazide
- 2 Chloroquine
- 3 Metronidazole
- 4 Dapsone
- 5 Chlorpheniramine maleate
- 6 Benzyl penicillin

### **III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique**

### **IV Drawing structures and reactions using chem draw®**

### **V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)**

### **Recommended Books (Latest Editions)**

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.

7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.



## **BP602 T. PHARMACOLOGY-III (Theory)**

**45 Hours**

**Scope:** This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and chronopharmacology.

**Objectives:** Upon completion of this course the student should be able to:

1. understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. comprehend the principles of toxicology and treatment of various poisonings and
3. appreciate correlation of pharmacology with related medical sciences.

### **Course Content:**

#### **UNIT-I**

**10hours**

##### **1. Pharmacology of drugs acting on Respiratory system**

- a. Anti -asthmatic drugs
- b. Drugs used in the management of COPD
- c. Expectorants and antitussives
- d. Nasal decongestants
- e. Respiratory stimulants

##### **2. Pharmacology of drugs acting on the Gastrointestinal Tract**

- a. Antiulcer agents.
- b. Drugs for constipation and diarrhoea.
- c. Appetite stimulants and suppressants.
- d. Digestants and carminatives.
- e. Emetics and anti-emetics.

#### **UNIT-II**

**10hours**

##### **3. Chemotherapy**

- a. General principles of chemotherapy.
- b. Sulfonamides and cotrimoxazole.
- c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

#### **UNIT-III**

**10hours**

##### **3. Chemotherapy**

- a. Antitubercular agents
- b. Antileprotic agents

- c. Antifungal agents
- d. Antiviral drugs
- e. Anthelmintics
- f. Antimalarial drugs
- g. Antiamoebic agents

**UNIT-IV**

**08hours**

**3. Chemotherapy**

- l. Urinary tract infections and sexually transmitted diseases.
- m. Chemotherapy of malignancy.

**4. Immunopharmacology**

- a. Immunostimulants
- b. Immunosuppressant

Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

**UNIT-V**

**07hours**

**5. Principles of toxicology**

- a. Definition and basic knowledge of acute, subacute and chronic toxicity.
- b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
- c. General principles of treatment of poisoning
- d. Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning.

**6. Chronopharmacology**

- a. Definition of rhythm and cycles.
- b. Biological clock and their significance leading to chronotherapy.

## BP 608 P. PHARMACOLOGY-III (Practical)

4Hrs/Week

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens ( rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology( student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

*\*Experiments are demonstrated by simulated experiments/videos*

### Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

## **BP 603 T. HERBAL DRUG TECHNOLOGY**

**(Theory)**

**45 hours**

**Scope:** This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

**Objectives:** Upon completion of this course the student should be able to:

1. understand raw material as source of herbal drugs from cultivation to herbal drug product
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP .

### **Course content:**

#### **UNIT-I**

**11 Hours**

##### **Herbs as raw materials**

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation

Source of Herbs

Selection, identification and authentication of herbal materials

Processing of herbal raw material

##### **Biodynamic Agriculture**

Good agricultural practices in cultivation of medicinal plants including Organic farming.

Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

##### **Indian Systems of Medicine**

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy

b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas,

Ghutika, Churna, Lehya and Bhasma.

#### **UNIT-II**

**7 Hours**

##### **Nutraceuticals**

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

**Herbal-Drug and Herb-Food Interactions:** General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

#### **UNIT-III**

**10 Hours**

##### **Herbal Cosmetics**

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

**Herbal excipients:**

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

**Herbal formulations :**

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

**UNIT- IV**

**10 Hours**

**Evaluation of Drugs** WHO & ICH guidelines for the assessment of herbal drugs  
Stability testing of herbal drugs.

**Patenting and Regulatory requirements of natural products:**

- a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy
- b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

**Regulatory Issues** - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

**UNIT-V**

**07 Hours**

**General Introduction to Herbal Industry**

Herbal drugs industry: Present scope and future prospects.

A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

**Schedule T – Good Manufacturing Practice of Indian systems of medicine**

Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

## **BP 609 P. HERBAL DRUG TECHNOLOGY (Practical)**

**4 hours/ week**

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

### **Recommended Books: (Latest Editions)**

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

## **BP 604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory)**

45 Hours

**Scope:** This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arising therein.

**Objectives:** Upon completion of the course student shall be able to:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

### **Course Content:**

#### **UNIT-I**

**10 Hours**

##### **Introduction to Biopharmaceutics**

**Absorption:** Mechanisms of drug absorption through GIT, factors influencing drug absorption through GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

#### **UNIT- II**

**10 Hours**

**Elimination:** Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

**Bioavailability and Bioequivalence:** Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

#### **UNIT- III**

**10 Hours**

**Pharmacokinetics:** Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters -  $K_E$ ,  $t_{1/2}$ ,  $V_d$ ,  $AUC$ ,  $K_a$ ,  $Cl_t$  and  $Cl_R$ - definitions methods of eliminations, understanding of their significance and application

**UNIT- IV****08 Hours****Multicompartment models:** Two compartment open model. IV bolus

Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.

**UNIT- V****07 Hours****Nonlinear Pharmacokinetics:** a. Introduction, b. Factors causing Non-linearity.

c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

**Recommended Books: (Latest Editions)**

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition, Prentice-Hall International edition. USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal, Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Gibaldi Donald, R. Mercei Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and
9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Robert F Notari Marcel Dekker Inc, New York and Basel, 1987.
12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania





## **BP 605 T. PHARMACEUTICAL BIOTECHNOLOGY (Theory)**

**45 Hours**

### **Scope:**

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

**Objectives:** Upon completion of the subject student shall be able to;

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

### **Unit I**

**10 Hours**

- a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
- b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.
- c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
- d) Brief introduction to Protein Engineering.
- e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
- f) Basic principles of genetic engineering.

### **Unit II**

**10 Hours**

- a) Study of cloning vectors, restriction endonucleases and DNA ligase.
- b) Recombinant DNA technology. Application of genetic engineering in medicine.
- c) Application of r DNA technology and genetic engineering in the production of:
  - i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.
- d) Brief introduction to PCR

### **Unit III**

**10 Hours**

Types of immunity- humoral immunity, cellular immunity

- a) Structure of Immunoglobulins
- b) Structure and Function of MHC
- c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.
- d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
- e) Storage conditions and stability of official vaccines
- f) Hybridoma technology- Production, Purification and Applications
- g) Blood products and Plasma Substitutes.

### **Unit IV**

**08Hours**

- a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
- b) Genetic organization of Eukaryotes and Prokaryotes
- c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.
- d) Introduction to Microbial biotransformation and applications.
- e) Mutation: Types of mutation/mutants.

### **Unit V**

**07 Hours**

- a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.
- b) Large scale production fermenter design and its various controls.
- c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,
- d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.

#### **Recommended Books (Latest edition):**

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. ~~J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal~~

Society of Chemistry.

5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

## **BP606TPHARMACEUTICAL QUALITY ASSURANCE (Theory)**

**45 Hours**

**Scope:** This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

**Objectives:** Upon completion of the course student shall be able to:

- understand the cGMP aspects in a pharmaceutical industry
- appreciate the importance of documentation
- understand the scope of quality certifications applicable to pharmaceutical industries
- understand the responsibilities of QA & QC departments

**Course content:**

### **UNIT – I**

**10 Hours**

**Quality Assurance and Quality Management concepts:** Definition and concept of Quality control, Quality assurance and GMP

**Total Quality Management (TQM):** Definition, elements, philosophies

**ICH Guidelines:** purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines

**Quality by design (QbD):** Definition, overview, elements of QbD program, tools

**ISO 9000 & ISO14000:** Overview, Benefits, Elements, steps for registration

**NABL accreditation :** Principles and procedures

### **UNIT - II**

**10 Hours**

**Organization and personnel:** Personnel responsibilities, training, hygiene and personal records.

**Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

**Equipments and raw materials:** Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

### **UNIT – III**

**10 Hours**

**Quality Control:** Quality control test for containers, rubber closures and secondary packing

materials.

**Good Laboratory Practices:** General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

#### **UNIT – IV**

**08 Hours**

**Complaints:** Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

**Document maintenance in pharmaceutical industry:** Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

#### **UNIT – V**

**07 Hours**

**Calibration and Validation:** Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

**Warehousing:** Good warehousing practice, materials management

#### **Recommended Books: (Latest Edition)**

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2<sup>nd</sup> Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

**SEMESTER VII**

## **BP701T. INSTRUMENTAL METHODS OF ANALYSIS (Theory)**

**45 Hours**

**Scope:** This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

**Objectives:** Upon completion of the course the student shall be able to

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

### **Course Content:**

#### **UNIT –I**

**10 Hours**

##### **UV Visible spectroscopy**

Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.

Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.

Applications - Spectrophotometric titrations, Single component and multi component analysis

##### **Fluorimetry**

Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications

#### **UNIT –II**

**10 Hours**

##### **IR spectroscopy**

Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations

Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications

**Flame Photometry**-Principle, interferences, instrumentation and applications



**Atomic absorption spectroscopy-** Principle, interferences, instrumentation and applications

**Nepheloturbidometry-** Principle, instrumentation and applications

**UNIT –III**

**10 Hours**

**Introduction to chromatography**

**Adsorption and partition column chromatography-**Methodology, advantages, disadvantages and applications.

**Thin layer chromatography-** Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.

**Paper chromatography-**Introduction, methodology, development techniques, advantages, disadvantages and applications

**Electrophoresis–** Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications

**UNIT –IV**

**08 Hours**

**Gas chromatography -** Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

**High performance liquid chromatography (HPLC)-**Introduction, theory, instrumentation, advantages and applications.

**UNIT –V**

**07 Hours**

**Ion exchange chromatography-** Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications

**Gel chromatography-** Introduction, theory, instrumentation and applications

**Affinity chromatography-** Introduction, theory, instrumentation and applications

## **BP705P. INSTRUMENTAL METHODS OF ANALYSIS (Practical)**

**4 Hours/Week**

- 1 Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
- 2 Estimation of dextrose by colorimetry
- 3 Estimation of sulfanilamide by colorimetry
- 4 Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
- 5 Assay of paracetamol by UV- Spectrophotometry
- 6 Estimation of quinine sulfate by fluorimetry
- 7 Study of quenching of fluorescence
- 8 Determination of sodium by flame photometry
- 9 Determination of potassium by flame photometry
- 10 Determination of chlorides and sulphates by nephelo turbidometry
- 11 Separation of amino acids by paper chromatography
- 12 Separation of sugars by thin layer chromatography
- 13 Separation of plant pigments by column chromatography
- 14 Demonstration experiment on HPLC
- 15 Demonstration experiment on Gas Chromatography

### **Recommended Books (Latest Editions)**

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

## BP 702 T. INDUSTRIAL PHARMACYII (Theory)

45 Hours

**Scope:** This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market

**Objectives:** Upon completion of the course, the student shall be able to:

1. Know the process of pilot plant and scale up of pharmaceutical dosage forms
2. Understand the process of technology transfer from lab scale to commercial batch
3. Know different Laws and Acts that regulate pharmaceutical industry
4. Understand the approval process and regulatory requirements for drug products

### Course Content:

#### UNIT-I

10 Hours

**Pilot plant scale up techniques:** General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

#### UNIT-II

10 Hours

**Technology development and transfer:** WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

#### UNIT-III

10 Hours

**Regulatory affairs:** Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals

**Regulatory requirements for drug approval:** Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

**UNIT-IV****08 Hours**

**Quality management systems:** Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

**UNIT-V****07 Hours**

**Indian Regulatory Requirements:** Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

**Recommended Books: (Latest Editions)**

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7<sup>th</sup> April available at [http://en.wikipedia.org/wiki/Regulatory\\_Affairs](http://en.wikipedia.org/wiki/Regulatory_Affairs).
2. International Regulatory Affairs Updates, 2005. available at <http://www.iraup.com/about.php>
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available at <http://www.cgmp.com/ra.htm>.

## **BP 703T. PHARMACY PRACTICE (Theory)**

**45 Hours**

**Scope:** In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.

**Objectives:** Upon completion of the course, the student shall be able to

1. know various drug distribution methods in a hospital
2. appreciate the pharmacy stores management and inventory control
3. monitor drug therapy of patient through medication chart review and clinical review
4. obtain medication history interview and counsel the patients
5. identify drug related problems
6. detect and assess adverse drug reactions
7. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
8. know pharmaceutical care services
9. do patient counseling in community pharmacy;
10. appreciate the concept of Rational drug therapy.

### **Unit I:**

**10 Hours**

#### **a) Hospital and its organization**

Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.

#### **b) Hospital pharmacy and its organization**

Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

#### **c) Adverse drug reaction**

Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting

drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

**d) Community Pharmacy**

Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

**Unit II:**

**10 Hours**

**a) Drug distribution system in a hospital**

Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.

**b) Hospital formulary**

Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

**c) Therapeutic drug monitoring**

Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

**d) Medication adherence**

Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

**e) Patient medication history interview**

Need for the patient medication history interview, medication interview forms.

**f) Community pharmacy management**

Financial, materials, staff, and infrastructure requirements.

**Unit III:**

**10 Hours**

**a) Pharmacy and therapeutic committee**

Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

**b) Drug information services**

Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.

**c) Patient counseling**

Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist

**d) Education and training program in the hospital**

Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.

**e) Prescribed medication order and communication skills**

Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

**Unit IV**

**8 Hours**

**Budget preparation and implementation**

Budget preparation and implementation

**a) Clinical Pharmacy**

Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care.

Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.

**b) Over the counter (OTC) sales**

Introduction and sale of over the counter, and Rational use of common over the counter medications.

**Unit V**

**7 Hours**

**a) Drug store management and inventory control**

Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

**b) Investigational use of drugs**

Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

**c) Interpretation of Clinical Laboratory Tests**

Blood chemistry, hematology, and urinalysis

**Recommended Books (Latest Edition):**

1. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills*, 1<sup>st</sup> ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger; 1986.
4. Tipnis Bajaj. *Hospital Pharmacy*, 1<sup>st</sup> ed. Maharashtra: Career Publications; 2008.
5. Scott LT. *Basic skills in interpreting laboratory data*, 4th ed. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N.S. *Health Education and Community Pharmacy*, 18th ed. India: CBS Publishers & Distributers; 2008.

**Journals:**

1. Therapeutic drug monitoring. ISSN: 0163-4356
2. Journal of pharmacy practice. ISSN : 0974-8326
3. American journal of health system pharmacy. ISSN: 1535-2900 (online)
4. Pharmacy times (Monthly magazine)

**Skill Enhancement Course : Practical (Qualifying course) (BP706PS-A)**

**CO: COURSE OBJECTIVES**

**CO-1** To equip students with hands-on skills and practical knowledge in various areas of pharmaceutical sciences, such as formulation, quality control, and analysis of pharmaceuticals.

**CO-2** To ensure students become proficient in laboratory techniques, including synthesis, testing, and analysis of drugs, as well as handling sophisticated instruments.

**CO-3** To cultivate ethical conduct and adherence to safety guidelines in the laboratory and other professional environments.

**CO-4** To strengthen students' ability to communicate scientific findings, collaborate in team-based projects, and present results effectively.

**CO-5** To prepare students for professional roles in the pharmaceutical industry, hospitals, and research by simulating real-world challenges and work environments.

**CO-6** To promote critical thinking and analytical skills, encouraging students to troubleshoot problems, analyze



data, and optimize processes.

**Practical:**

1. Patient counseling techniques.
2. Drug-drug interaction checks using standard drug databases.
3. Case studies on common diseases (like hypertension, diabetes, etc.)
4. Interpretation of laboratory data relevant to drug therapy.
5. Inventory control and management (FIFO, LIFO methods)
6. Preparation of reports on hospital pharmacy systems (outpatient and inpatient)
7. Practical sessions on Good Manufacturing Practices (GMP) and Quality Control
8. Familiarization with medical equipment used in hospitals and clinics.

**COURSE OUTCOMES**

**COs-1** Students will develop practical skills relevant to the pharmaceutical or technical industry through hands-on experience.

**COs-2** Students will Gain familiarity with standard equipment and techniques used in laboratory or field environments.

**COs-3** Students will learn and apply regulatory, safety, and ethical standards in practical situations, including laboratory work and industrial practices.

**COs-4** Students will develop effective communication and teamwork skills through group projects and collaborative tasks.

**COs-5** Students will be able to learn the skills to plan, execute, and manage time efficiently in practical projects and assignments.

**Suggested Readings:**

- "Pharmaceutical Analysis: A Textbook for Pharmacy Students and Pharmaceutical Chemists" by David G. Watson.
- "Practical Skills in Pharmacy" by John Hickey and Marjorie Weiss.
- "Pharmacy Practice" by Kevin Taylor, Geoffrey Harding, and Azzah Al-Muhtadi.

## Data Analysis / Computer Programming (BP706PS-B)

### CO: COURSE OBJECTIVES

**CO-1** To introduce students to fundamental programming concepts and techniques, including variables, data types, operators, control structures, and functions.

**CO-2** To provide knowledge about common data structures such as arrays, lists, stacks, queues, and their applications in organizing and managing data.

**CO-3** To teach students how to create and interpret various forms of data visualizations (e.g., charts, graphs) using programming tools.

**CO-4** To provide students with knowledge of basic statistical methods and how to apply them to analyze datasets using programming.

**CO-5** To guide students in designing and implementing projects that involve significant data analysis tasks, fostering creativity and problem-solving skills.

### Practical:

1. Handling missing values, outliers, and duplicates.
2. Visualizing data using plots (e.g., histograms, box plots, scatter plots), identifying patterns.
3. Retrieving data, joining tables, and performing aggregate functions.
4. Basics of working with databases like MongoDB or Firebase.
5. Students may be required to build a project based on real-world datasets, where they demonstrate data analysis, visualization, and model-building skills.
6. Using visual analytics tools for advanced data presentation.

### COURSE OUTCOMES

**COs-1** Students will demonstrate proficiency in at least one programming language, such as Python, R, or Java, by writing clean, efficient, and bug-free code.

**COs-2** Students will perform basic and advanced statistical analyses on datasets using appropriate algorithms and techniques.

**COs-3** Students will demonstrate the ability to work with databases by retrieving, manipulating, and analyzing data using SQL or NoSQL queries.

**COs-4** Students will develop a complete data analysis project from problem identification to solution presentation, demonstrating the ability to apply course concepts to real-world data.

**COs-5** Students will be able to demonstrate an understanding of data privacy laws and ethical considerations in data analysis and programming.

### Suggested Readings:

- "Clean Code: A Handbook of Agile Software Craftsmanship" by Robert C. Martin
- "The Pragmatic Programmer: Your Journey to Mastery" by Andrew Hunt and David Thomas

## Python Programming (BP706PS-C)

### CO: COURSE OBJECTIVES

**CO-1** To provide students with an understanding of Python's syntax, basic structure, and built-in data types such as strings, lists, dictionaries, and tuples.

**CO-2** To enable students to implement conditional statements, loops (for and while), and functions to write modular code.

**CO-3** To cultivate problem-solving skills by applying Python to solve computational and real-world problems using logical algorithms.

**CO-4** To introduce object-oriented programming principles in Python, including classes, objects, inheritance, polymorphism, and encapsulation.

**CO-5** To introduce advanced data structures such as stacks, queues, linked lists, and trees, and how to implement them in Python.

**CO-6** To provide an introduction to algorithmic techniques such as searching, sorting, and basic recursion, and implementing these algorithms in Python.

### Practical:

1. **Introduction to Python IDEs** (e.g., PyCharm, Jupyter Notebook, VS Code)
2. Python Syntax and Structure: Variables, Data Types (int, float, str, bool), Basic Input and Output
3. Parameters and Return Values
4. Importing and Using Built-in Modules (e.g., math, random, datetime)
5. **Numpy** (Numerical Python) – Arrays, Matrix Operations
6. Mini Projects that apply the learned concepts, such as: Data Analysis Projects using CSV files and Pandas
7. Debugging Code using Print Statements and Python Debugger (pdb)

### COURSE OUTCOMES

**COs-1** Students will be able to understand Python Syntax and Programming Structure. Ability to write Python code using appropriate syntax.

**COs-2** Students learn to use Python for problem-solving, including mathematical calculations, string manipulation, and list operations.

**COs-3** Students will learn to understand the concept of reusable code through functions and modularization.

**COs-4** Students will develop effective communication and teamwork skills through group projects and collaborative tasks.

**COs-5** Students will be able to understand the concepts of inheritance, encapsulation, and polymorphism.

**COs-6** Ability to design and develop small applications or scripts to automate tasks or solve specific problems.

### Suggested Readings:

- “Python Crash Course” by Eric Matthes
- “Learning Python” by Mark Lutz



## **BP 704T: NOVEL DRUG DELIVERY SYSTEMS (Theory)**

**45 Hours**

**Scope:** This subject is designed to impart basic knowledge on the area of novel drug delivery systems.

**Objectives:** Upon completion of the course student shall be able

1. To understand various approaches for development of novel drug delivery systems.
2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation

### **Course content:**

#### **Unit-I**

**10 Hours**

**Controlled drug delivery systems:** Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations

**Polymers:** Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

#### **Unit-II**

**10 Hours**

**Microencapsulation:** Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications

**Mucosal Drug Delivery system:** Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

**Implantable Drug Delivery Systems:** Introduction, advantages and disadvantages, concept of implants and osmotic pump

#### **Unit-III**

**10 Hours**

**Transdermal Drug Delivery Systems:** Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

**Gastroretentive drug delivery systems:** Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications

**Nasopulmonary drug delivery system:** Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

#### **Unit-IV**

**08 Hours**

**Targeted drug Delivery:** Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

**Unit-V**

**07 Hours**

**Ocular Drug Delivery Systems:** Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts

**Intrauterine Drug Delivery Systems:** Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

**Recommended Books: (Latest Editions)**

1. Y W. Chien, Novel Drug Delivery Systems, 2<sup>nd</sup> edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

**Journals**

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian Drugs (IDMA)
3. Journal of Controlled Release (Elsevier Sciences)
4. Drug Development and Industrial Pharmacy (Marcel & Decker)
5. International Journal of Pharmaceutics (Elsevier Sciences)

**SEMESTER VIII**

## **BP801T. BIOSTATISTICS AND RESEARCH METHODOLOGY (Theory)**

**45 Hours**

**Scope:** To understand the applications of Biostatistics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel.

**Objectives:** Upon completion of the course the student shall be able to

- Know the operation of M.S. Excel, SPSS, R and MINITAB<sup>®</sup>, DoE (Design of Experiment)
- Know the various statistical techniques to solve statistical problems
- Appreciate statistical techniques in solving the problems.

### **Course content:**

#### **Unit-I**

**10 Hours**

**Introduction:** Statistics, Biostatistics, Frequency distribution

**Measures of central tendency:** Mean, Median, Mode- Pharmaceutical examples

**Measures of dispersion:** Dispersion, Range, standard deviation, Pharmaceutical problems

**Correlation:** Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples

#### **Unit-II**

**10 Hours**

**Regression:** Curve fitting by the method of least squares, fitting the lines  $y = a + bx$  and  $x = a + by$ , Multiple regression, standard error of regression- Pharmaceutical Examples

**Probability:** Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems

Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples

**Parametric test:** t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference

#### **Unit-III**

**10 Hours**

**Non Parametric tests:** Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test



**Introduction to Research:** Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism

**Graphs:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph

**Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

#### **Unit-IV**

**8 Hours**

Blocking and confounding system for Two-level factorials

**Regression modeling:** Hypothesis testing in Simple and Multiple regression models

**Introduction to Practical components of Industrial and Clinical Trials Problems:**

Statistical Analysis Using Excel, SPSS, MINITAB<sup>®</sup>, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach

#### **Unit-V**

**7Hours**

**Design and Analysis of experiments:**

**Factorial Design:** Definition,  $2^2$ ,  $2^3$  design. Advantage of factorial design

**Response Surface methodology:** Central composite design, Historical design, Optimization Techniques

#### **Recommended Books (Latest edition):**

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

## **BP 802T SOCIAL AND PREVENTIVE PHARMACY**

**Hours: 45**

### **Scope:**

The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

### **Objectives:**

After the successful completion of this course, the student shall be able to:

- Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.
- Have a critical way of thinking based on current healthcare development.
- Evaluate alternative ways of solving problems related to health and pharmaceutical issues

### **Course content:**

#### **Unit I:**

**10 Hours**

**Concept of health and disease:** Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

**Social and health education:** Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

**Sociology and health:** Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health

**Hygiene and health:** personal hygiene and health care; avoidable habits

#### **Unit II:**

**10 Hours**

**Preventive medicine:** General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse

#### **Unit III:**

**10 Hours**

**National health programs, its objectives, functioning and outcome of the following:** HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National

programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

**Unit IV:**

**08 Hours**

National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program

**Unit V:**

**07 Hours**

Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

**Recommended Books (Latest edition):**

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2<sup>nd</sup> Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4<sup>th</sup> Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6<sup>th</sup> Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2<sup>nd</sup> Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
5. Park Textbook of Preventive and Social Medicine, K Park, 21<sup>st</sup> Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

**Recommended Journals:**

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland

## **BP803ET. PHARMA MARKETING MANAGEMENT (Theory)**

**45 Hours**

### **Scope:**

The pharmaceutical industry not only needs highly qualified researchers, chemists and, technical people, but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.

**Course Objective:** The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

### **Unit I**

**10 Hours**

#### **Marketing:**

Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.

#### **Pharmaceutical market:**

Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation & targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.

### **Unit II**

**10 Hours**

#### **Product decision:**

Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.

### **Unit III**

**10 Hours**

#### **Promotion:**

Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

**Unit IV****10 Hours****Pharmaceutical marketing channels:**

Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

**Professional sales representative (PSR):**

Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

**Unit V****10 Hours****Pricing:**

Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority).

**Emerging concepts in marketing:**

Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.

**Recommended Books: (Latest Editions)**

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill
4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Management: Global Perspective, Indian Context, Macmillan India, New Delhi.
7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.



## **BP804 ET: PHARMACEUTICAL REGULATORY SCIENCE (Theory)**

**45Hours**

**Scope:** This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia, UK etc. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.

**Objectives:** Upon completion of the subject student shall be able to;

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international markets

### **Course content:**

#### **Unit I**

**10Hours**

##### **New Drug Discovery and development**

Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

#### **Unit II**

**10Hours**

##### **Regulatory Approval Process**

Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA.

##### **Regulatory authorities and agencies**

Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)

#### **Unit III**

**10Hours**

##### **Registration of Indian drug product in overseas market**

Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical

Document (eCTD), ASEAN Common Technical Document (ACTD)research.

#### **Unit IV**

**08Hours**

##### **Clinical trials**

Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials

#### **Unit V**

**07Hours**

##### **Regulatory Concepts**

Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book

##### **Recommended books (Latest edition):**

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185. Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5<sup>th</sup> edition, Drugs and the Pharmaceutical Sciences, Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
9. Drugs: From Discovery to Approval, Second Edition By Rick Ng



## **BP 805T: PHARMACOVIGILANCE (Theory)**

**45 hours**

**Scope:** This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data and signal detection. This paper also develops the skills of classifying drugs, diseases and adverse drug reactions.

### **Objectives:**

*At completion of this paper it is expected that students will be able to (know, do, and appreciate):*

1. Why drug safety monitoring is important?
2. History and development of pharmacovigilance
3. National and international scenario of pharmacovigilance
4. Dictionaries, coding and terminologies used in pharmacovigilance
5. Detection of new adverse drug reactions and their assessment
6. International standards for classification of diseases and drugs
7. Adverse drug reaction reporting systems and communication in pharmacovigilance
8. Methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle
9. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
10. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India
11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
12. CIOMS requirements for ADR reporting
13. Writing case narratives of adverse events and their quality.

### **Course Content**

#### **Unit I**

**10 Hours**

##### **Introduction to Pharmacovigilance**

- History and development of Pharmacovigilance
- Importance of safety monitoring of Medicine
- WHO international drug monitoring programme
- Pharmacovigilance Program of India(PvPI)

##### **Introduction to adverse drug reactions**

- Definitions and classification of ADRs
- Detection and reporting
- Methods in Causality assessment
- Severity and seriousness assessment
- Predictability and preventability assessment
- Management of adverse drug reactions

##### **Basic terminologies used in pharmacovigilance**

- Terminologies of adverse medication related events
- Regulatory terminologies

## **Unit II**

**10 hours**

### **Drug and disease classification**

- Anatomical, therapeutic and chemical classification of drugs
- International classification of diseases
- Daily defined doses
- International Non proprietary Names for drugs

### **Drug dictionaries and coding in pharmacovigilance**

- WHO adverse reaction terminologies
- MedDRA and Standardised MedDRA queries
- WHO drug dictionary
- Eudravigilance medicinal product dictionary

### **Information resources in pharmacovigilance**

- Basic drug information resources
- Specialised resources for ADRs

### **Establishing pharmacovigilance programme**

- Establishing in a hospital
- Establishment & operation of drug safety department in industry
- Contract Research Organisations (CROs)
- Establishing a national programme

## **Unit III**

**10 Hours**

### **Vaccine safety surveillance**

- Vaccine Pharmacovigilance
- Vaccination failure
- Adverse events following immunization

### **Pharmacovigilance methods**

- Passive surveillance – Spontaneous reports and case series
- Stimulated reporting
- Active surveillance – Sentinel sites, drug event monitoring and registries
- Comparative observational studies – Cross sectional study, case control study and cohort study
- Targeted clinical investigations

### **Communication in pharmacovigilance**

- Effective communication in Pharmacovigilance
- Communication in Drug Safety Crisis management
- Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media

## Unit IV

8 Hours

### Safety data generation

- Pre clinical phase
- Clinical phase
- Post approval phase (PMS)

### ICH Guidelines for Pharmacovigilance

- Organization and objectives of ICH
- Expedited reporting
- Individual case safety reports
- Periodic safety update reports
- Post approval expedited reporting
- Pharmacovigilance planning
- Good clinical practice in pharmacovigilance studies

## Unit V

7 hours

### Pharmacogenomics of adverse drug reactions

- Genetics related ADR with example focusing PK parameters.

### Drug safety evaluation in special population

- Paediatrics
- Pregnancy and lactation
- Geriatrics

### CIOMS

- CIOMS Working Groups
- CIOMS Form

### CDSCO (India) and Pharmacovigilance

- D&C Act and Schedule Y
- Differences in Indian and global pharmacovigilance requirements

### Recommended Books (Latest edition):

1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.
5. An Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers.
6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones & Bartlett Publishers.
7. Textbook of Pharmacoepidemiology edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers.
8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills: G. Parthasarathi, Karin Nyfort Hansen, Milap C. Nahata
9. National Formulary of India
10. Text Book of Medicine by Yashpal Munjal

11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna

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12. <http://www.who/umc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297>
13. <http://www.ich.org/>
14. <http://www.cioms.ch/>
15. <http://edsco.nic.in/>
16. [http://www.who.int/vaccine\\_safety/en/](http://www.who.int/vaccine_safety/en/)
17. [http://www.ipc.gov.in/PvPI/pv\\_home.html](http://www.ipc.gov.in/PvPI/pv_home.html)

## **BP 806 ET. QUALITY CONTROL AND STANDARDIZATION OF HERBALS (Theory)**

**Scope:** In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

**Objectives:** Upon completion of the subject student shall be able to;

1. know WHO guidelines for quality control of herbal drugs
2. know Quality assurance in herbal drug industry
3. know the regulatory approval process and their registration in Indian and international markets
4. appreciate EU and ICH guidelines for quality control of herbal drugs

### **Unit I**

**10 hours**

Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms

WHO guidelines for quality control of herbal drugs.

Evaluation of commercial crude drugs intended for use

### **Unit II**

**10 hours**

**Quality assurance in herbal drug industry** of cGMP, GAP, GMP and GLP in traditional system of medicine.

WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines

WHO Guidelines on GACP for Medicinal Plants.

### **Unit III**

**10 hours**

EU and ICH guidelines for quality control of herbal drugs.

Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

### **Unit IV**

**08 hours**

Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products.

Preparation of documents for new drug application and export registration

GMP requirements and Drugs & Cosmetics Act provisions.

## **Unit V**

**07 hours**

Regulatory requirements for herbal medicines.

WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems

Comparison of various Herbal Pharmacopoeias.

Role of chemical and biological markers in standardization of herbal products

### **Recommended Books: (Latest Editions)**

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I, Carrier Pub., 2006.
4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.
5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,
6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.
8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.
9. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.
10. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
11. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.
12. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

## BP 807 ET. COMPUTER AIDED DRUG DESIGN (Theory)

45 Hours

**Scope:** This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

**Objectives:** Upon completion of the course, the student shall be able to understand

- Design and discovery of lead molecules
- The role of drug design in drug discovery process
- The concept of QSAR and docking
- Various strategies to develop new drug like molecules.
- The design of new drug molecules using molecular modeling software

### Course Content:

#### UNIT-I

10 Hours

##### Introduction to Drug Discovery and Development

Stages of drug discovery and development

##### Lead discovery and Analog Based Drug Design

Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.

**Analog Based Drug Design:** Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

#### UNIT-II

10 Hours

##### Quantitative Structure Activity Relationship (QSAR)

SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammett's substituent constant and Taft's steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

#### UNIT-III

10 Hours

##### Molecular Modeling and virtual screening techniques

**Virtual Screening techniques:** Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,

**Molecular docking:** Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.



**UNIT-IV****08 Hours****Informatics & Methods in drug design**

Introduction to Bioinformatics, chemo informatics. ADME databases, chemical, biochemical and pharmaceutical databases.

**UNIT-V****07 Hours**

**Molecular Modeling:** Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.

**Recommended Books (Latest Editions)**

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.
3. Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.
4. Foye WO "Principles of Medicinal chemistry 'Lea & Febiger.
5. Koro Ikovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
6. Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" John Wiley & Sons, New York.
7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
8. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
9. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action" Academic Press New York.

**BP808ET: CELL AND MOLECULAR BIOLOGY (Elective subject)**

**45 Hours**

**Scope:**

- Cell biology is a branch of biology that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function.
- This is done both on a microscopic and molecular level.
- Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organisms such as humans, plants, and sponges.

**Objectives:** Upon completion of the subject student shall be able to;

- Summarize cell and molecular biology history.
- Summarize cellular functioning and composition.
- Describe the chemical foundations of cell biology.
- Summarize the DNA properties of cell biology.
- Describe protein structure and function.
- Describe cellular membrane structure and function.
- Describe basic molecular genetic mechanisms.
- Summarize the Cell Cycle

**Course content:**

**Unit I**

**10Hours**

- a) Cell and Molecular Biology: Definitions theory and basics and Applications.
- b) Cell and Molecular Biology: History and Summation.
- c) Properties of cells and cell membrane.
- d) Prokaryotic versus Eukaryotic
- e) Cellular Reproduction
- f) Chemical Foundations – an Introduction and Reactions (Types)

**Unit II**

**10 Hours**

- a) DNA and the Flow of Molecular Information
- b) DNA Functioning
- c) DNA and RNA
- d) Types of RNA
- e) Transcription and Translation

**Unit III**

**10 Hours**

- a) Proteins: Defined **and** Amino Acids
- b) Protein Structure

- c) Regularities in Protein Pathways
- d) Cellular Processes
- e) Positive Control and significance of Protein Synthesis

**Unit IV**

**08 Hours**

- a) Science of Genetics
- b) Transgenics and Genomic Analysis
- c) Cell Cycle analysis
- d) Mitosis and Meiosis
- e) Cellular Activities and Checkpoints

**Unit V**

**07 Hours**

- a) Cell Signals: Introduction
- b) Receptors for Cell Signals
- c) Signaling Pathways: Overview
- d) Misregulation of Signaling Pathways
- e) Protein-Kinases: Functioning

**Recommended Books (latest edition):**

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4<sup>th</sup> edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Pepler: Microbial Technology.
9. Edward: Fundamentals of Microbiology.
10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
12. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
13. RA Goldshy et. al., : Kuby Immunology.

## BP809ET. COSMETIC SCIENCE(Theory)

45Hours

### UNIT I

10Hours

Classification of cosmetic and cosmeceutical products

Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs

**Cosmetic excipients:** Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application

**Skin:** Basic structure and function of skin.

**Hair:** Basic structure of hair. Hair growth cycle.

**Oral Cavity:** Common problem associated with teeth and gums.

### UNIT II

10 Hours

**Principles of formulation and building blocks of skin care products:**

Face wash,

Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals.

**Antiperspirants & deodorants-** Actives & mechanism of action.

**Principles of formulation and building blocks of Hair care products:**

Conditioning shampoo, Hair conditioner, anti-dandruff shampoo.

Hair oils.

Chemistry and formulation of Para-phenylene diamine based hair dye.

Principles of formulation and building blocks of oral care products:

Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

### UNIT III

10 Hours

Sun protection, Classification of Sunscreens and SPF.

**Role of herbs in cosmetics:**

Skin Care: Aloe and turmeric

Hair care: Henna and amla.

Oral care: Neem and clove

**Analytical cosmetics:** BIS specification and analytical methods for shampoo, skin-cream and toothpaste.

### UNIT IV

08 Hours.

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties

Soaps, and syndet bars. Evolution and skin benefits.

## **UNIT V**

**07 Hours**

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis.

Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes

Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor.

Antiperspirants and Deodorants- Actives and mechanism of action

### **References**

- 1) Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
- 2) Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4<sup>th</sup> Edition, Vandana Publications Pvt. Ltd., Delhi.
- 3) Text book of cosmeticology by Sanju Nanda & Roop K. Khar, Tata Publishers.

## BP810 ET. PHARMACOLOGICAL SCREENING METHODS

45 Hours

**Scope:** This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.

### Objectives

Upon completion of the course the student shall be able to,

- Appreciate the applications of various commonly used laboratory animals.
- Appreciate and demonstrate the various screening methods used in preclinical research
- Appreciate and demonstrate the importance of biostatistics and research methodology
- Design and execute a research hypothesis independently

<b>Unit –I</b>	<b>08 Hours</b>
<b>Laboratory Animals:</b> Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.	
<b>Unit –II</b>	<b>10 Hours</b>
<b>Preclinical screening models</b> a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study. <b>b. Study of screening animal models for</b> Diuretics, nootropics, anti-Parkinson's, antiasthmatics, <b>Preclinical screening models:</b> for CNS activity- analgesic, antipyretic, anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease	

<p><b>Unit –III</b></p> <p><b>Preclinical screening models:</b> for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics</p>	
<p><b>Unit –IV</b></p> <p><b>Preclinical screening models:</b> for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslipidemic, anti aggregatory, coagulants, and anticoagulants</p> <p>Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.</p>	
<p><b>Research methodology and Bio-statistics</b></p> <p>Selection of research topic, review of literature, research hypothesis and study design</p> <p>Pre-clinical data analysis and interpretation using Students ‘t’ test and One-way ANOVA. Graphical representation of data</p>	<p><b>05 Hours</b></p>

**Recommended Books (latest edition):**

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. CPCSEA guidelines for laboratory animal facility.
4. Drug discovery and Evaluation by Vogel H.G.
5. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

## BP 811 ET. ADVANCED INSTRUMENTATION TECHNIQUES

45 Hours

**Scope:** This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

**Objectives:** Upon completion of the course the student shall be able to

- understand the advanced instruments used and its applications in drug analysis
- understand the chromatographic separation and analysis of drugs.
- understand the calibration of various analytical instruments
- know analysis of drugs using various analytical instruments.

### Course Content:

#### UNIT-I

10 Hours

##### **Nuclear Magnetic Resonance spectroscopy**

Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

**Mass Spectrometry-** Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications

#### UNIT-II

10 Hours

**Thermal Methods of Analysis:** Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

**X-Ray Diffraction Methods:** Origin of X-rays, basic aspects of crystals, X-ray

Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.

#### UNIT-III

10 Hours

**Calibration and validation-**as per ICH and USFDA guidelines

##### **Calibration of following Instruments**

Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer,



Fluorimeter, Flame Photometer, HPLC and GC

**UNIT-IV**

**08 Hours**

**Radio immune assay:**Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

**Extraction techniques:**General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

**UNIT-V**

**07 Hours**

**Hyphenated techniques-**LC-MS/MS, GC-MS/MS, HPTLC-MS.

**Recommended Books (Latest Editions)**

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

## BP 812 ET. DIETARY SUPPLEMENTS AND NUTRACEUTICALS

**No. of hours :3**

**Tutorial:1**

**Credit point:4**

### **Scope :**

This subject covers foundational topic that are important for understanding the need and requirements of dietary supplements among different groups in the population.

### **Objective:**

This module aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements. By the end of the course, students should be able to :

1. Understand the need of supplements by the different group of people to maintain healthy life.
2. Understand the outcome of deficiencies in dietary supplements.
3. Appreciate the components in dietary supplements and the application.
4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims.

### **UNIT I**

**07 hours**

- a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.
- b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.
- c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

### **UNIT II**

**15 hours**

Phytochemicals as nutraceuticals: Occurrence and characteristic features(chemical nature medicinal benefits) of following

- a) Carotenoids-  $\alpha$  and  $\beta$ -Carotene, Lycopene, Xanthophylls, leutin
- b) Sulfides: Diallyl sulfides, Allyl trisulfide.
- c) Polyphenolics: Reservetrol
- d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones
- e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum
- f) Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans
- g) Tocopherols
- h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.

### **UNIT III**

**07 hours**

- a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.

- b) Dietary fibres and complex carbohydrates as functional food ingredients..

**UNIT IV**

**10 hours**

- a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.
- b) Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E,  $\alpha$ - Lipoic acid, melatonin  
Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole.
- c) Functional foods for chronic disease prevention

**UNIT V**

**06 hours**

- a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.
- b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.
- c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.

**References:**

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K.T Agusti and P.Faizal: BSPublication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2<sup>nd</sup> Edn., Avery Publishing Group, NY (1997).
6. G. Gibson and C.williams Editors *2000 Functional foods* Woodhead Publ.Co.London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M.K. Sachmidl and T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea and Febiger

**Semester VIII – Elective course on Pharmaceutical Product Development**

**No of Hours: 3**

**Tutorial:1**

**Credit points:4**

**Unit-I**

**10 Hours**

Introduction to pharmaceutical product development, objectives, regulations related to preformulation, formulation development, stability assessment, manufacturing and quality control testing of different types of dosage forms

**Unit-II**

**10 Hours**

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories

- i. Solvents and solubilizers
- ii. Cyclodextrins and their applications
- iii. Non - ionic surfactants and their applications
- iv. Polyethylene glycols and sorbitols
- v. Suspending and emulsifying agents
- vi. Semi solid excipients

**Unit-III**

**10 Hours**

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories

- i. Tablet and capsule excipients
- ii. Directly compressible vehicles
- iii. Coat materials
- iv. Excipients in parenteral and aerosols products
- v. Excipients for formulation of NDDS

Selection and application of excipients in pharmaceutical formulations with specific industrial applications

**Unit-IV**

**08 Hours**

Optimization techniques in pharmaceutical product development. A study of various optimization techniques for pharmaceutical product development with specific examples. Optimization by factorial designs and their applications. A study of QbD and its application in pharmaceutical product development.

**Unit-V**

**07 Hours**

Selection and quality control testing of packaging materials for pharmaceutical product development- regulatory considerations.



### **Recommended Books (Latest editions)**

1. Pharmaceutical Statistics Practical and Clinical Applications by Stanford Bolton, CharlesBon; Marcel Dekker Inc.
2. Encyclopedia of Pharmaceutical Technology, edited by James swarbrick, Third Edition, Informa Healthcare publishers.
3. Pharmaceutical Dosage Forms, Tablets, Volume II, edited by Herbert A. Lieberman and Leon Lachman; Marcel Dekker, Inc.
4. The Theory and Practice of Industrial Pharmacy, Fourth Edition, edited by Roop kKhar, S P Vyas, Farhan J Ahmad, Gaurav K Jain; CBS Publishers and Distributors Pvt.Ltd. 2013.
5. Martin's Physical Pharmacy and Pharmaceutical Sciences, Fifth Edition, edited by Patrick J. Sinko, BI Publications Pvt. Ltd.
6. Targeted and Controlled Drug Delivery, Novel Carrier Systems by S. P. Vyas and R. K.Khar, CBS Publishers and Distributors Pvt. Ltd, First Edition 2012.
7. Pharmaceutical Dosage Forms and Drug Delivery Systems, Loyd V. Allen Jr., Nicholas B.Popovich, Howard C. Ansel, 9th Ed. 40
8. Aulton's Pharmaceutics – The Design and Manufacture of Medicines, Michael E. Aulton, 3rd Ed.
9. Remington – The Science and Practice of Pharmacy, 20th Ed.
10. Pharmaceutical Dosage Forms – Tablets Vol 1 to 3, A. Liberman, Leon Lachman and Joseph B. Schwartz
11. Pharmaceutical Dosage Forms – Disperse Systems Vol 1 to 3, H.A. Liberman, Martin, M.R and Gilbert S. Banker.
12. Pharmaceutical Dosage Forms – Parenteral Medication Vol 1 & 2, Kenneth E. Avis and H.A. Libermann.
13. Advanced Review Articles related to the topics.



# Shobhit University, Gangoh

(Established by UP Shobhit University Act No. 3, 2012)

## School Of Pharmacy

### Ordinances, Regulations & Syllabus

For

**Bachelor of Pharmacy (B.Pharm) 4 Year Programme Semester  
Pattern**

(w.e.f.session2013-14)

**Approved by Pharmacy Council of India and  
adopted in the year 2013, 1<sup>st</sup> Meeting, Board of  
Studies.**

[Frame under Regulation 6,7 & 8 of the Bachelor of Pharmacy (B. Pharm)]

## **CHAPTER- I: REGULATIONS**

### **1. Short Title and Commencement**

These regulations shall be called as “The Revised Regulations for the B. Pharm. Degree Program (CBCS)of the Pharmacy Council of India, New Delhi”. They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by Pharmacy Council of India.

### **2. Minimum qualification for admission**

#### **First year B. Pharm:**

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

#### **2.2. B. Pharm lateral entry (to third semester):**

A pass in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

### **3. Duration of the program**

The course of study for B.Pharm shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

### **4. Medium of instruction and examinations**

Medium of instruction and examination shall be in English.

### **5. Working days in each semester**

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year.

### **6. Attendance and progress**

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.



## **7. Program/Course credit structure**

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

### **Credit assignment**

#### **Theory and Laboratory courses**

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and /or tutorial (T) hours, and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and tutorial hours, and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

#### **Minimum credit requirements**

The minimum credit points required for award of a B. Pharm. degree is 208. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Project over the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

The lateral entry students shall get 52 credit points transferred from their D. Pharm program. Such students shall take up additional remedial courses of 'Communication Skills' (Theory and Practical) and 'Computer Applications in Pharmacy' (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

## **8. Academic work**

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

### 9. Course of study

The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to VIII. The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table – I to VIII.

**Table-I: Course of study for semester I**

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3	1	4
BP102T	Pharmaceutical Analysis I – Theory	3	1	4
BP103T	Pharmaceutics I – Theory	3	1	4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	3	1	4
BP105T	Communication skills – Theory *	2	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2	-	2
BP107P	Human Anatomy and Physiology – Practical	4	-	2
BP108P	Pharmaceutical Analysis I – Practical	4	-	2
BP109P	Pharmaceutics I – Practical	4	-	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical	4	-	2
BP111P	Communication skills – Practical*	2	-	1
BP112RBP	Remedial Biology – Practical*	2	-	1
<b>Total</b>		<b>32/34<sup>§</sup>/36<sup>#</sup></b>	<b>4</b>	<b>27/29<sup>§</sup>/30<sup>#</sup></b>

<sup>#</sup>Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

<sup>§</sup>Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

\* Non University Examination (NUE)

**Table-II: Course of study for semester II**

<b>Course Code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP201T	Human Anatomy and Physiology II – Theory	3	1	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	3	1	4
BP203T	Biochemistry – Theory	3	1	4
BP204T	Pathophysiology – Theory	3	1	4
BP205T	Computer Applications in Pharmacy – Theory *	3	-	3
BP206T	Environmental sciences – Theory *	3	-	3
BP207P	Human Anatomy and Physiology II –Practical	4	-	2
BP208P	Pharmaceutical Organic Chemistry I– Practical	4	-	2
BP209P	Biochemistry – Practical	4	-	2
BP210P	Computer Applications in Pharmacy – Practical*	2	-	1
<b>Total</b>		<b>32</b>	<b>4</b>	<b>29</b>

\*Non University Examination (NUE)

**Table-III: Course of study for semester III**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP301T	Pharmaceutical Organic Chemistry II – Theory	3	1	4
BP302T	Physical Pharmaceutics I – Theory	3	1	4
BP303T	Pharmaceutical Microbiology – Theory	3	1	4
BP304T	Pharmaceutical Engineering – Theory	3	1	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	-	2
BP306P	Physical Pharmaceutics I – Practical	4	-	2
BP307P	Pharmaceutical Microbiology – Practical	4	-	2
BP 308P	Pharmaceutical Engineering –Practical	4	-	2
<b>Total</b>		<b>28</b>	<b>4</b>	<b>24</b>

**Table-IV: Course of study for semester IV**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP401T	Pharmaceutical Organic Chemistry III– Theory	3	1	4
BP402T	Medicinal Chemistry I – Theory	3	1	4
BP403T	Physical Pharmaceutics II – Theory	3	1	4
BP404T	Pharmacology I – Theory	3	1	4
BP405T	Pharmacognosy and Phytochemistry I– Theory	3	1	4
BP406P	Medicinal Chemistry I – Practical	4	-	2
BP407P	Physical Pharmaceutics II – Practical	4		2
BP408P	Pharmacology I – Practical	4	-	2
BP409P	Pharmacognosy and Phytochemistry I – Practical	4	-	2
<b>Total</b>		<b>31</b>	<b>5</b>	<b>28</b>

**Table-V: Course of study for semester V**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP501T	Medicinal Chemistry II – Theory	3	1	4
BP502T	Industrial PharmacyI– Theory	3	1	4
BP503T	Pharmacology II – Theory	3	1	4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3	1	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	1	4
BP506P	Industrial PharmacyI – Practical	4	-	2
BP507P	Pharmacology II – Practical	4	-	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	-	2
<b>Total</b>		<b>27</b>	<b>5</b>	<b>26</b>

**Table-VI: Course of study for semester VI**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP601T	Medicinal Chemistry III – Theory	3	1	4
BP602T	Pharmacology III – Theory	3	1	4
BP603T	Herbal Drug Technology – Theory	3	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4
BP605T	Pharmaceutical Biotechnology – Theory	3	1	4
BP606T	Quality Assurance –Theory	3	1	4
BP607P	Medicinal chemistry III – Practical	4	-	2
BP608P	Pharmacology III – Practical	4	-	2
BP609P	Herbal Drug Technology – Practical	4	-	2
<b>Total</b>		<b>30</b>	<b>6</b>	<b>30</b>

**Table-VII: Course of study for semester VII**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP701T	Instrumental Methods of Analysis – Theory	3	1	4
BP702T	Industrial PharmacyII – Theory	3	1	4
BP703T	Pharmacy Practice – Theory	3	1	4
BP704T	Novel Drug Delivery System – Theory	3	1	4
BP705P	Instrumental Methods of Analysis – Practical	4	-	2
BP706PS	Practice School*	12	-	6
<b>Total</b>		<b>28</b>	<b>5</b>	<b>24</b>

\* Non University Examination (NUE)

**Table-VIII: Course of study for semester VIII**

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3	1	4
BP802T	Social and Preventive Pharmacy	3	1	4
BP803ET	Pharma Marketing Management	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardization of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Advanced Instrumentation Techniques			
BP812ET	Dietary Supplements and Nutraceuticals			
BP813PW	Project Work	12	-	6
<b>Total</b>		<b>24</b>	<b>4</b>	<b>22</b>

**Table-IX: Semester wise credits distribution**

Semester	Credit Points
I	27/29 <sup>§</sup> /30 <sup>#</sup>
II	29
III	26
IV	28
V	26
VI	26
VII	24
VIII	22
Extracurricular/ Co curricular activities	01*
<b>Total credit points for the program</b>	<b>209/211<sup>§</sup>/212<sup>#</sup></b>

\* The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

<sup>§</sup>Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics course.

<sup>#</sup>Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology course.

## **10. Program Committee**

1. The B. Pharm. program shall have a Program Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Program Committee shall be as follows:

A senior teacher shall be the Chairperson; One Teacher from each department handling B.Pharm courses; and four student representatives of the program (one from each academic year), nominated by the Head of the institution.

3. Duties of the Program Committee:

- i. Periodically reviewing the progress of the classes.
- ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
- iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Program Committee shall meet at least thrice in a semester preferably at the end of each Sessionalexam (Internal Assessment) and before the end semester exam.

## **11. Examinations/Assessments**

The scheme for internal assessment and end semester examinations is given in Table – X.

### **End semester examinations**

The End Semester Examinations for each theory and practical course through semesters I to VIII shall be conducted by the university except for the subjects with asterix symbol (\*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

**Tables-X: Schemes for internal assessments and end semester examinations semester wise**

**Semester I**

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP101T	Human Anatomy and Physiology I- Theory	10	15	1 Hr	25	75	3 Hrs	100
BP102T	Pharmaceutical Analysis I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP103T	Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP105T	Communication skills – Theory *	5	10	1 Hr	15	35	1.5 Hrs	50
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory*	5	10	1 Hr	15	35	1.5 Hrs	50
BP107P	Human Anatomy and Physiology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP108P	Pharmaceutical Analysis I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP109P	Pharmaceutics I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP110P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP111P	Communication skills – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
BP112RBP	Remedial Biology – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
<b>Total</b>		<b>70/75<sup>§</sup>/80<sup>#</sup></b>	<b>115/125<sup>§</sup>/130<sup>#</sup></b>	<b>23/24<sup>§</sup>/26<sup>#</sup> Hrs</b>	<b>185/200<sup>§</sup>/210<sup>#</sup></b>	<b>490/525<sup>§</sup>/ 540<sup>#</sup></b>	<b>31.5/33<sup>§</sup>/ 35<sup>#</sup> Hrs</b>	<b>675/725<sup>§</sup>/ 750<sup>#</sup></b>

<sup>#</sup>Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

<sup>§</sup>Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

\* Non University Examination (NUE)



## Semester II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP201T	Human Anatomy and Physiology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP202T	Pharmaceutical Organic Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP203T	Biochemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP204T	Pathophysiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP205T	Computer Applications in Pharmacy – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP206T	Environmental sciences – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP207P	Human Anatomy and Physiology II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP208P	Pharmaceutical Organic Chemistry I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP209P	Biochemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP210P	Computer Applications in Pharmacy – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
<b>Total</b>		<b>80</b>	<b>125</b>	<b>20 Hrs</b>	<b>205</b>	<b>520</b>	<b>30 Hrs</b>	<b>725</b>

\* The subject experts at college level shall conduct examinations

### Semester III

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP302T	Physical Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr	15	35	4 Hrs	50
<b>Total</b>		<b>60</b>	<b>100</b>	<b>20</b>	<b>160</b>	<b>440</b>	<b>28Hrs</b>	<b>600</b>

### Semester IV

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP404T	Pharmacology I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP405T	Pharmacognosy I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP406P	Medicinal Chemistry I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP407P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP408P	Pharmacology I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP409P	Pharmacognosy I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
<b>Total</b>		<b>70</b>	<b>115</b>	<b>21 Hrs</b>	<b>185</b>	<b>515</b>	<b>31 Hrs</b>	<b>700</b>

### Semester V

Course code	Name of the course	Internal Assessment			End Semester Exams		Total Marks	
		Continuous Mode	Sessional Exams		Total	Marks		Duration
			Marks	Duration				
BP501T	Medicinal Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP502T	Industrial PharmacyI– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP503T	Pharmacology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP504T	Pharmacognosy II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP505T	Pharmaceutical Jurisprudence – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP506P	Industrial PharmacyI– Practical	5	10	4 Hr	15	35	4 Hrs	50
BP507P	Pharmacology II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP508P	Pharmacognosy II – Practical	5	10	4 Hr	15	35	4 Hrs	50
<b>Total</b>		<b>65</b>	<b>105</b>	<b>17 Hr</b>	<b>170</b>	<b>480</b>	<b>27 Hrs</b>	<b>650</b>

### Semester VI

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP601T	Medicinal Chemistry III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP602T	Pharmacology III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP603T	Herbal Drug Technology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP605T	Pharmaceutical Biotechnology– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP606T	Quality Assurance– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP607P	Medicinal chemistry III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP608P	Pharmacology III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP609P	Herbal Drug Technology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
<b>Total</b>		<b>75</b>	<b>120</b>	<b>18 Hrs</b>	<b>195</b>	<b>555</b>	<b>30 Hrs</b>	<b>750</b>

## Semester VII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP701T	Instrumental Methods of Analysis – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP702T	Industrial Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP703T	Pharmacy Practice – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP704T	Novel Drug Delivery System – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP705 P	Instrumental Methods of Analysis – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP706 PS	Practice School*	25	-	-	25	125	5 Hrs	150
<b>Total</b>		<b>70</b>	<b>70</b>	<b>8Hrs</b>	<b>140</b>	<b>460</b>	<b>21 Hrs</b>	<b>600</b>

\* The subject experts at college level shall conduct examinations

**Semester VIII**

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP801T	Biostatistics and Research Methodology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP802T	Social and Preventive Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP803ET	Pharmaceutical Marketing – Theory	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 = 200
BP804ET	Pharmaceutical Regulatory Science – Theory							
BP805ET	Pharmacovigilance – Theory							
BP806ET	Quality Control and Standardization of Herbals – Theory							
BP807ET	Computer Aided Drug Design – Theory							
BP808ET	Cell and Molecular Biology – Theory							
BP809ET	Cosmetic Science – Theory							
BP810ET	Experimental Pharmacology – Theory							
BP811ET	Advanced Instrumentation Techniques – Theory							
BP812PW	Project Work	-	-	-	-	150	4 Hrs	150

<b>Total</b>	<b>40</b>	<b>60</b>	<b>4 Hrs</b>	<b>100</b>	<b>450</b>	<b>16 Hrs</b>	<b>550</b>
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### Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

**Table-XI:Scheme for awarding internal assessment: Continuous mode**

Theory		
Criteria	Maximum Marks	
Attendance (Refer Table – XII)	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5
<b>Total</b>	<b>10</b>	<b>5</b>
Practical		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
<b>Total</b>	<b>5</b>	

**Table- XII: Guidelines for the allotment of marks for attendance**

Percentage of Attendance	Theory	Practical
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

#### 11.2.1. Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in tables – X.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

#### Question paper pattern for theory Sessional examinations

##### For subjects having University examination

I. Multiple Choice Questions (MCQs) = 10 x 1 = 10

OR

Objective Type Questions (5 x 2) = 05 x 2 = 10

(Answer all the questions)

I. Long Answers (Answer 1 out of 2) = 1 x 10 = 10

II. Short Answers (Answer 2 out of 3) = 2 x 5 = 10

Total = -----  
30 marks

**For subjects having Non University Examination**

I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 4 out of 6)	=	4 x 5 = 20
		-----
Total	=	30 marks
		-----

**Question paper pattern for practical sessional examinations**

I. Synopsis	=	10
II. Experiments	=	25
III. Viva voce	=	05
		-----
Total	=	40 marks
		-----

**12. Promotion and award of grades**

A student shall be declared PASS and eligible for getting grade in a course of B.Pharm. program if he/she secures at least 50% marks in that particular course including internal assessment. For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

**13. Carry forward of marks**

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessments shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

**14. Improvement of internal assessment**

A student shall have the opportunity to improve his/her performance only once in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

**15. Re-examination of end semester examinations**

Reexamination of end semester examinations shall be conducted as per the schedule given in table XIII. The exact dates of examinations shall be notified from time to time.

**Table-XIII: Tentative schedule of end semester examinations**

<b>Semester</b>	<b>For Regular Candidates</b>	<b>For Failed Candidates</b>
I, III, V and VII	November / December	May / June
II, IV, VI and VIII	May / June	November / December

**Question paper pattern for end semester theory examinations**

**For 75 marks paper**

I. Multiple Choice Questions(MCQs)	=	20 x 1	=	20
OR				OR
Objective Type Questions (10 x 2)	=	10 x 2	=	20
(Answer all the questions)				
II. Long Answers (Answer 2 out of 3)	=	2 x 10	=	20
III. Short Answers (Answer 7 out of 9)	=	7 x 5	=	35
				-----
Total	=			75 marks
				-----

**For 50 marks paper**

I. Long Answers (Answer 2 out of 3)	=	2 x 10	=	20
II. Short Answers (Answer 6 out of 8)	=	6 x 5	=	30
				-----
Total	=			50 marks
				-----

**For 35 marks paper**

I. Long Answers (Answer 1 out of 2)	=	1 x 10	=	10
II. Short Answers (Answer 5 out of 7)	=	5 x 5	=	25
				-----
Total	=			35 marks
				-----

**Question paper pattern for end semester practical examinations**

I. Synopsis	=	5
II. Experiments	=	25
III. Viva voce	=	5
		-----
Total	=	35 marks
		-----

**16. Academic Progression:**

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. Academic progression rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I, II and III semesters till the IV semester examinations. However, he/she shall not be eligible to attend the courses of V semester until all the courses of I and II semesters are successfully completed.

A student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of I, II, III and IV semesters are successfully completed.

A student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of I, II, III, IV, V and VI semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified in 26.

A lateral entry student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of III and IV semesters are successfully completed.

A lateral entry student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of III, IV, V and VI semesters are successfully completed.

A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified in 26.

Any student who has given more than 4 chances for successful completion of I / III semester courses and more than 3 chances for successful completion of II / IV semester courses shall be permitted to attend V / VII semester classes ONLY during the subsequent academic year as the case may be. In simpler terms there shall NOT be any ODD BATCH for any semester.

Note: Grade AB should be considered as failed and treated as one head for deciding academic progression. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

### 17. Grading of performances

#### Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – XII.

**Table – XII: Letter grades and grade points equivalent to Percentage of marks and performances**

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the saidevaluation/examination in due course.

### 18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called ‘Semester Grade Point Average’ (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses(Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student’s grade points in these courses are G1, G2, G3, G4 and G5, respectively, and then students’ SGPA is equal to:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and AB Sgrade awarded in that semester. For example if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4* \text{ZERO} + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

**19. Cumulative Grade Point Average (CGPA)**

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6 + C_7S_7 + C_8S_8}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8}$$

where C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>,... is the total number of credits for semester I,II,III,... and S<sub>1</sub>,S<sub>2</sub>, S<sub>3</sub>,...is the SGPA of semester I,II,III,....

**20. Declaration of class**

The class shall be awarded on the basis of CGPA as follows:

- First Class with Distinction = CGPA of. 7.50 and above
- First Class = CGPA of 6.00 to 7.49
- Second Class = CGPA of 5.00 to 5.99

**21. Project work**

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below.

***Evaluation of Dissertation Book:***

Objective(s) of the work done	15 Marks
Methodology adopted	20 Marks
Results and Discussions	20 Marks
Conclusions and Outcomes	20 Marks

**Total** 75 Marks

***Evaluation of Presentation:***

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks

**Total** 75 Marks

*Explanation:* The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.

**22. Industrial training (Desirable)**

Every candidate shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc. After the Semester – VI and before the commencement of Semester – VII, and shall submit satisfactory report of such work and certificate duly signed by the authority of training organization to the head of the institute.

**23. Practice School**

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college level and grade point shall be awarded.

#### **24. Award of Ranks**

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the B.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the B. Pharm program in minimum prescribed number of years, (four years) for the award of Ranks.

#### **25. Award of degree**

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

#### **26. Duration for completion of the program of study**

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

#### **27. Re-admission after break of study**

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

No condonation is allowed for the candidate who has more than 2 years of break up period and he/she has to rejoin the program by paying the required fees.

### **Programme Educational Objectives (PEOs)**

**PEO1 Applying principles and technologies:** Graduates should be able to apply principles and technologies to develop, formulate, and manufacture drugs and pharmaceuticals.

**PEO2 Serving society:** Graduates should be able to use medications and devices appropriately to achieve optimal therapeutic outcomes.

**PEO3 Promoting leadership and ethics:** Graduates should be able to demonstrate leadership and entrepreneurship qualities, as well as professional ethics and human values.

**PEO4 Lifelong learning :** Graduates should be able to absorb new technologies and continue learning throughout their lives.

**PEO5 Communicating effectively:** Graduates should be able to communicate well with other healthcare professionals.

**PEO6 Meeting industry needs:** Graduates should be able to meet the needs of the pharmaceutical industry and provide clinical services to the community.

**PEO7 Academic excellence:** Graduates should have knowledge of fundamental principles and their applications in pharmaceutical sciences and technology.



**PEO8 Technical competence:** Graduates should have strong fundamental concepts and high technical competence in pharmaceutical sciences.

**PEO9 Professional Competence:** Graduates will demonstrate the knowledge and skills necessary to practice pharmacy effectively in various healthcare settings, ensuring safe and effective medication use.

**PEO10 Patient-Centered Care:** Graduates will provide high-quality, patient-centered care, including medication management, counseling, and health promotion, to improve patient outcomes.

**PEO11 Inter-professional Collaboration:** Graduates will work collaboratively within interdisciplinary healthcare teams to optimize patient care and contribute to public health initiatives.

### **Programme Specific Objectives (PSO's)**

**PSO1 Pharmaceutical Care Skills:** Students will demonstrate the ability to assess patient medication needs, develop individualized care plans, and implement appropriate therapeutic interventions.

**PSO2 Drug Development and Management:** Students will gain knowledge in drug formulation, development processes, and the management of pharmaceutical products throughout their lifecycle.

**PSO3 Clinical Knowledge Application:** Students will apply pharmacological principles and clinical knowledge to evaluate and optimize drug therapy in diverse patient populations.

**PSO4 Regulatory and Compliance Understanding:** Students will understand the regulatory frameworks governing pharmacy practice, including drug approval processes, safety, and quality assurance.

**PSO5 Communication Proficiency:** Students will develop effective communication skills to counsel patients, collaborate with healthcare professionals, and convey complex information clearly.

**PSO6 Health Promotion and Disease Prevention:** Students will engage in public health initiatives, providing education on disease prevention and health promotion strategies.

**PSO7 Research and Evidence-Based Practice:** Students will engage in research activities and apply evidence-based practices to inform clinical decisions and improve patient outcomes.

**PSO8 Ethical Decision-Making:** Students will learn to navigate ethical dilemmas in pharmacy practice, demonstrating professional judgment and integrity.

### **Programme Outcome Objectives (POO's)**

**POO1 Clinical Competence:** Graduates will be able to conduct comprehensive medication reviews, assess patient health needs, and design effective therapeutic regimens.

**POO2 Pharmaceutical Knowledge:** Graduates will possess a thorough understanding of pharmacology, pharmacotherapy, drug interactions, and the mechanisms of drug action.

**POO3 Ethical Practice:** Graduates will demonstrate professionalism and ethical behavior in all aspects of pharmacy practice, including patient interactions and professional relationships.

**POO4 Communication Skills:** Graduates will effectively communicate with patients, caregivers, and healthcare team members, ensuring clarity and understanding of medication information.

**POO5 Critical Thinking and Problem Solving:** Graduates will apply critical thinking skills to analyze patient data, identify medication-related problems, and develop appropriate solutions.

**POO6 Research and Evidence-Based Practice:** Graduates will be able to conduct research, critically evaluate scientific literature, and apply evidence-based guidelines in clinical practice.

**POO7 Interprofessional Collaboration:** Graduates will work effectively within interdisciplinary teams to enhance patient care and contribute to overall healthcare delivery.

**POO8 Lifelong Learning:** Graduates will demonstrate a commitment to continuous professional development and lifelong learning in the rapidly evolving field of pharmacy.

**POO9 Public Health Awareness:** Graduates will engage in community health initiatives, promoting wellness and preventive care through education and outreach.

## **CHAPTER - II: SYLLABUS**

## **Semester I**

## **BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)**

**45 Hours**

**Scope:** This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

**Objectives:** Upon completion of this course the student should be able to

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

### **Course Content:**

#### **Unit I**

**10 hours**

- **Introduction to human body**

Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

- **Cellular level of organization**

Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine

- **Tissue level of organization**

Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

#### **Unit II**

**10 hours**

- **Integumentary system**

Structure and functions of skin

- **Skeletal system**

Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system

Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction

- **Joints**

Structural and functional classification, types of joints movements and its articulation

**Unit III**

**10 hours**

- **Body fluids and blood**

- Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.

- **Lymphatic system**

Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

**Unit IV**

**08 hours**

**Peripheral nervous system:**

Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system.

Origin and functions of spinal and cranial nerves.

- **Special senses**

Structure and functions of eye, ear, nose and tongue and their disorders.

**Unit V**

**07 hours**

- **Cardiovascular system**

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

## **BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)**

**4 Hours/week**

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
  
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

### **Recommended Books (Latest Editions)**

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA
4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.

6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

**Reference Books (Latest Editions)**

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata



## BP102T. PHARMACEUTICAL ANALYSIS (Theory)

45 Hours

**Scope:** This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

**Objectives:** Upon completion of the course student shall be able to

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- develop analytical skills

### Course Content:

#### UNIT-I

10 Hours

(a) **Pharmaceutical analysis**- Definition and scope

- i) Different techniques of analysis
- ii) Methods of expressing concentration
- iii) Primary and secondary standards.
- iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

(b) **Errors:** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

(c) Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

#### UNIT-II

10 Hours

- **Acid base titration:** Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves
- **Non aqueous titration:** Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

#### UNIT-III

10 Hours

- **Precipitation titrations:** Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.
- **Complexometric titration:** Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.
- **Gravimetry:** Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.
- Basic Principles, methods and application of diazotisation titration.

## **UNIT-IV**

**08 Hours**

### **Redox titrations**

(a) Concepts of oxidation and reduction

(b) Types of redox titrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

## **UNIT-V**

**07 Hours**

### **• Electrochemical methods of analysis**

- **Conductometry**- Introduction, Conductivity cell, Conductometric titrations, applications.
- **Potentiometry** - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.
- **Polarography** - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

## **BP108P. PHARMACEUTICAL ANALYSIS (Practical)**

**4 Hours / Week**

### **I Limit Test of the following**

- (1) Chloride
- (2) Sulphate
- (3) Iron
- (4) Arsenic

### **II Preparation and standardization of**

- (1) Sodium hydroxide
- (2) Sulphuric acid
- (3) Sodium thiosulfate
- (4) Potassium permanganate
- (5) Ceric ammonium sulphate

### **III Assay of the following compounds along with Standardization of Titrant**

- (1) Ammonium chloride by acid base titration
- (2) Ferrous sulphate by Cerimetry
- (3) Copper sulphate by Iodometry
- (4) Calcium gluconate by complexometry
- (5) Hydrogen peroxide by Permanganometry
- (6) Sodium benzoate by non-aqueous titration
- (7) Sodium Chloride by precipitation titration

### **IV Determination of Normality by electro-analytical methods**

- (1) Conductometric titration of strong acid against strong base
- (2) Conductometric titration of strong acid and weak acid against strong base
- (3) Potentiometric titration of strong acid against strong base

### **Recommended Books: (Latest Editions)**

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

## BP103T. PHARMACEUTICS- I (Theory)

45 Hours

**Scope:** This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

**Objectives:** Upon completion of this course the student should be able to:

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

### Course Content:

#### UNIT – I

10 Hours

- **Historical background and development of profession of pharmacy:** History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.
- **Dosage forms:** Introduction to dosage forms, classification and definitions
- **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.
- **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

#### UNIT – II

10 Hours

- **Pharmaceutical calculations:** Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.
- **Powders:** Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.
- **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

**UNIT – III****08 Hours**

- **Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.
- **Biphasic liquids:**
- **Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.
- **Emulsions:** Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

**UNIT – IV****08 Hours**

- **Suppositories:** Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.
- **Pharmaceutical incompatibilities:** Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

**UNIT – V****07 Hours**

- **Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosage forms

## **BP109P. PHARMACEUTICALS (Practical)**

**3 Hours / week**

### **1. Syrups**

- a) Syrup IP'66
- b) Compound syrup of Ferrous Phosphate BPC'68

### **2. Elixirs**

- a) Piperazine citrate elixir
- b) Paracetamol pediatric elixir

### **3. Linctus**

- a) Terpin Hydrate Linctus IP'66
- b) Iodine Throat Paint (Mandles Paint)

### **4. Solutions**

- a) Strong solution of ammonium acetate
- b) Cresol with soap solution
- c) Lugol's solution

### **5. Suspensions**

- a) Calamine lotion
- b) Magnesium Hydroxide mixture
- c) Aluminium Hydroxide gel

### **6. Emulsions**

- a) Turpentine Liniment
- b) Liquid paraffin emulsion

### **7. Powders and Granules**

- a) ORS powder (WHO)
- b) Effervescent granules
- c) Dusting powder
- d) Divided powders

### **8. Suppositories**

- a) Glycero gelatin suppository
- b) Cocoa butter suppository
- c) Zinc Oxide suppository

### **8. Semisolids**

- a) Sulphur ointment
- b) Non staining-iodine ointment with methyl salicylate
- c) Carbopal gel

### **9. Gargles and Mouthwashes**

- a) Iodine gargle
- b) Chlorhexidine mouthwash

**Recommended Books: (Latest Editions)**

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

## BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

45 Hours

**Scope:** This subject deals with the monographs of inorganic drugs and pharmaceuticals.

**Objectives:** Upon completion of course student shall be able to

- know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- understand the medicinal and pharmaceutical importance of inorganic compounds

### Course Content:

#### UNIT I

10 Hours

- **Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate

**General methods of preparation,** assay for the compounds superscripted with **asterisk (\*)**, properties and medicinal uses of inorganic compounds belonging to the following classes

#### UNIT II

10 Hours

- **Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.
- **Major extra and intracellular electrolytes:** Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride\*, Potassium chloride, Calcium gluconate\* and Oral Rehydration Salt (ORS), Physiological acid base balance.
- **Dental products:** Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

#### UNIT III

10 Hours

- **Gastrointestinal agents**

**Acidifiers:** Ammonium chloride\* and Dil. HCl

**Antacid:** Ideal properties of antacids, combinations of antacids, Sodium



Bicarbonate\*, Aluminum hydroxide gel, Magnesium hydroxide mixture

**Cathartics:** Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

**Antimicrobials:** Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide\*, Chlorinated lime\*, Iodine and its preparations

#### UNIT IV

**08 Hours**

- **Miscellaneous compounds**

**Expectorants:** Potassium iodide, Ammonium chloride\*.

**Emetics:** Copper sulphate\*, Sodium potassium tartarate

**Haematinics:** Ferrous sulphate\*, Ferrous gluconate

**Poison and Antidote:** Sodium thiosulphate\*, Activated charcoal, Sodium nitrite<sup>333</sup>

**Astringents:** Zinc Sulphate, Potash Alum

#### UNIT V

**07 Hours**

- **Radiopharmaceuticals:** Radio activity, Measurement of radioactivity, Properties of  $\alpha$ ,  $\beta$ ,  $\gamma$  radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide  $I^{131}$ , Storage conditions, precautions & pharmaceutical application of radioactive substances.

## **BP110P. PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)**

**4 Hours / Week**

- I Limit tests for following ions**
  - Limit test for Chlorides and Sulphates
  - Modified limit test for Chlorides and Sulphates
  - Limit test for Iron
  - Limit test for Heavy metals
  - Limit test for Lead
  - Limit test for Arsenic
- II Identification test**
  - Magnesium hydroxide
  - Ferrous sulphate
  - Sodium bicarbonate
  - Calcium gluconate
  - Copper sulphate
- III Test for purity**
  - Swelling power of Bentonite
  - Neutralizing capacity of aluminum hydroxide gel
  - Determination of potassium iodate and iodine in potassium Iodide
- IV Preparation of inorganic pharmaceuticals**
  - Boric acid
  - Potash alum
  - Ferrous sulphate

### **Recommended Books (Latest Editions)**

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4<sup>th</sup> edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3<sup>rd</sup> Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia

## **BP105T.COMMUNICATION SKILLS (Theory)**

**30 Hours**

**Scope:** This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

### **Objectives:**

Upon completion of the course the student shall be able to

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

### **Course content:**

#### **UNIT – I**

**07 Hours**

- **Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context
- **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers
- **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

#### **UNIT – II**

**07 Hours**

- **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication
- **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

**UNIT – III**

**07 Hours**

- **Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations
- **Effective Written Communication:** Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication
- **Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

**UNIT – IV**

**05 Hours**

- **Interview Skills:** Purpose of an interview, Do's and Dont's of an interview
- **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

**UNIT – V**

**04 Hours**

- **Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

## **BP111P.COMMUNICATION SKILLS (Practical)**

**2 Hours / week**

The following learning modules are to be conducted using wordsworth® English language lab software

### **Basic communication covering the following topics**

Meeting People

Asking Questions

Making Friends

What did you do?

Do's and Dont's

### **Pronunciations covering the following topics**

Pronunciation (Consonant Sounds)

Pronunciation and Nouns

Pronunciation (Vowel Sounds)

### **Advanced Learning**

Listening Comprehension / Direct and Indirect Speech

Figures of Speech

Effective Communication

Writing Skills

Effective Writing

Interview Handling Skills

E-Mail etiquette

Presentation Skills

**Recommended Books: (Latest Edition)**

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2<sup>nd</sup> Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1<sup>st</sup>Edition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1<sup>st</sup>Edition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1<sup>st</sup>Edition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5<sup>th</sup>Edition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2<sup>nd</sup>Edition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1<sup>st</sup>Edition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1<sup>st</sup>Edition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4<sup>th</sup>Edition, Pan Mac Millan,2009
12. Bringing out the best in people, Aubrey Daniels, 2<sup>nd</sup>Edition, Mc Graw Hill, 1999

## **BP 106RBT.REMEDIAL BIOLOGY (Theory)**

**30 Hours**

**Scope:** To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

**Objectives:** Upon completion of the course, the student shall be able to

- know the classification and salient features of five kingdoms of life
- understand the basic components of anatomy & physiology of plant
- know understand the basic components of anatomy & physiology animal with special reference to human

### **UNIT I**

**07 Hours**

#### **Living world:**

- Definition and characters of living organisms
- Diversity in the living world
- Binomial nomenclature
- Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus,

#### **Morphology of Flowering plants**

- Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.
- General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledones.

### **UNIT II**

**07 Hours**

#### **Body fluids and circulation**

- Composition of blood, blood groups, coagulation of blood
- Composition and functions of lymph
- Human circulatory system
- Structure of human heart and blood vessels
- Cardiac cycle, cardiac output and ECG

#### **Digestion and Absorption**

- Human alimentary canal and digestive glands
- Role of digestive enzymes
- Digestion, absorption and assimilation of digested food

#### **Breathing and respiration**

- Human respiratory system
- Mechanism of breathing and its regulation
- Exchange of gases, transport of gases and regulation of respiration
- Respiratory volumes

### **UNIT III**

**07 Hours**

#### **Excretory products and their elimination**

- Modes of excretion
- Human excretory system- structure and function
- Urine formation
- Rennin angiotensin system

#### **Neural control and coordination**

- Definition and classification of nervous system
- Structure of a neuron
- Generation and conduction of nerve impulse
- Structure of brain and spinal cord
- Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

#### **Chemical coordination and regulation**

- Endocrine glands and their secretions
- Functions of hormones secreted by endocrine glands

#### **Human reproduction**

- Parts of female reproductive system
- Parts of male reproductive system
- Spermatogenesis and Oogenesis
- Menstrual cycle

### **UNIT IV**

**05 Hours**

#### **Plants and mineral nutrition:**

- Essential mineral, macro and micronutrients
- Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

#### **Photosynthesis**

- Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

### **UNIT V**

**04 Hours**

**Plant respiration:** Respiration, glycolysis, fermentation (anaerobic).

#### **Plant growth and development**

- Phases and rate of plant growth, Condition of growth, Introduction to plant growthregulators

#### **Cell - The unit of life**

- Structure and functions of cell and cell organelles. Cell division

#### **Tissues**

- Definition, types of tissues, location and functions.



**Text Books**

- a. Text book of Biology by S. B. Gokhale
- b. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

**Reference Books**

- a. A Text book of Biology by B.V. Sreenivasa Naidu
- b. A Text book of Biology by Naidu and Murthy
- c. Botany for Degree students By A.C.Dutta.
- d.Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthkrishnan.
- e. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate

## **BP112RBP.REMEDIAL BIOLOGY (Practical)**

**30 Hours**

1. Introduction to experiments in biology
  - a) Study of Microscope
  - b) Section cutting techniques
  - c) Mounting and staining
  - d) Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues pertinent to Stem, Root  
Leaf, seed, fruit and flower
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

### **Reference Books**

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava.
3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi

## BP 106RMT.REMEDIAL MATHEMATICS (Theory)

30 Hours

**Scope:** This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

**Objectives:** Upon completion of the course the student shall be able to:-

1. Know the theory and their application in Pharmacy
2. Solve the different types of problems by applying theory
3. Appreciate the important application of mathematics in Pharmacy

### Course Content:

#### UNIT – I

06 Hours

- **Partial fraction**

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

- **Logarithms**

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

- **Function:**

Real Valued function, Classification of real valued functions,

- **Limits and continuity :**

Introduction, Limit of a function, Definition of limit of a function ( $\epsilon - \delta$  definition),  $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$ ,  $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$ ,

#### UNIT –II

06 Hours

- **Matrices and Determinant:**

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations

### UNIT – III

06 Hours

#### • Calculus

**Differentiation** : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of  $x^n$  w.r.t  $x$ , where  $n$  is any rational number, Derivative of  $e^x$ , Derivative of  $\log_e x$ , Derivative of  $a^x$ , Derivative of trigonometric functions from first principles (**without Proof**), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application

### UNIT – IV

06 Hours

#### • Analytical Geometry

**Introduction:** Signs of the Coordinates, Distance formula,

**Straight Line** : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line

#### **Integration:**

Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

### UNIT-V

06 Hours

- **Differential Equations** : Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, **Application in solving Pharmacokinetic equations**
- **Laplace Transform** : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, **Application in solving Chemical kinetics and Pharmacokinetics equations**

### Recommended Books (Latest Edition)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr.B.S.Grewal

## **Semester II**

## **BP 201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)**

**45 Hours**

**Scope:** This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

**Objectives:** Upon completion of this course the student should be able to:

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

### **Course Content:**

#### **Unit I**

**10 hours**

- **Nervous system**

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity)

#### **Unit II**

**06 hours**

- **Digestive system**

Anatomy of GI Tract with special reference to anatomy and functions of stomach, ( Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine

and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

- **Energetics**

Formation and role of ATP, Creatinine Phosphate and BMR.

### **Unit III**

- **Respiratory system** **10 hours**

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration

Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

- **Urinary system**

Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

### **Unit IV**

**10 hours**

- **Endocrine system**

Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

### **Unit V**

**09 hours**

- **Reproductive system**

Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition

- **Introduction to genetics**

Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance

## **BP 207 P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)**

**4 Hours/week**

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. To study the integumentary and special senses using specimen, models, etc.,
2. To study the nervous system using specimen, models, etc.,
3. To study the endocrine system using specimen, models, etc
4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feedback mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

### **Recommended Books (Latest Editions)**

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & WilkinsCo, Riverview, MI USA



4. Text book of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

**Reference Books:**

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

## BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY –I (Theory)

45 Hours

**Scope:** This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

**Objectives:** Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. identify/confirm the identification of organic compound

### Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (\*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

### UNIT-I

07 Hours

- **Classification, nomenclature and isomerism**

Classification of Organic Compounds

Common and IUPAC systems of nomenclature of organic compounds

(up to 10 Carbons open chain and carbocyclic compounds)

Structural isomerisms in organic compounds

### UNIT-II 10 Hours

- **Alkanes\*, Alkenes\* and Conjugated dienes\***

SP<sup>3</sup> hybridization in alkanes, Halogenation of alkanes, uses of paraffins.

Stabilities of alkenes, SP<sup>2</sup> hybridization in alkenes

E<sub>1</sub> and E<sub>2</sub> reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E<sub>1</sub> versus E<sub>2</sub> reactions, Factors affecting E<sub>1</sub> and E<sub>2</sub> reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

### UNIT-III 10 Hours

- **Alkyl halides\***

SN<sub>1</sub> and SN<sub>2</sub> reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

SN<sub>1</sub> versus SN<sub>2</sub> reactions, Factors affecting SN<sub>1</sub> and SN<sub>2</sub> reactions

Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

- **Alcohols\***- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

#### **UNIT-IV 10 Hours**

- **Carbonyl compounds\* (Aldehydes and ketones)**

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

#### **UNIT-V**

**08 Hours**

- **Carboxylic acids\***

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

- **Aliphatic amines\*** - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

## **BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY -I (Practical)**

**4 Hours / week**

1. Systematic qualitative analysis of unknown organic compounds like
  1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
  2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
  3. Solubility test
  4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
  5. Melting point/Boiling point of organic compounds
  6. Identification of the unknown compound from the literature using melting point/ boiling point.
  7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
  8. Minimum 5 unknown organic compounds to be analysed systematically.
2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

### **Recommended Books (Latest Editions)**

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwalia/Chatwal.

## BP203 T. BIOCHEMISTRY (Theory)

45 Hours

**Scope:** Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

**Objectives:** Upon completion of course student shall be able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

### Course Content:

#### UNIT I

08 Hours

- **Biomolecules**

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

- **Bioenergetics**

Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP

#### UNIT II

10 Hours

- **Carbohydrate metabolism**

Glycolysis – Pathway, energetics and significance

Citric acid cycle- Pathway, energetics and significance

HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency

Glycogen metabolism Pathways and glycogen storage diseases (GSD)

Gluconeogenesis- Pathway and its significance

Hormonal regulation of blood glucose level and Diabetes mellitus

- **Biological oxidation**

Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate level phosphorylation

Inhibitors ETC and oxidative phosphorylation/Uncouplers

### **UNIT III**

**10 Hours**

- **Lipid metabolism**

β-Oxidation of saturated fatty acid (Palmitic acid)

Formation and utilization of ketone bodies; ketoacidosis

De novo synthesis of fatty acids (Palmitic acid)

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

- **Amino acid metabolism**

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alcaptonuria, tyrosinemia)

Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme; hyperbilirubinemia and jaundice

#### **UNIT IV**

**10 Hours**

- **Nucleic acid metabolism and genetic information transfer**

Biosynthesis of purine and pyrimidine nucleotides

Catabolism of purine nucleotides and Hyperuricemia and Gout disease

Organization of mammalian genome

Structure of DNA and RNA and their functions

DNA replication (semi conservative model)

Transcription or RNA synthesis

Genetic code, Translation or Protein synthesis and inhibitors

## UNIT V

07 Hours

- **Enzymes**

Introduction, properties, nomenclature and IUB classification of enzymes

Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)

Enzyme inhibitors with examples

Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation

Therapeutic and diagnostic applications of enzymes and isoenzymes

Coenzymes –Structure and biochemical functions

### **BP 209 P. BIOCHEMISTRY (Practical)**

**4 Hours / Week**

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.



### **Recommended Books (Latest Editions)**

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

### **BP 204T.PATHOPHYSIOLOGY (THEORY)**

**45Hours**

**Scope:** Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

**Objectives:** Upon completion of the subject student shall be able to –

1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

#### **Course content:**

##### **Unit I**

**10Hours**

- **Basic principles of Cell injury and Adaptation:**

Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance

- **Basic mechanism involved in the process of inflammation and repair:**

Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis

**Unit II**

**10Hours**

- **Cardiovascular System:**

Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)

- **Respiratory system:** Asthma, Chronic obstructive airways diseases.

- **Renal system:** Acute and chronic renal failure .

**Unit II**

**10Hours**

- **Haematological Diseases:**

Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia

- **Endocrine system:** Diabetes, thyroid diseases, disorders of sex hormones

- **Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.

- **Gastrointestinal system:** Peptic Ulcer

- 

**Unit IV**

**8 Hours**

- Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.

- **Disease of bones and joints:** Rheumatoid arthritis, osteoporosis and gout

- **Principles of cancer:** classification, etiology and pathogenesis of cancer

- **Diseases of bones and joints:** Rheumatoid Arthritis, Osteoporosis, Gout

- **Principles of Cancer:** Classification, etiology and pathogenesis of Cancer

**Unit V**

**7 Hours**

- **Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis, Urinary tract infections

- **Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhoea

**Recommended Books (Latest Editions)**

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6<sup>th</sup> edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12<sup>th</sup> edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12<sup>th</sup> ed; united states;
5. William and Wilkins, Baltimore; 1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21<sup>st</sup> edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12<sup>th</sup> edition; WB Saunders Company; 2010.
8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9<sup>th</sup> edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6<sup>th</sup> edition; Philadelphia; WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3<sup>rd</sup> edition; London; Churchill Livingstone publication; 2003.

#### **Recommended Journals**

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

## BP205 T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hrs (2 Hrs/Week)

**Scope:** This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

**Objectives:** Upon completion of the course the student shall be able to

1. know the various types of application of computers in pharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

### Course content:

#### UNIT – I

06 hours

**Number system:** Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division

**Concept of Information Systems and Software :** Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

#### UNIT –II

06 hours

**Web technologies:** Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

#### UNIT – III

06 hours

**Application of computers in Pharmacy** – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring

Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

**UNIT – IV**

**06 hours**

**Bioinformatics:** Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

**UNIT-V**

**06 hours**

**Computers as data analysis in Preclinical development:**

Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMMS)

### **BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)**

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard , generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

#### **Recommended books (Latest edition):**

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

## **BP 206 T. ENVIRONMENTAL SCIENCES (Theory)**

**30 hours**

**Scope:** Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

**Objectives:** Upon completion of the course the student shall be able to:

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

### **Course content:**

#### **Unit-I**

**10hours**

The Multidisciplinary nature of environmental studies

Natural Resources

Renewable and non-renewable resources:

Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

#### **Unit-II**

**10hours**

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

#### **Unit- III**

**10hours**

Environmental Pollution: Air pollution; Water pollution; Soil pollution

**Recommended Books (Latest edition):**

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clarendon Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment



## **SEMESTER III**

## BP301T. PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory)

45 Hours

**Scope:** This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

**Objectives:** Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. prepare organic compounds

### Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (\*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

#### UNIT I

10 Hours

- **Benzene and its derivatives**

- A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule
- B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.
- C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction
- D. Structure and uses of DDT, Saccharin, BHC and Chloramine

#### UNIT II

10 Hours

- **Phenols\*** - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols
- **Aromatic Amines\*** - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts
- **Aromatic Acids\*** -Acidity, effect of substituents on acidity and important reactions of benzoic acid.

#### UNIT III

10 Hours

- **Fats and Oils**
  - a. Fatty acids – reactions.

- b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
- c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

**UNIT IV**

**08 Hours**

- **Polynuclear hydrocarbons:**

- a. Synthesis, reactions
- b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

**UNIT V**

**07 Hours**

- **Cyclo alkanes\***

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

## BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)

4 Hrs/week

### I Experiments involving laboratory techniques

- Recrystallization
- Steam distillation

### II Determination of following oil values (including standardization of reagents)

- Acid value
- Saponification value
- Iodine value

### III Preparation of compounds

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
- 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/
- Acetanilide by halogenation (Bromination) reaction.
- 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
- Benzoic acid from Benzyl chloride by oxidation reaction.
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions.
- Benzil from Benzoin by oxidation reaction.
- Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction
- Cinnamic acid from Benzaldehyde by Perkin reaction
- *P*-Iodo benzoic acid from *P*-amino benzoic acid

### Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.

8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

**BP302T. PHYSICAL PHARMACEUTICS-I (Theory)**

**45Hours**

**Scope:** The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

**Objectives:** Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

**Course Content:**

**UNIT-I**

**10 Hours**

**Solubility of drugs:** Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

**UNIT-II**

**10Hours**

**States of Matter and properties of matter:** State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism.

**Physicochemical properties of drug molecules:** Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

**UNIT-III**

**08 Hours**

**Surface and interfacial phenomenon:** Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

**UNIT-IV****08Hours**

**Complexation and protein binding:** Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

**UNIT-V****07 Hours**

**pH, buffers and Isotonic solutions:** Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

### **BP306P. PHYSICAL PHARMACEUTICS – I (Practical)**

**4 Hrs/week**

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl<sub>4</sub> and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

#### **Recommended Books: (Latest Editions)**

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene, Parott.
3. Tutorial Pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
9. Physical Pharmaceutics by C.V.S. Subramanyam
10. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar

## **BP 303 T. PHARMACEUTICAL MICROBIOLOGY (Theory)**

**45Hours**

### **Scope:**

- Study of all categories of microorganisms especially for the production of alcohol antibiotics, vaccines, vitamins enzymes etc..

**Objectives:** Upon completion of the subject student shall be able to;

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterilization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

### **Course content:**

#### **Unit I**

**10 Hours**

Introduction, history of microbiology, its branches, scope and its importance.

Introduction to Prokaryotes and Eukaryotes

Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count).

Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.

#### **Unit II**

**10 Hours**

Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC).

Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization.

Evaluation of the efficiency of sterilization methods.



Equipments employed in large scale sterilization.

Sterility indicators.

### **Unit III**

**10 Hours**

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.

Classification and mode of action of disinfectants

Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions

Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

### **Unit IV**

**08 Hours**

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.

Assessment of a new antibiotic.

### **Unit V**

**07Hours**

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

## **BP 307P.PHARMACEUTICAL MICROBIOLOGY (Practical)**

**4 Hrs/week**

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

### **Recommended Books (Latest edition)**

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4<sup>th</sup> edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Pepler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

## BP 304 T. PHARMACEUTICAL ENGINEERING (Theory)

45 Hours

**Scope:** This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

**Objectives:** Upon completion of the course student shall be able:

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

### Course content:

#### UNIT-I

10 Hours

- **Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.
- **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.
- **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

#### UNIT-II

10 Hours

- **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

- **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.
- **Distillation:** Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

### UNIT- III

**08 Hours**

- **Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.
- **Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

### UNIT-IV

**08 Hours**

- **Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.
- **Centrifugation:** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

### UNIT- V

**07 Hours**

- **Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

**Recommended Books: (Latest Editions)**

1. Introduction to chemical engineering – Walter L Badger & Julius Banchemo, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – McCabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceuticals- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

## **BP308P - PHARMACEUTICAL ENGINEERING (Practical)**

**4 Hours/week**

- I. Determination of radiation constant of brass, iron, unpainted and painted glass.
- II. Steam distillation – To calculate the efficiency of steam distillation.
- III. To determine the overall heat transfer coefficient by heat exchanger.
- IV. Construction of drying curves (for calcium carbonate and starch).
- V. Determination of moisture content and loss on drying.
- VI. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.
- VII. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
- VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
- IX. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
- X. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
- XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity
- XII. To study the effect of time on the Rate of Crystallization.
- XIII. To calculate the uniformity Index for given sample by using Double Cone Blender.

## **SEMESTER IV**

## **BP401T. PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory)**

**45 Hours**

**Scope:** This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

**Objectives:** At the end of the course, the student shall be able to

1. understand the methods of preparation and properties of organic compounds
2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. know the medicinal uses and other applications of organic compounds

### **Course Content:**

**Note: To emphasize on definition, types, mechanisms, examples, uses/applications**

#### **UNIT-I**

**10 Hours**

##### **Stereo isomerism**

Optical isomerism –

Optical activity, enantiomerism, diastereoisomerism, meso compounds

Elements of symmetry, chiral and a chiral molecules

DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers

Reactions of chiral molecules

Racemic modification and resolution of racemic mixture.

Asymmetric synthesis: partial and absolute

#### **UNIT-II**

**10 Hours**

Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems)

Methods of determination of configuration of geometrical isomers.

Conformational isomerism in Ethane, n-Butane and Cyclohexane.

Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.

Stereospecific and stereoselective reactions

#### **UNIT-III**

**10 Hours**



**Heterocyclic compounds:**

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives

Pyrrole, Furan, and Thiophene

Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene

**UNIT-IV****8 Hours**

Synthesis, reactions and medicinal uses of following compounds/derivatives

Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine

Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

**UNIT-V****07 Hours****Reactions of synthetic importance**

Metal hydride reduction ( $\text{NaBH}_4$  and  $\text{LiAlH}_4$ ), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.

Oppenauer-oxidation and Dakin reaction.

Beckmanns rearrangement and Schmidt rearrangement.

Claisen-Schmidt condensatio

**Recommended Books (Latest Editions)**

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist

## BP402T. MEDICINAL CHEMISTRY – I (Theory)

**45 Hours**

**Scope:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Objectives:** Upon completion of the course the student shall be able to

1. understand the chemistry of drugs with respect to their pharmacological activity
2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. know the Structural Activity Relationship (SAR) of different class of drugs
4. write the chemical synthesis of some drugs

### Course Content:

**Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (\*)**

#### UNIT- I

**10 Hours**

##### **Introduction to Medicinal Chemistry**

##### **History and development of medicinal chemistry**

##### **Physicochemical properties in relation to biological action**

Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

##### **Drug metabolism**

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects.

#### UNIT- II

**10 Hours**

##### **Drugs acting on Autonomic Nervous System**

##### **Adrenergic Neurotransmitters:**

Biosynthesis and catabolism of catecholamine.

Adrenergic receptors (Alpha & Beta) and their distribution.

##### **Sympathomimetic agents: SAR of Sympathomimetic agents**

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine\*, Dopamine,

Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol\*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

- Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
- Agents with mixed mechanism: Ephedrine, Metaraminol.

#### **Adrenergic Antagonists:**

**Alpha adrenergic blockers:** Tolazoline\*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

**Beta adrenergic blockers:** SAR of beta blockers, Propranolol\*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

### **UNIT-III**

**10 Hours**

#### **Cholinergic neurotransmitters:**

Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

#### **Parasympathomimetic agents: SAR of Parasympathomimetic agents**

**Direct acting agents:** Acetylcholine, Carbachol\*, Bethanechol, Methacholine, Pilocarpine.

**Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible):** Physostigmine, Neostigmine\*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorophate, Echothiophate iodide, Parathione, Malathion.

**Cholinesterase reactivator:** Pralidoxime chloride.

#### **Cholinergic Blocking agents: SAR of cholinolytic agents**

**Solanaceous alkaloids and analogues:** Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide\*.

**Synthetic cholinergic blocking agents:** Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride\*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride\*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

### **UNIT- IV**

**08 Hours**

#### **Drugs acting on Central Nervous System**

### **A. Sedatives and Hypnotics:**

**Benzodiazepines:** SAR of Benzodiazepines, Chlordiazepoxide, Diazepam\*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

**Barbiturates:** SAR of barbiturates, Barbitol\*, Phenobarbital, Mephobarbital, Amobarbital, Butobarbital, Pentobarbital, Secobarbital

#### **Miscellaneous:**

Amides & imides: Glutethimide.

Alcohol & their carbamate derivatives: Meprobamate, Ethchlorvynol.

Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

### **B. Antipsychotics**

**Phenothiazines:** SAR of Phenothiazines - Promazine hydrochloride, Chlorpromazine hydrochloride\*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

**Ring Analogues of Phenothiazines:** Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

**Fluro buterophenones:** Haloperidol, Droperidol, Risperidone.

**Beta amino ketones:** Molindone hydrochloride.

**Benzamides:** Sulpieride.

**C. Anticonvulsants:** SAR of Anticonvulsants, mechanism of anticonvulsant action

**Barbiturates:** Phenobarbitone, Methobarbital. **Hydantoins:**

Phenytoin\*, Mephénytoin, Ethotoin **Oxazolindione diones:**

Trimethadione, Paramethadione **Succinimides:**

Phensuximide, Methsuximide, Ethosuximide\* **Urea and**

**monoacylureas:** Phenacemide, Carbamazepine\*

**Benzodiazepines:** Clonazepam

**Miscellaneous:** Primidone, Valproic acid, Gabapentin, Felbamate

**UNIT – V**

**07 Hours**

**Drugs acting on Central Nervous System**

**General anesthetics:**

**Inhalation anesthetics:** Halothane\*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

**Ultra short acting barbiturates:** Methohexital sodium\*, Thiopental sodium, Thiopental sodium.

**Dissociative anesthetics:** Ketamine hydrochloride.\*

**Narcotic and non-narcotic analgesics**

**Morphine and related drugs:** SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anileridine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate\*, Methadone hydrochloride\*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

**Narcotic antagonists:** Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

**Anti-inflammatory agents:** Sodium salicylate, Aspirin, Mefenamic acid\*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepirac, Diclofenac, Ketorolac, Ibuprofen\*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

## **BP406P. MEDICINAL CHEMISTRY – I (Practical)**

**4 Hours/Week**

### **I Preparation of drugs/ intermediates**

- 1 1,3-pyrazole
- 2 1,3-oxazole
- 3 Benzimidazole
- 4 Benztriazole
- 5 2,3- diphenyl quinoxaline
- 6 Benzocaine
- 7 Phenytoin
- 8 Phenothiazine
- 9 Barbiturate

### **II Assay of drugs**

- 1 Chlorpromazine
- 2 Phenobarbitone
- 3 Atropine
- 4 Ibuprofen
- 5 Aspirin
- 6 Furosemide

### **III Determination of Partition coefficient for any two drugs**

#### **Recommended Books (Latest Editions)**

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.

7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

## **BP 403 T. PHYSICAL PHARMACEUTICS-II (Theory)**

**45Hours**

**Scope:** The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

**Objectives:** Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

### **Course Content:**

#### **UNIT-I**

**07 Hours**

**Colloidal dispersions:** Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action.

#### **UNIT-II**

**10 Hours**

**Rheology:** Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

**Deformation of solids:** Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

#### **UNIT-III**

**10 Hours**

**Coarse dispersion:** Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.



#### **UNIT-IV**

**10Hours**

**Micromeretics:** Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

#### **UNIT-V**

**10 Hours**

**Drug stability:** Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

## **BP 407P. PHYSICAL PHARMACEUTICS- II (Practical)**

**3 Hrs/week**

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

### **Recommended Books: (Latest Editions)**

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceuticals by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

## **BP 404 T. PHARMACOLOGY-I (Theory)**

**45 Hrs**

**Scope:** The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

**Objectives:** Upon completion of this course the student should be able to

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

### **Course Content:**

#### **UNIT-I**

**08 hours**

##### **1. General Pharmacology**

- a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists( competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.
- b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

#### **UNIT-II**

**12 Hours**

##### **General Pharmacology**

- a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
- b. Adverse drug reactions.
- c. Drug interactions (pharmacokinetic and pharmacodynamic)
- d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

**UNIT-III****10 Hours****2. Pharmacology of drugs acting on peripheral nervous system**

- a. Organization and function of ANS.
- b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.
- c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.
- d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
- e. Local anesthetic agents.
- f. Drugs used in myasthenia gravis and glaucoma

**UNIT-IV****08 Hours****3. Pharmacology of drugs acting on central nervous system**

- a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
- b. General anesthetics and pre-anesthetics.
- c. Sedatives, hypnotics and centrally acting muscle relaxants.
- d. Anti-epileptics
- e. Alcohols and disulfiram

**UNIT-V****07 Hours****3. Pharmacology of drugs acting on central nervous system**

- a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.
- b. Drugs used in Parkinsons disease and Alzheimer's disease.
- c. CNS stimulants and nootropics.
- d. Opioid analgesics and antagonists
- e. Drug addiction, drug abuse, tolerance and dependence.

## BP 408 P.PHARMACOLOGY-I (Practical)

4Hrs/Week

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

*Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos*

### Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology

6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

## **BP 405 T.PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory)**

**45 Hours**

**Scope:** The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

**Objectives:** Upon completion of the course, the student shall be able

1. to know the techniques in the cultivation and production of crude drugs
2. to know the crude drugs, their uses and chemical nature
3. know the evaluation techniques for the herbal drugs
4. to carry out the microscopic and morphological evaluation of crude drugs

### **Course Content:**

#### **UNIT-I**

**10 Hours**

##### **Introduction to Pharmacognosy:**

- (a) Definition, history, scope and development of Pharmacognosy
- (b) Sources of Drugs – Plants, Animals, Marine & Tissue culture
- (c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

##### **Classification of drugs:**

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

##### **Quality control of Drugs of Natural Origin:**

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

#### **UNIT-II**

**10 Hours**

##### **Cultivation, Collection, Processing and storage of drugs of natural origin:**

Cultivation and Collection of drugs of natural origin  
Factors influencing cultivation of medicinal plants.  
Plant hormones and their applications.  
Polyploidy, mutation and hybridization with reference to medicinal plants

##### **Conservation of medicinal plants**

#### **UNIT-III**

**07 Hours**

##### **Plant tissue culture:**

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy.

Edible vaccines

**UNIT IV****10 Hours****Pharmacognosy in various systems of medicine:**

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

**Introduction to secondary metabolites:**

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

**UNIT V****08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

**Plant Products:**

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

**Primary metabolites:**

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

**Carbohydrates:** Acacia, Agar, Tragacanth, Honey

**Proteins and Enzymes :** Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

**Lipids(Waxes, fats, fixed oils) :** Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

**Marine Drugs:**

Novel medicinal agents from marine sources





**BP408 P. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical)**

**4 Hours/Week**

1. Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and palisade ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

**Recommended Books: (Latest Editions)**

1. W.C.Evans, Trease and Evans Pharmacognosy, 16<sup>th</sup> edition, W.B. Saunders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9<sup>th</sup> Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37<sup>th</sup> Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), 1<sup>st</sup> Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

**SEMESTER V**

## BP501T. MEDICINAL CHEMISTRY – II (Theory)

45 Hours

**Scope:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

**Objectives:** Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

### Course Content:

**Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (\*)**

#### UNIT- I

10 Hours

**Antihistaminic agents:** Histamine, receptors and their distribution in the humanbody

**H<sub>1</sub>-antagonists:** Diphenhydramine hydrochloride\*, Dimenhydrinate, Doxylamines succinate, Clemastine fumarate, Diphenylpyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride\*, Phenidamine tartarate, Promethazine hydrochloride\*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

**H<sub>2</sub>-antagonists:** Cimetidine\*, Famotidine, Ranitidin.

**Gastric Proton pump inhibitors:** Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

**Anti-neoplastic agents:**

**Alkylating agents:** Meclorothamine\*, Cyclophosphamide, Melphalan,

Chlorambucil, Busulfan, Thiotepa

**Antimetabolites:** Mercaptopurine\*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate\*, Azathioprine

**Antibiotics:** Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

**Plant products:** Etoposide, Vinblastin sulphate, Vincristin sulphate

**Miscellaneous:** Cisplatin, Mitotane.

## UNIT – II

**10 Hours**

### **Anti-anginal:**

**Vasodilators:** Amyl nitrite, Nitroglycerin\*, Pentaerythritol tetranitrate, Isosorbide dinitrite\*, Dipyridamole.

**Calcium channel blockers:** Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

### **Diuretics:**

Carbonic anhydrase inhibitors: Acetazolamide\*, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide\*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,

Loop diuretics: Furosemide\*, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.

Osmotic Diuretics: Mannitol

**Anti-hypertensive Agents:** Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,\* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

## UNIT- III

**10 Hours**

**Anti-arrhythmic Drugs:** Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate\*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcaïnide hydrochloride, Amiodarone, Sotalol.

**Anti-hyperlipidemic agents:** Clofibrate, Lovastatin, Cholesteramine and Cholestipol

**Coagulant & Anticoagulants:** Menadione, Acetomenadione, Warfarin\*, Anisindione, clopidogrel

**Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.



**UNIT- IV****08 Hours****Drugs acting on Endocrine system**

Nomenclature, Stereochemistry and metabolism of steroids

**Sex hormones:** Testosterone, Nandralone, Progesterones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.

**Drugs for erectile dysfunction:** Sildenafil, Tadalafil.

**Oral contraceptives:** Mifepristone, Norgestril, Levonorgestrol

**Corticosteroids:** Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

**Thyroid and antithyroid drugs:** L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

**UNIT – V****07 Hours****Antidiabetic agents:**

Insulin and its preparations

Sulfonyl ureas: Tolbutamide\*, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone.

Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acarbose, Voglibose.

**Local Anesthetics:** SAR of Local anesthetics

**Benzoic Acid derivatives;** Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

**Amino Benzoic acid derivatives:** Benzocaine\*, Butamben, Procaine\*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

**Lidocaine/Anilide derivatives:** Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

**Miscellaneous:** Phenacaine, Dipiperodon, Dibucaine.\*

**Recommended Books (Latest Editions)**

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1 to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.





## BP 502 T. Industrial PharmacyI (Theory)

**45 Hours**

**Scope:** Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

**Objectives:** Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

### Course content:

**3 hours/ week**

#### UNIT-I

**07 Hours**

**Preformulation Studies:** Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

*a. Physical properties:* Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism

*b. Chemical Properties:* Hydrolysis, oxidation, reduction, racemisation, polymerization

BCS classification of drugs & its significant

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

#### UNIT-II

**10 Hours**

##### Tablets:

- a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.
- b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.
- c. Quality control tests: In process and finished product tests

**Liquid orals:** Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

### UNIT-III

08 Hours

#### Capsules:

- a. **Hard gelatin capsules:** Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.
- b. **Soft gelatin capsules:** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

**Pellets:** Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

### UNIT-IV

10 Hours

#### Parenteral Products:

- a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity
- b. Production procedure, production facilities and controls, aseptic processing
- c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.
- d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

**Ophthalmic Preparations:** Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

### UNIT-V

10 Hours

**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

**Pharmaceutical Aerosols:** Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

**Packaging Materials Science:** Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

## **BP 506 P. Industrial PharmacyI (Practical)**

**4 Hours/week**

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

### **Recommended Books: (Latest Editions)**

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5<sup>th</sup>edition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

## BP503.T. PHARMACOLOGY-II (Theory)

45 Hours

**Scope:** This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.

**Objectives:** Upon completion of this course the student should be able to

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

### Course Content:

#### UNIT-I

10hours

##### 1. Pharmacology of drugs acting on cardio vascular system

- a. Introduction to hemodynamic and electrophysiology of heart.
- b. Drugs used in congestive heart failure
- c. Anti-hypertensive drugs.
- d. Anti-anginal drugs.
- e. Anti-arrhythmic drugs.
- f. Anti-hyperlipidemic drugs.

#### UNIT-II

10hours

##### 1. Pharmacology of drugs acting on cardio vascular system

- a. Drug used in the therapy of shock.
- b. Hematinics, coagulants and anticoagulants.
- c. Fibrinolytics and anti-platelet drugs
- d. Plasma volume expanders

##### 2. Pharmacology of drugs acting on urinary system

- a. Diuretics
- b. Anti-diuretics.

#### UNIT-III

10hours

##### 3. Autocoids and related drugs

- a. Introduction to autocoids and classification
- b. Histamine, 5-HT and their antagonists.
- c. Prostaglandins, Thromboxanes and Leukotrienes.
- d. Angiotensin, Bradykinin and Substance P.
- e. Non-steroidal anti-inflammatory agents
- f. Anti-gout drugs
- g. Antirheumatic drugs

**UNIT-IV****08hours****5. Pharmacology of drugs acting on endocrine system**

- a. Basic concepts in endocrine pharmacology.
- b. Anterior Pituitary hormones- analogues and their inhibitors.
- c. Thyroid hormones- analogues and their inhibitors.
- d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.
- d. Insulin, Oral Hypoglycemic agents and glucagon.
- e. ACTH and corticosteroids.

**UNIT-V****07hours****5. Pharmacology of drugs acting on endocrine system**

- a. Androgens and Anabolic steroids.
- b. Estrogens, progesterone and oral contraceptives.
- c. Drugs acting on the uterus.

**6. Bioassay**

- a. Principles and applications of bioassay.
- b. Types of bioassay
- c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT

## BP 507 P. PHARMACOLOGY-II (Practical)

4Hrs/Week

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of  $PA_2$  value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of  $PD_2$  value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

*Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos*

### Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.



## BP504 T. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

45Hours

**Scope:** The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

**Objectives:** Upon completion of the course, the student shall be able

1. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. to understand the preparation and development of herbal formulation.
3. to understand the herbal drug interactions
4. to carryout isolation and identification of phytoconstituents

### Course Content:

#### UNIT-I

7 Hours

##### Metabolic pathways in higher plants and their determination

- a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.
- b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

#### UNIT-II

14 Hours

General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites:

**Alkaloids:** Vinca, Rauwolfia, Belladonna, Opium,

**Phenylpropanoids and Flavonoids:** Lignans, Tea, Ruta

**Steroids, Cardiac Glycosides & Triterpenoids:** Liquorice, Dioscorea, Digitalis

**Volatile oils:** Mentha, Clove, Cinnamon, Fennel, Coriander,

**Tannins:** Catechu, Pterocarpus

**Resins:** Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony

**Glycosides:** Senna, Aloes, Bitter Almond

**Iridoids, Other terpenoids & Naphthaquinones:** Gentian, Artemisia, taxus, carotenoids

#### UNIT-III

06 Hours

Isolation, Identification and Analysis of Phytoconstituents

- a) Terpenoids: Menthol, Citral, Artemisin
- b) Glycosides: Glycyrrhetic acid & Rutin
- c) Alkaloids: Atropine, Quinine, Reserpine, Caffeine
- d) Resins: Podophyllotoxin, Curcumin

#### UNIT-IV

10 Hours

Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

#### UNIT V

8 Hours

##### Basics of Phytochemistry

Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.



**BP 508 P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)**

**4 Hours/Week**

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
  - a. Caffeine - from tea dust.
  - b. Diosgenin from Dioscorea
  - c. Atropine from Belladonna
  - d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstituents by TLC
6. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

**Recommended Books: (Latest Editions)**

1. W.C.Evans, Trease and Evans Pharmacognosy, 16<sup>th</sup> edition, W.B. Saunders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37<sup>th</sup> Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), 1<sup>st</sup> Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, 1<sup>st</sup> edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.



## **BP 505 T. PHARMACEUTICAL JURISPRUDENCE (Theory)**

**45 Hours**

**Scope:** This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

**Objectives:** Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

### **Course Content:**

#### **UNIT-I**

**10 Hours**

##### **Drugs and Cosmetics Act, 1940 and its rules 1945:**

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties.

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

#### **UNIT-II**

**10 Hours**

##### **Drugs and Cosmetics Act, 1940 and its rules 1945.**

Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

#### **UNIT-III**

**10 Hours**

- **Pharmacy Act –1948:** Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and

## Penalties

- **Medicinal and Toilet Preparation Act –1955:** Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.
- **Narcotic Drugs and Psychotropic substances Act-1985 and Rules:** Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

## UNIT-IV

**08 Hours**

- **Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties
- **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties
- **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

## UNIT-V

**07 Hours**

- **Pharmaceutical Legislations** – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee
- **Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath
- **Medical Termination of Pregnancy Act**
- **Right to Information Act**
- **Introduction to Intellectual Property Rights (IPR)**

### **Recommended books: (Latest Edition)**

1. Forensic Pharmacy by B. Suresh

2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9. Bare Acts of the said laws published by Government. Reference books (Theory)

**SEMESTER VI**

## BP601T. MEDICINAL CHEMISTRY – III (Theory)

45 Hours

**Scope:** This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.

**Objectives:** Upon completion of the course student shall be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

### Course Content:

**Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (\*)**

#### UNIT – I

10 Hours

##### Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

**β-Lactam antibiotics:** Penicillin, Cephalosporins, β- Lactamase inhibitors, Monobactams

**Aminoglycosides:** Streptomycin, Neomycin, Kanamycin

**Tetracyclines:** Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

#### UNIT – II

10 Hours

##### Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

**Macrolide:** Erythromycin Clarithromycin, Azithromycin.

**Miscellaneous:** Chloramphenicol\*, Clindamycin.

**Prodrugs:** Basic concepts and application of prodrugs design.

**Antimalarials:** Etiology of malaria.

**Quinolines:** SAR, Quinine sulphate, Chloroquine\*, Amodiaquine, Primaquine phosphate, Pamaquine\*, Quinacrine hydrochloride, Mefloquine.

**Biguanides and dihydro triazines:** Cycloguanil pamoate, Proguanil.

**Miscellaneous:** Pyrimethamine, Artesunate, Artemether, Atovaquone.

### UNIT – III

10 Hours

#### Anti-tubercular Agents

**Synthetic anti tubercular agents:** Isoniazid\*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.\*

**Anti tubercular antibiotics:** Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate.

#### Urinary tract anti-infective agents

**Quinolones:** SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin\*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

**Miscellaneous:** Furazolidine, Nitrofurantoin\*, Methanamine.

#### Antiviral agents:

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir\*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

### UNIT – IV

08 Hours

#### Antifungal agents:

**Antifungal antibiotics:** Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

**Synthetic Antifungal agents:** Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconazole, Miconazole\*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate\*.

**Anti-protozoal Agents:** Metronidazole\*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

**Anthelmintics:** Diethylcarbamazine citrate\*, Thiabendazole, Mebendazole\*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.



### **Sulphonamides and Sulfones**

Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfoxazole, Sulphamethizine, Sulfacetamide\*, Sulphapyridine, Sulfamethoxazole\*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

**Folate reductase inhibitors:** Trimethoprim\*, Cotrimoxazole.

**Sulfones:** Dapsone\*.

## **UNIT – V**

**07 Hours**

### **Introduction to Drug Design**

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammett's electronic parameter, Taft's steric parameter and Hansch analysis.

Pharmacophore modeling and docking techniques.

**Combinatorial Chemistry:** Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

## BP607P. MEDICINAL CHEMISTRY- III (Practical)

4 Hours / week

### **I Preparation of drugs and intermediates**

- 1 Sulphanilamide
- 2 7-Hydroxy, 4-methyl coumarin
- 3 Chlorobutanol
- 4 Triphenyl imidazole
- 5 Tolbutamide
- 6 Hexamine

### **II Assay of drugs**

- 1 Isonicotinic acid hydrazide
- 2 Chloroquine
- 3 Metronidazole
- 4 Dapsone
- 5 Chlorpheniramine maleate
- 6 Benzyl penicillin

### **III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique**

### **IV Drawing structures and reactions using chem draw®**

### **V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)**

### **Recommended Books (Latest Editions)**

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.

7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

## **BP602 T. PHARMACOLOGY-III (Theory)**

**45 Hours**

**Scope:** This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and chronopharmacology.

**Objectives:** Upon completion of this course the student should be able to:

1. understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. comprehend the principles of toxicology and treatment of various poisonings and
3. appreciate correlation of pharmacology with related medical sciences.

### **Course Content:**

#### **UNIT-I**

**10hours**

##### **1. Pharmacology of drugs acting on Respiratory system**

- a. Anti -asthmatic drugs
- b. Drugs used in the management of COPD
- c. Expectorants and antitussives
- d. Nasal decongestants
- e. Respiratory stimulants

##### **2. Pharmacology of drugs acting on the Gastrointestinal Tract**

- a. Antiulcer agents.
- b. Drugs for constipation and diarrhoea.
- c. Appetite stimulants and suppressants.
- d. Digestants and carminatives.
- e. Emetics and anti-emetics.

#### **UNIT-II**

**10hours**

##### **3. Chemotherapy**

- a. General principles of chemotherapy.
- b. Sulfonamides and cotrimoxazole.
- c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

#### **UNIT-III**

**10hours**

##### **3. Chemotherapy**

- a. Antitubercular agents
- b. Antileprotic agents

- c. Antifungal agents
- d. Antiviral drugs
- e. Anthelmintics
- f. Antimalarial drugs
- g. Antiamoebic agents

**UNIT-IV**

**08hours**

**3. Chemotherapy**

- l. Urinary tract infections and sexually transmitted diseases.
- m. Chemotherapy of malignancy.

**4. Immunopharmacology**

- a. Immunostimulants
  - b. Immunosuppressant
- Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

**UNIT-V**

**07hours**

**5. Principles of toxicology**

- a. Definition and basic knowledge of acute, subacute and chronic toxicity.
- b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
- c. General principles of treatment of poisoning
- d. Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning.

**6. Chronopharmacology**

- a. Definition of rhythm and cycles.
- b. Biological clock and their significance leading to chronotherapy.

## BP 608 P. PHARMACOLOGY-III (Practical)

4Hrs/Week

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens ( rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology( student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

*\*Experiments are demonstrated by simulated experiments/videos*

### Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

## **BP 603 T. HERBAL DRUG TECHNOLOGY**

**(Theory)**

**45 hours**

**Scope:** This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

**Objectives:** Upon completion of this course the student should be able to:

1. understand raw material as source of herbal drugs from cultivation to herbal drug product
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP .

### **Course content:**

#### **UNIT-I**

**11 Hours**

##### **Herbs as raw materials**

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation

Source of Herbs

Selection, identification and authentication of herbal materials

Processing of herbal raw material

##### **Biodynamic Agriculture**

Good agricultural practices in cultivation of medicinal plants including Organic farming.

Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

##### **Indian Systems of Medicine**

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy

b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.

#### **UNIT-II**

**7 Hours**

##### **Nutraceuticals**

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

**Herbal-Drug and Herb-Food Interactions:** General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

#### **UNIT-III**

**10 Hours**

##### **Herbal Cosmetics**

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

**Herbal excipients:**

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

**Herbal formulations :**

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

**UNIT- IV**

**10 Hours**

**Evaluation of Drugs** WHO & ICH guidelines for the assessment of herbal drugs  
Stability testing of herbal drugs.

**Patenting and Regulatory requirements of natural products:**

- a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy
- b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

**Regulatory Issues** - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

**UNIT-V**

**07 Hours**

**General Introduction to Herbal Industry**

Herbal drugs industry: Present scope and future prospects.

A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

**Schedule T – Good Manufacturing Practice of Indian systems of medicine**

Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.



## **BP 609 P. HERBAL DRUG TECHNOLOGY (Practical)**

**4 hours/ week**

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

### **Recommended Books: (Latest Editions)**

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

**BP 604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS  
(Theory)**

45 Hours

**Scope:** This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arising therein.

**Objectives:** Upon completion of the course student shall be able to:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

**Course Content:**

**UNIT-I**

**10 Hours**

**Introduction to Biopharmaceutics**

**Absorption:** Mechanisms of drug absorption through GIT, factors influencing drug absorption through GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

**UNIT- II**

**10 Hours**

**Elimination:** Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

**Bioavailability and Bioequivalence:** Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

**UNIT- III**

**10 Hours**

**Pharmacokinetics:** Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters -  $K_E$ ,  $t_{1/2}$ ,  $V_d$ ,  $AUC$ ,  $K_a$ ,  $Cl_t$  and  $Cl_R$ - definitions methods of eliminations, understanding of their significance and application

**UNIT- IV****08 Hours****Multicompartment models:** Two compartment open model. IV bolus

Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.

**UNIT- V****07 Hours**

**Nonlinear Pharmacokinetics:** a. Introduction, b. Factors causing Non-linearity.  
c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

**Recommended Books: (Latest Editions)**

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition, Prentice-Hall International edition, USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal, Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Gibaldi Donald, R. Merceel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febiger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Robert F Notari Marcel Dekker Inc, New York and Basel, 1987.
12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania



## **BP 605 T. PHARMACEUTICAL BIOTECHNOLOGY (Theory)**

**45 Hours**

### **Scope:**

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

**Objectives:** Upon completion of the subject student shall be able to;

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

### **Unit I**

**10 Hours**

- a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
- b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.
- c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
- d) Brief introduction to Protein Engineering.
- e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
- f) Basic principles of genetic engineering.

### **Unit II**

**10 Hours**

- a) Study of cloning vectors, restriction endonucleases and DNA ligase.
- b) Recombinant DNA technology. Application of genetic engineering in medicine.
- c) Application of r DNA technology and genetic engineering in the production of:
  - i) Interferon
  - ii) Vaccines- hepatitis- B
  - iii) Hormones-Insulin.
- d) Brief introduction to PCR

### **Unit III**

**10 Hours**

Types of immunity- humoral immunity, cellular immunity

- a) Structure of Immunoglobulins
- b) Structure and Function of MHC
- c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.
- d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
- e) Storage conditions and stability of official vaccines
- f) Hybridoma technology- Production, Purification and Applications
- g) Blood products and Plasma Substitutes.

### **Unit IV**

**08Hours**

- a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
- b) Genetic organization of Eukaryotes and Prokaryotes
- c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.
- d) Introduction to Microbial biotransformation and applications.
- e) Mutation: Types of mutation/mutants.

### **Unit V**

**07 Hours**

- a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.
- b) Large scale production fermenter design and its various controls.
- c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,
- d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.

### **Recommended Books (Latest edition):**

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal

Society of Chemistry.

5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

## **BP606TPHARMACEUTICAL QUALITY ASSURANCE (Theory)**

**45 Hours**

**Scope:** This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

**Objectives:** Upon completion of the course student shall be able to:

- understand the cGMP aspects in a pharmaceutical industry
- appreciate the importance of documentation
- understand the scope of quality certifications applicable to pharmaceutical industries
- understand the responsibilities of QA & QC departments

**Course content:**

### **UNIT – I**

**10 Hours**

**Quality Assurance and Quality Management concepts:** Definition and concept of Quality control, Quality assurance and GMP

**Total Quality Management (TQM):** Definition, elements, philosophies

**ICH Guidelines:** purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines

**Quality by design (QbD):** Definition, overview, elements of QbD program, tools

**ISO 9000 & ISO14000:** Overview, Benefits, Elements, steps for registration

**NABL accreditation :** Principles and procedures

### **UNIT - II**

**10 Hours**

**Organization and personnel:** Personnel responsibilities, training, hygiene and personal records.

**Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

**Equipments and raw materials:** Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

### **UNIT – III**

**10 Hours**

**Quality Control:** Quality control test for containers, rubber closures and secondary packing



materials.

**Good Laboratory Practices:** General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

#### **UNIT – IV**

**08 Hours**

**Complaints:** Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

**Document maintenance in pharmaceutical industry:** Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

#### **UNIT – V**

**07 Hours**

**Calibration and Validation:** Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

**Warehousing:** Good warehousing practice, materials management

#### **Recommended Books: (Latest Edition)**

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2<sup>nd</sup> Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

**SEMESTER VII**

## **BP701T. INSTRUMENTAL METHODS OF ANALYSIS (Theory)**

**45 Hours**

**Scope:** This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

**Objectives:** Upon completion of the course the student shall be able to

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

### **Course Content:**

#### **UNIT –I**

**10 Hours**

##### **UV Visible spectroscopy**

Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.

Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.

Applications - Spectrophotometric titrations, Single component and multi component analysis

##### **Fluorimetry**

Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications

#### **UNIT –II**

**10 Hours**

##### **IR spectroscopy**

Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations

Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications

**Flame Photometry**-Principle, interferences, instrumentation and applications

**Atomic absorption spectroscopy-** Principle, interferences, instrumentation and applications

**Nepheloturbidometry-** Principle, instrumentation and applications

**UNIT –III**

**10 Hours**

**Introduction to chromatography**

**Adsorption and partition column chromatography-**Methodology, advantages, disadvantages and applications.

**Thin layer chromatography-** Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.

**Paper chromatography-**Introduction, methodology, development techniques, advantages, disadvantages and applications

**Electrophoresis–** Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications

**UNIT –IV**

**08 Hours**

**Gas chromatography -** Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

**High performance liquid chromatography (HPLC)-**Introduction, theory, instrumentation, advantages and applications.

**UNIT –V**

**07 Hours**

**Ion exchange chromatography-** Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications

**Gel chromatography-** Introduction, theory, instrumentation and applications

**Affinity chromatography-** Introduction, theory, instrumentation and applications

## **BP705P. INSTRUMENTAL METHODS OF ANALYSIS (Practical)**

**4 Hours/Week**

- 1 Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
- 2 Estimation of dextrose by colorimetry
- 3 Estimation of sulfanilamide by colorimetry
- 4 Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
- 5 Assay of paracetamol by UV- Spectrophotometry
- 6 Estimation of quinine sulfate by fluorimetry
- 7 Study of quenching of fluorescence
- 8 Determination of sodium by flame photometry
- 9 Determination of potassium by flame photometry
- 10 Determination of chlorides and sulphates by nephelo turbidometry
- 11 Separation of amino acids by paper chromatography
- 12 Separation of sugars by thin layer chromatography
- 13 Separation of plant pigments by column chromatography
- 14 Demonstration experiment on HPLC
- 15 Demonstration experiment on Gas Chromatography

### **Recommended Books (Latest Editions)**

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

## BP 702 T. INDUSTRIAL PHARMACYII (Theory)

45 Hours

**Scope:** This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market

**Objectives:** Upon completion of the course, the student shall be able to:

1. Know the process of pilot plant and scale up of pharmaceutical dosage forms
2. Understand the process of technology transfer from lab scale to commercial batch
3. Know different Laws and Acts that regulate pharmaceutical industry
4. Understand the approval process and regulatory requirements for drug products

### Course Content:

#### UNIT-I

10 Hours

**Pilot plant scale up techniques:** General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

#### UNIT-II

10 Hours

**Technology development and transfer:** WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

#### UNIT-III

10 Hours

**Regulatory affairs:** Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals

**Regulatory requirements for drug approval:** Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

**UNIT-IV****08 Hours**

**Quality management systems:** Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

**UNIT-V****07 Hours**

**Indian Regulatory Requirements:** Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

**Recommended Books: (Latest Editions)**

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7<sup>th</sup> April available at [http://en.wikipedia.org/wiki/Regulatory\\_Affairs](http://en.wikipedia.org/wiki/Regulatory_Affairs).
2. International Regulatory Affairs Updates, 2005. available at <http://www.iraup.com/about.php>
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available at <http://www.cgmp.com/ra.htm>.

## **BP 703T. PHARMACY PRACTICE (Theory)**

**45 Hours**

**Scope:** In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.

**Objectives:** Upon completion of the course, the student shall be able to

1. know various drug distribution methods in a hospital
2. appreciate the pharmacy stores management and inventory control
3. monitor drug therapy of patient through medication chart review and clinical review
4. obtain medication history interview and counsel the patients
5. identify drug related problems
6. detect and assess adverse drug reactions
7. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
8. know pharmaceutical care services
9. do patient counseling in community pharmacy;
10. appreciate the concept of Rational drug therapy.

### **Unit I:**

**10 Hours**

#### **a) Hospital and its organization**

Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.

#### **b) Hospital pharmacy and its organization**

Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

#### **c) Adverse drug reaction**

Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting



drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

**d) Community Pharmacy**

Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

**Unit II:**

**10 Hours**

**a) Drug distribution system in a hospital**

Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.

**b) Hospital formulary**

Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

**c) Therapeutic drug monitoring**

Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

**d) Medication adherence**

Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

**e) Patient medication history interview**

Need for the patient medication history interview, medication interview forms.

**f) Community pharmacy management**

Financial, materials, staff, and infrastructure requirements.

**Unit III:**

**10 Hours**

**a) Pharmacy and therapeutic committee**

Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

**b) information services**

**Drug**

Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.

**c) Patient counseling**

Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist

**d) Education and training program in the hospital**

Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.

**e) Prescribed medication order and communication skills**

Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

**Unit IV**

**8 Hours**

**Budget preparation and implementation**

**a) Clinical Pharmacy**

Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care.

Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.

**b) Over the counter (OTC) sales**

Introduction and sale of over the counter, and Rational use of common over the counter medications.

**Unit V**

**7 Hours**

**a) Drug store management and inventory control**

Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

**b) Investigational use of drugs**

Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

**c) Interpretation of Clinical Laboratory Tests**

Blood chemistry, hematology, and urinalysis

**Recommended Books (Latest Edition):**

1. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills*, 1<sup>st</sup> ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger; 1986.
4. Tipnis Bajaj. *Hospital Pharmacy*, 1<sup>st</sup> ed. Maharashtra: Career Publications; 2008.
5. Scott LT. *Basic skills in interpreting laboratory data*, 4th ed. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N.S. *Health Education and Community Pharmacy*, 18th ed. India: CBS Publishers & Distributers; 2008.

**Journals:**

1. Therapeutic drug monitoring. ISSN: 0163-4356
2. Journal of pharmacy practice. ISSN : 0974-8326
3. American journal of health system pharmacy. ISSN: 1535-2900 (online)
4. Pharmacy times (Monthly magazine)

## **BP 704T: NOVEL DRUG DELIVERY SYSTEMS (Theory)**

**45 Hours**

**Scope:** This subject is designed to impart basic knowledge on the area of novel drug delivery systems.

**Objectives:** Upon completion of the course student shall be able

1. To understand various approaches for development of novel drug delivery systems.
2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation

### **Course content:**

#### **Unit-I**

**10 Hours**

**Controlled drug delivery systems:** Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations

**Polymers:** Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

#### **Unit-II**

**10 Hours**

**Microencapsulation:** Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications

**Mucosal Drug Delivery system:** Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

**Implantable Drug Delivery Systems:** Introduction, advantages and disadvantages, concept of implants and osmotic pump

#### **Unit-III**

**10 Hours**

**Transdermal Drug Delivery Systems:** Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

**Gastroretentive drug delivery systems:** Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications

**Nasopulmonary drug delivery system:** Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

#### **Unit-IV**

**08 Hours**

**Targeted drug Delivery:** Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

**Unit-V**

**07 Hours**

**Ocular Drug Delivery Systems:** Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts

**Intrauterine Drug Delivery Systems:** Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

**Recommended Books: (Latest Editions)**

1. Y W. Chien, Novel Drug Delivery Systems, 2<sup>nd</sup> edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

**Journals**

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian Drugs (IDMA)
3. Journal of Controlled Release (Elsevier Sciences)
4. Drug Development and Industrial Pharmacy (Marcel & Decker)
5. International Journal of Pharmaceutics (Elsevier Sciences)

**SEMESTER VIII**

## **BP801T. BIOSTATISTICS AND RESEARCH METHODOLOGY (Theory)**

**45 Hours**

**Scope:** To understand the applications of Biostatistics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel.

**Objectives:** Upon completion of the course the student shall be able to

- Know the operation of M.S. Excel, SPSS, R and MINITAB<sup>®</sup>, DoE (Design of Experiment)
- Know the various statistical techniques to solve statistical problems
- Appreciate statistical techniques in solving the problems.

### **Course content:**

#### **Unit-I**

**10 Hours**

**Introduction:** Statistics, Biostatistics, Frequency distribution

**Measures of central tendency:** Mean, Median, Mode- Pharmaceutical examples

**Measures of dispersion:** Dispersion, Range, standard deviation, Pharmaceutical problems

**Correlation:** Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples

#### **Unit-II**

**10 Hours**

**Regression:** Curve fitting by the method of least squares, fitting the lines  $y = a + bx$  and  $x = a + by$ , Multiple regression, standard error of regression- Pharmaceutical Examples

**Probability:** Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems

Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples

**Parametric test:** t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference

#### **Unit-III**

**10 Hours**

**Non Parametric tests:** Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test

**Introduction to Research:** Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism

**Graphs:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph

**Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

#### **Unit-IV**

**8 Hours**

Blocking and confounding system for Two-level factorials

**Regression modeling:** Hypothesis testing in Simple and Multiple regression models

**Introduction to Practical components of Industrial and Clinical Trials Problems:**

Statistical Analysis Using Excel, SPSS, MINITAB<sup>®</sup>, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach

#### **Unit-V**

**7Hours**

**Design and Analysis of experiments:**

**Factorial Design:** Definition,  $2^2$ ,  $2^3$  design. Advantage of factorial design

**Response Surface methodology:** Central composite design, Historical design, Optimization Techniques

#### **Recommended Books (Latest edition):**

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. New York.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery



## **BP 802T SOCIAL AND PREVENTIVE PHARMACY**

**Hours: 45**

### **Scope:**

The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

### **Objectives:**

After the successful completion of this course, the student shall be able to:

- Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.
- Have a critical way of thinking based on current healthcare development.
- Evaluate alternative ways of solving problems related to health and pharmaceutical issues

### **Course content:**

#### **Unit I:**

**10 Hours**

**Concept of health and disease:** Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

**Social and health education:** Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

**Sociology and health:** Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health

**Hygiene and health:** personal hygiene and health care; avoidable habits

#### **Unit II:**

**10 Hours**

**Preventive medicine:** General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse

#### **Unit III:**

**10 Hours**

**National health programs, its objectives, functioning and outcome of the following:** HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National

programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

**Unit IV:**

**08 Hours**

National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program

**Unit V:**

**07 Hours**

Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

**Recommended Books (Latest edition):**

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2<sup>nd</sup> Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4<sup>th</sup> Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6<sup>th</sup> Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2<sup>nd</sup> Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
5. Park Textbook of Preventive and Social Medicine, K Park, 21<sup>st</sup> Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

**Recommended Journals:**

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland

## **BP803ET. PHARMA MARKETING MANAGEMENT (Theory)**

**45 Hours**

### **Scope:**

The pharmaceutical industry not only needs highly qualified researchers, chemists and, technical people, but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.

**Course Objective:** The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

### **Unit I**

**10 Hours**

#### **Marketing:**

Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.

#### **Pharmaceutical market:**

Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation & targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.

### **Unit II**

**10 Hours**

#### **Product decision:**

Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.

### **Unit III**

**10 Hours**

#### **Promotion:**

Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

**Unit IV****10 Hours****Pharmaceutical marketing channels:**

Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

**Professional sales representative (PSR):**

Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

**Unit V****10 Hours****Pricing:**

Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority).

**Emerging concepts in marketing:**

Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.

**Recommended Books: (Latest Editions)**

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill
4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global Perspective, IndianContext,Macmilan India, New Delhi.
7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.



## **BP804 ET: PHARMACEUTICAL REGULATORY SCIENCE (Theory)**

**45Hours**

**Scope:** This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia, UK etc. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.

**Objectives:** Upon completion of the subject student shall be able to;

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international markets

### **Course content:**

#### **Unit I**

**10Hours**

##### **New Drug Discovery and development**

Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

#### **Unit II**

**10Hours**

##### **Regulatory Approval Process**

Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA.

##### **Regulatory authorities and agencies**

Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)

#### **Unit III**

**10Hours**

##### **Registration of Indian drug product in overseas market**

Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical

Document (eCTD), ASEAN Common Technical Document (ACTD)research.

#### **Unit IV**

**08Hours**

##### **Clinical trials**

Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials

#### **Unit V**

**07Hours**

##### **Regulatory Concepts**

Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book

##### **Recommended books (Latest edition):**

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185. Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5<sup>th</sup> edition, Drugs and the Pharmaceutical Sciences, Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
9. Drugs: From Discovery to Approval, Second Edition By Rick Ng

## **BP 805T: PHARMACOVIGILANCE (Theory)**

**45 hours**

**Scope:** This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data and signal detection. This paper also develops the skills of classifying drugs, diseases and adverse drug reactions.

### **Objectives:**

*At completion of this paper it is expected that students will be able to (know, do, and appreciate):*

1. Why drug safety monitoring is important?
2. History and development of pharmacovigilance
3. National and international scenario of pharmacovigilance
4. Dictionaries, coding and terminologies used in pharmacovigilance
5. Detection of new adverse drug reactions and their assessment
6. International standards for classification of diseases and drugs
7. Adverse drug reaction reporting systems and communication in pharmacovigilance
8. Methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle
9. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
10. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India
11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
12. CIOMS requirements for ADR reporting
13. Writing case narratives of adverse events and their quality.

### **Course Content**

#### **Unit I**

**10 Hours**

##### **Introduction to Pharmacovigilance**

- History and development of Pharmacovigilance
- Importance of safety monitoring of Medicine
- WHO international drug monitoring programme
- Pharmacovigilance Program of India(PvPI)

##### **Introduction to adverse drug reactions**

- Definitions and classification of ADRs
- Detection and reporting
- Methods in Causality assessment
- Severity and seriousness assessment
- Predictability and preventability assessment
- Management of adverse drug reactions

##### **Basic terminologies used in pharmacovigilance**



- Terminologies of adverse medication related events
- Regulatory terminologies

## **Unit II**

**10 hours**

### **Drug and disease classification**

- Anatomical, therapeutic and chemical classification of drugs
- International classification of diseases
- Daily defined doses
- International Non proprietary Names for drugs

### **Drug dictionaries and coding in pharmacovigilance**

- WHO adverse reaction terminologies
- MedDRA and Standardised MedDRA queries
- WHO drug dictionary
- Eudravigilance medicinal product dictionary

### **Information resources in pharmacovigilance**

- Basic drug information resources
- Specialised resources for ADRs

### **Establishing pharmacovigilance programme**

- Establishing in a hospital
- Establishment & operation of drug safety department in industry
- Contract Research Organisations (CROs)
- Establishing a national programme

## **Unit III**

**10 Hours**

### **Vaccine safety surveillance**

- Vaccine Pharmacovigilance
- Vaccination failure
- Adverse events following immunization

### **Pharmacovigilance methods**

- Passive surveillance – Spontaneous reports and case series
- Stimulated reporting
- Active surveillance – Sentinel sites, drug event monitoring and registries
- Comparative observational studies – Cross sectional study, case control study and cohort study
- Targeted clinical investigations

### **Communication in pharmacovigilance**

- Effective communication in Pharmacovigilance
- Communication in Drug Safety Crisis management
- Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media

## Unit IV

8 Hours

### Safety data generation

- Pre clinical phase
- Clinical phase
- Post approval phase (PMS)

### ICH Guidelines for Pharmacovigilance

- Organization and objectives of ICH
- Expedited reporting
- Individual case safety reports
- Periodic safety update reports
- Post approval expedited reporting
- Pharmacovigilance planning
- Good clinical practice in pharmacovigilance studies

## Unit V

7 hours

### Pharmacogenomics of adverse drug reactions

- Genetics related ADR with example focusing PK parameters.

### Drug safety evaluation in special population

- Paediatrics
- Pregnancy and lactation
- Geriatrics

### CIOMS

- CIOMS Working Groups
- CIOMS Form

### CDSCO (India) and Pharmacovigilance

- D&C Act and Schedule Y
- Differences in Indian and global pharmacovigilance requirements

### Recommended Books (Latest edition):

1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.
5. An Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers.
6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones & Bartlett Publishers.
7. Textbook of Pharmacoepidemiology edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers.
8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills: G. Parthasarathi, Karin Nyfort Hansen, Milap C. Nahata
9. National Formulary of India
10. Text Book of Medicine by Yashpal Munjal

11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna

12. <http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297>
13. <http://www.ich.org/>
14. <http://www.cioms.ch/>
15. <http://edsco.nic.in/>
16. [http://www.who.int/vaccine\\_safety/en/](http://www.who.int/vaccine_safety/en/)
17. [http://www.ipc.gov.in/PvPI/pv\\_home.html](http://www.ipc.gov.in/PvPI/pv_home.html)

## **BP 806 ET. QUALITY CONTROL AND STANDARDIZATION OF HERBALS (Theory)**

**Scope:** In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

**Objectives:** Upon completion of the subject student shall be able to;

1. know WHO guidelines for quality control of herbal drugs
2. know Quality assurance in herbal drug industry
3. know the regulatory approval process and their registration in Indian and international markets
4. appreciate EU and ICH guidelines for quality control of herbal drugs

### **Unit I**

**10 hours**

Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms

WHO guidelines for quality control of herbal drugs.

Evaluation of commercial crude drugs intended for use

### **Unit II**

**10 hours**

**Quality assurance in herbal drug industry** of cGMP, GAP, GMP and GLP in traditional system of medicine.

WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines

WHO Guidelines on GACP for Medicinal Plants.

### **Unit III**

**10 hours**

EU and ICH guidelines for quality control of herbal drugs.

Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

### **Unit IV**

**08 hours**

Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products.

Preparation of documents for new drug application and export registration

GMP requirements and Drugs & Cosmetics Act provisions.

**Unit V****07 hours**

Regulatory requirements for herbal medicines.

WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems

Comparison of various Herbal Pharmacopoeias.

Role of chemical and biological markers in standardization of herbal products

**Recommended Books: (Latest Editions)**

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I, Carrier Pub., 2006.
4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.
5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,
6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.
8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.
9. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.
10. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
11. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.
12. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

## BP 807 ET. COMPUTER AIDED DRUG DESIGN (Theory)

45 Hours

**Scope:** This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

**Objectives:** Upon completion of the course, the student shall be able to understand

- Design and discovery of lead molecules
- The role of drug design in drug discovery process
- The concept of QSAR and docking
- Various strategies to develop new drug like molecules.
- The design of new drug molecules using molecular modeling software

### Course Content:

#### UNIT-I

10 Hours

##### Introduction to Drug Discovery and Development

Stages of drug discovery and development

##### Lead discovery and Analog Based Drug Design

Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.

**Analog Based Drug Design:** Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

#### UNIT-II

10 Hours

##### Quantitative Structure Activity Relationship (QSAR)

SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammett's substituent constant and Taft's steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

#### UNIT-III

10 Hours

##### Molecular Modeling and virtual screening techniques

**Virtual Screening techniques:** Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,

**Molecular docking:** Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.

**UNIT-IV****08 Hours****Informatics & Methods in drug design**

Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

**UNIT-V****07 Hours**

**Molecular Modeling:** Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.

**Recommended Books (Latest Editions)**

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Park Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.
3. Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.
4. Foye WO "Principles of Medicinal chemistry 'Lea & Febiger.
5. Koro Ikovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
6. Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" John Wiley & Sons, New York.
7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
8. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
9. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action" Academic Press New York.



**BP808ET: CELL AND MOLECULAR BIOLOGY (Elective subject)**

**45 Hours**

**Scope:**

- Cell biology is a branch of biology that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function.
- This is done both on a microscopic and molecular level.
- Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organisms such as humans, plants, and sponges.

**Objectives:** Upon completion of the subject student shall be able to;

- Summarize cell and molecular biology history.
- Summarize cellular functioning and composition.
- Describe the chemical foundations of cell biology.
- Summarize the DNA properties of cell biology.
- Describe protein structure and function.
- Describe cellular membrane structure and function.
- Describe basic molecular genetic mechanisms.
- Summarize the Cell Cycle

**Course content:**

**Unit I**

**10Hours**

- a) Cell and Molecular Biology: Definitions theory and basics and Applications.
- b) Cell and Molecular Biology: History and Summation.
- c) Properties of cells and cell membrane.
- d) Prokaryotic versus Eukaryotic
- e) Cellular Reproduction
- f) Chemical Foundations – an Introduction and Reactions (Types)

**Unit II**

**10 Hours**

- a) DNA and the Flow of Molecular Information
- b) DNA Functioning
- c) DNA and RNA
- d) Types of RNA
- e) Transcription and Translation

**Unit III**

**10 Hours**

- a) Proteins: Defined **and** Amino Acids
- b) Protein Structure

- c) Regularities in Protein Pathways
- d) Cellular Processes
- e) Positive Control and significance of Protein Synthesis

**Unit IV**

**08 Hours**

- a) Science of Genetics
- b) Transgenics and Genomic Analysis
- c) Cell Cycle analysis
- d) Mitosis and Meiosis
- e) Cellular Activities and Checkpoints

**Unit V**

**07 Hours**

- a) Cell Signals: Introduction
- b) Receptors for Cell Signals
- c) Signaling Pathways: Overview
- d) Misregulation of Signaling Pathways
- e) Protein-Kinases: Functioning

**Recommended Books (latest edition):**

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4<sup>th</sup> edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Pepler: Microbial Technology.
9. Edward: Fundamentals of Microbiology.
10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
12. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
13. RA Goldshy et. al., : Kuby Immunology.

**BP809ET. COSMETIC SCIENCE**  
(Theory)

**45Hours**

**UNIT I**

**10Hours**

Classification of cosmetic and cosmeceutical products  
Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs

**Cosmetic excipients:** Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application

**Skin:** Basic structure and function of skin.

**Hair:** Basic structure of hair. Hair growth cycle.

**Oral Cavity:** Common problem associated with teeth and gums.

**UNIT II**

**10 Hours**

**Principles of formulation and building blocks of skin care products:**

Face wash,

Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals.

**Antiperspirants & deodorants-** Actives & mechanism of action.

**Principles of formulation and building blocks of Hair care products:**

Conditioning shampoo, Hair conditioner, anti-dandruff shampoo.

Hair oils.

Chemistry and formulation of Para-phenylene diamine based hair dye.

Principles of formulation and building blocks of oral care products:

Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

**UNIT III**

**10 Hours**

Sun protection, Classification of Sunscreens and SPF.

**Role of herbs in cosmetics:**

Skin Care: Aloe and turmeric

Hair care: Henna and amla.

Oral care: Neem and clove

**Analytical cosmetics:** BIS specification and analytical methods for shampoo, skin-cream and toothpaste.

**UNIT IV**

**08 Hours.**

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties

Soaps, and syndet bars. Evolution and skin benefits.

## **UNIT V**

**07 Hours**

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis.

Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes

Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor.

Antiperspirants and Deodorants- Actives and mechanism of action

### **References**

- 1) Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
- 2) Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4<sup>th</sup> Edition, Vandana Publications Pvt. Ltd., Delhi.
- 3) Text book of cosmeticology by Sanju Nanda & Roop K. Khar, Tata Publishers.

## BP810 ET. PHARMACOLOGICAL SCREENING METHODS

45 Hours

**Scope:** This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.

### Objectives

Upon completion of the course the student shall be able to,

- Appreciate the applications of various commonly used laboratory animals.
- Appreciate and demonstrate the various screening methods used in preclinical research
- Appreciate and demonstrate the importance of biostatistics and research methodology
- Design and execute a research hypothesis independently

<b>Unit –I</b>	<b>08 Hours</b>
<b>Laboratory Animals:</b> Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.	
<b>Unit –II</b>	<b>10 Hours</b>
<b>Preclinical screening models</b> a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study. <b>b. Study of screening animal models for</b> Diuretics, nootropics, anti-Parkinson's, antiasthmatics, <b>Preclinical screening models:</b> for CNS activity- analgesic, antipyretic, anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease	

<p><b>Unit –III</b>  <b>Preclinical screening models:</b> for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics</p>	
<p><b>Unit –IV</b>  <b>Preclinical screening models:</b> for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslipidemic, anti aggregatory, coagulants, and anticoagulants  Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.</p>	
<p><b>Research methodology and Bio-statistics</b>  Selection of research topic, review of literature, research hypothesis and study design  Pre-clinical data analysis and interpretation using Students ‘t’ test and One-way ANOVA. Graphical representation of data</p>	<p><b>05 Hours</b></p>

**Recommended Books (latest edition):**

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. CPCSEA guidelines for laboratory animal facility.
4. Drug discovery and Evaluation by Vogel H.G.
5. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

## **BP 811 ET. ADVANCED INSTRUMENTATION TECHNIQUES**

**45 Hours**

**Scope:** This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

**Objectives:** Upon completion of the course the student shall be able to

- understand the advanced instruments used and its applications in drug analysis
- understand the chromatographic separation and analysis of drugs.
- understand the calibration of various analytical instruments
- know analysis of drugs using various analytical instruments.

### **Course Content:**

#### **UNIT-I**

**10 Hours**

##### **Nuclear Magnetic Resonance spectroscopy**

Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

**Mass Spectrometry-** Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications

#### **UNIT-II**

**10 Hours**

**Thermal Methods of Analysis:** Principles, instrumentation and applications of Thermo gravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

**X-Ray Diffraction Methods:** Origin of X-rays, basic aspects of crystals, X-ray

Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.

#### **UNIT-III**

**10 Hours**

**Calibration and validation-**as per ICH and USFDA guidelines

##### **Calibration of following Instruments**

Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer,

Fluorimeter, Flame Photometer, HPLC and GC

**UNIT-IV**

**08 Hours**

**Radio immune assay:** Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

**Extraction techniques:** General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

**UNIT-V**

**07 Hours**

**Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.**

**Recommended Books (Latest Editions)**

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein



## BP 812 ET. DIETARY SUPPLEMENTS AND NUTRACEUTICALS

**No. of hours :3**

**Tutorial:1**

**Credit point:4**

### **Scope :**

This subject covers foundational topic that are important for understanding the need and requirements of dietary supplements among different groups in the population.

### **Objective:**

This module aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements. By the end of the course, students should be able to :

1. Understand the need of supplements by the different group of people to maintain healthy life.
2. Understand the outcome of deficiencies in dietary supplements.
3. Appreciate the components in dietary supplements and the application.
4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims.

### **UNIT I**

**07 hours**

- a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.
- b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.
- c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

### **UNIT II**

**15 hours**

Phytochemicals as nutraceuticals: Occurrence and characteristic features(chemical nature medicinal benefits) of following

- a) Carotenoids-  $\alpha$  and  $\beta$ -Carotene, Lycopene, Xanthophylls, leutin
- b) Sulfides: Diallyl sulfides, Allyl trisulfide.
- c) Polyphenolics: Reservetrol
- d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones
- e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum
- f) Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans
- g) Tocopherols
- h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.

### **UNIT III**

**07 hours**

- a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.

- b) Dietary fibres and complex carbohydrates as functional food ingredients..

#### **UNIT IV**

**10 hours**

- a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.
- b) Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E,  $\alpha$ - Lipoic acid, melatonin  
Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole.
- c) Functional foods for chronic disease prevention

#### **UNIT V**

**06 hours**

- a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.
- b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.
- c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.

#### **References:**

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and nutraceuticals in preventing diseases by K.T Agusti and P.Faizal: BSPublication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2<sup>nd</sup> Edn., Avery Publishing Group, NY (1997).
6. G. Gibson and C.williams Editors *2000 Functional foods* Woodhead Publ.Co.London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M.K. Sachmidl and T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea and Febiger

**Semester VIII – Elective course on Pharmaceutical Product Development No of**

**Hours: 3**

**Tutorial:1**

**Credit points:4**

**Unit-I**

**10 Hours**

Introduction to pharmaceutical product development, objectives, regulations related to preformulation, formulation development, stability assessment, manufacturing and quality control testing of different types of dosage forms

**Unit-II**

**10 Hours**

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories

- i. Solvents and solubilizers
- ii. Cyclodextrins and their applications
- iii. Non - ionic surfactants and their applications
- iv. Polyethylene glycols and sorbitols
- v. Suspending and emulsifying agents
- vi. Semi solid excipients

**Unit-III**

**10 Hours**

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories

- i. Tablet and capsule excipients
- ii. Directly compressible vehicles
- iii. Coat materials
- iv. Excipients in parenteral and aerosols products
- v. Excipients for formulation of NDDS

Selection and application of excipients in pharmaceutical formulations with specific industrial applications

**Unit-IV**

**08 Hours**

Optimization techniques in pharmaceutical product development. A study of various optimization techniques for pharmaceutical product development with specific examples. Optimization by factorial designs and their applications. A study of QbD and its application in pharmaceutical product development.

**Unit-V**

**07 Hours**

Selection and quality control testing of packaging materials for pharmaceutical product development- regulatory considerations.



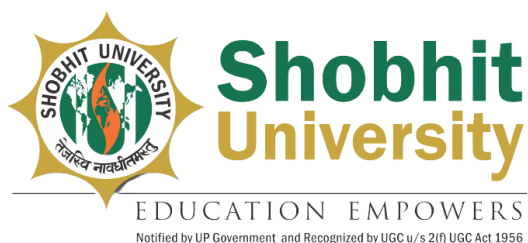
### **Recommended Books (Latest editions)**

1. Pharmaceutical Statistics Practical and Clinical Applications by Stanford Bolton, CharlesBon; Marcel Dekker Inc.
2. Encyclopedia of Pharmaceutical Technology, edited by James swarbrick, Third Edition, Informa Healthcare publishers.
3. Pharmaceutical Dosage Forms, Tablets, Volume II, edited by Herbert A. Lieberman and Leon Lachman; Marcel Dekker, Inc.
4. The Theory and Practice of Industrial Pharmacy, Fourth Edition, edited by Roop kKhar, S P Vyas, Farhan J Ahmad, Gaurav K Jain; CBS Publishers and Distributors Pvt.Ltd. 2013.
5. Martin's Physical Pharmacy and Pharmaceutical Sciences, Fifth Edition, edited by Patrick J. Sinko, BI Publications Pvt. Ltd.
6. Targeted and Controlled Drug Delivery, Novel Carrier Systems by S. P. Vyas and R. K.Khar, CBS Publishers and Distributors Pvt. Ltd, First Edition 2012.
7. Pharmaceutical Dosage Forms and Drug Delivery Systems, Loyd V. Allen Jr., Nicholas B.Popovich, Howard C. Ansel, 9th Ed. 40
8. Aulton's Pharmaceutics – The Design and Manufacture of Medicines, Michael E. Aulton, 3rd Ed.
9. Remington – The Science and Practice of Pharmacy, 20th Ed.
10. Pharmaceutical Dosage Forms – Tablets Vol 1 to 3, A. Liberman, Leon Lachman and Joseph B. Schwartz
11. Pharmaceutical Dosage Forms – Disperse Systems Vol 1 to 3, H.A. Liberman, Martin, M.R and Gilbert S. Banker.
12. Pharmaceutical Dosage Forms – Parenteral Medication Vol 1 & 2, Kenneth E. Avis and H.A. Libermann.
13. Advanced Review Articles related to the topics.

# **ORDINANCE**

**For the Degree of**

**Doctor of Philosophy (Ph.D.)**



**Shobhit University**

**Gangoh, Saharanpur**

**2023**

[Includes the provisions & guidelines of UGC (Minimum Standards and Procedure for award of Ph.D. Degree) Regulations 2022]

## **Ordinance for the Degree of Doctor of Philosophy (2023)**

All Schools/Institutes/Departments/Centers/Colleges of Shobhit University, Gangoh shall be eligible to offer Ph.D. programmes. None of the School/Institute/Department/Center/College shall conduct any Ph.D. programme through distance mode. These rules shall be applicable to all the new candidates joining Ph.D. programmes of Shobhit University on/ or after its implementation. This ordinance entails all the provisions of the gazette notification of UGC (Minimum Standards and Procedure for Award of Ph.D. Degree), Regulation, 2022, and amendments made there in from time to time.

### **1. Important Definitions**

- a. “Act” means the University Grants Commission Act,1956 (3 of 1956);
- b. “Adjunct Faculty” means a part-time or contingent instructor, but not full-time faculty member hired to teach by a Higher Educational Institution;
- c. “Cumulative Grade Point Average (CGPA)” means a measure of the overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all semesters. It is expressed up to two decimal places;
- d. “Credit” means the number of hours of instruction required per week over the duration of a semester. A three-credit course in a semester means three one-hour lectures per week, with each one-hour lecture counted as one credit;
- e. “Course” means one of the specified units which go to comprise a programme of study;
- f. “Course Work” means courses of study prescribed by the School/Department/ Centre to be undertaken by a student registered for the Ph.D. Degree;
- g. “Degree” means a degree awarded by a Higher Educational Institution in accordance with the provisions of section 22 (3) of the Act;
- h. “External Examiner” means an academician/researcher with published research work who is not part of the Higher Educational Institution where the Ph.D. scholar has registered for the Ph.D. programme;
- i. “Grade Point” means a numerical weight allotted to each letter grade on a 10-point scale;
- j. “Guide/Research Supervisor” means an academician/researcher recognized by Higher Educational Institution to supervise the Ph.D. scholar for his/her research;
- k. “Interdisciplinary Research” means research conducted by a Ph.D. scholar in two or more academic disciplines;
- l. “Plagiarism” means the practice of taking someone else’s work or idea and passing them as one’s own;
- m. “Programme” means a higher education programme pursued for a degree specified by the

Commission under sub-section (3) of section 22 of the Act;

- n. "Prospectus" means any document, whether in print or otherwise, issued for providing fair and transparent information relating to a Higher Educational Institution and programmes, to the general public (including to those seeking admission in such Higher Educational Institutions) by the Higher Educational Institutions;
- o. "Research Proposal" means a brief write-up giving an outline of the proposed research work which the Ph.D. scholar shall submit along with the application for registration for Ph.D. programme;
- p. "University" means a Higher Educational Institution established or incorporated by or under a Central Act, a Provincial Act, or a State Act, and shall include any institution for higher education deemed to be a University under Section 3 of the Act.

## **2. Categories of candidates for admission to Ph.D. programs**

### **(i) Full-time candidates**

A **full-time** Ph.D. candidate shall be required to remain present in the University campus till submission of his/her Ph.D. thesis. He/she shall also have to undertake minimum 6 hours per week of academic work load as assigned by the School/ Institute/Department/Center/College in which, he/she is registered for Ph.D. programme besides the course work and Ph.D. work. Such candidates are eligible to receive assistantship from the University or fellowship from CSIR/UGC or any other funding agency.

### **(ii) Part-time candidates**

A **part-time** Ph.D. candidate can be a regular Shobhit University academic or non-academic faculty/staff member who satisfies the eligibility requirements. Other eligible candidates can be those who are sponsored by Public Sector Undertaking/ Research and Development Organizations/ Private Industries/ Service Sectors/ Educational Institutions/ any other State and Central Government Organization

**(iii) Inter-disciplinary Ph.D. (I-Ph.D.)** is intended for students whose interests cross multiple academic disciplines. Such students who have excellent academic record and clear understanding of their research topic are eligible for this program. The program seeks to offer an intimate and varied community in which the students bring strong individual initiative together with the shared research concerns and expertise of a diverse supervisory committee in diverse studies that cross traditional disciplinary borders.

### **(iv) Eligibility**

A candidate seeking registration for the Degree of Doctor of Philosophy (Ph.D.) in Shobhit University must possess the following qualifications:

- (a) Candidates for admission to the Ph D programme shall have a Master's degree or a professional degree declared equivalent to the Master's degree by the corresponding statutory regulatory body, with at least 55% marks in aggregate or its equivalent grade 'B' in the UGC 7-point scale (or an equivalent grade in a point scale wherever grading system is followed) or an equivalent degree/ M.Phil. from a foreign educational Institution accredited by an



Assessment and Accreditation Agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country for the purpose of assessing, accrediting or assuring quality and standards of educational institutions.

- (b) Candidates who have cleared the M.Phil. Course work with at least 55% marks in aggregate or its equivalent grade 'B' in the UGC 7-point scale (or an equivalent grade in a point scale wherever grading system is followed) and successfully completing the M.Phil. Degree shall be eligible to proceed to do research work leading to the Ph. D. Degree in the same Institution in an integrated programme.
- (c) Bachelor's Degree in Engineering/Pharmacy with 75 % or more marks or the grade equivalent in relevant field of Engineering/ Technology/ Architecture /Pharmacy of a University or its equivalent, with at least five years of experience in Public Sector Undertaking/ Research and Development Organizations/ Private Industries/ Service Sectors/ Educational Institutions/ any other State and Central Government Organizations
- (d) A relaxation of 5% of marks, from 55% to 50%, or an equivalent relaxation of grade, may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-abled and other categories of candidates as per the decision of the Commission from time to time, or for those who had obtained their Master's degree prior to 19th September, 1991. The eligibility marks of 55% (or an equivalent grade in a point scale wherever grading system is followed) and the relaxation of 5% to the categories mentioned above are permissible based only on the qualifying marks without including the grace mark procedures.

### **3. Application**

A candidate seeking registration for Ph.D. degree must apply to the University on the prescribed application form. The application form shall be accompanied by:

- (i) Documents supporting all academic qualifications (Self Attested copies of the mark-sheets/ grade-sheets and degree certificates).
- (ii) Documents supporting his/her previous work experience, if any.
- (iii) Prescribed application fee, as applicable.
- (iv) No Objection Certificate (NOC) from the employer, in case the candidate is employed.
- (v) Migration Certificate.

### **4. Admission Procedure**

The university shall notify well in advance in the institutional website and through advertisement in national newspapers, of which at least one shall be in the regional language, the number of seats for admission, subject/discipline-wise distribution of available seats, criteria for admission, procedure for admission, examination centre(s) where entrance test(s) shall be conducted and all other relevant information for the benefit of the candidates.

The eligible candidates shall apply on the prescribed application available in the university or on the website. The duly completed form with the prescribed fee shall be submitted to the Registrar, Shobhit University, Gangoh, Saharanpur-247341 on or before the notified date.

The University shall decide on an annual basis through their academic bodies a predetermined and manageable number of Ph.D. scholars to be admitted depending on the number of available Research Supervisors and other academic and physical facilities available, keeping in mind the norms regarding the scholar- teacher ratio [as indicated in clause 5(vi)], laboratory, library and such other facilities. The university shall adhere to the National/State-level reservation policy, as applicable.

The University shall admit candidates by a two stage process through:

(a) An Entrance Test shall be deemed to be qualified with 50% marks. The syllabus of the Entrance Test shall consist of 50% of research methodology and 50% shall be subject specific. The Entrance Test shall be conducted at the Centre(s) notified in advance (changes of Centres, if any, also to be notified well in advance) at the level of the University and

(b) An interview/viva-voce to be organized by the University where the candidates are required to discuss their research interest/area through a presentation before a duly constituted Department/School Level Research Committee. A weightage of 70 % for the entrance test and 30 % for the performance in the interview/viva- voce shall be given.

The interview/viva voce shall also consider the following aspects.

- (i) The candidate possesses the competence for the proposed research.
- (ii) The research work can be suitably undertaken at the institution.
- (iii) The proposed area of research can contribute to new/additional knowledge.

The University shall maintain the list of all the Ph.D. registered students on its website on year-wise basis. The list shall include the name of the registered candidate, topic of his/her research, name of his/her supervisor/co-supervisor, date of enrolment/registration.

*Note: The candidates who have qualified UGC/CSIR (JRF) examination/ NET/SLET/GATE/GPAT/CEED & similar national level test or are holder of teacher fellowship or have passed M.Phil. Degree, from a recognized university may be exempted from the University entrance test. However, they shall be required to appear for personal interview and to discuss their proposed research area(s).*

## **5. Allocation of Supervisor(s)**

- (i) The allocation of the supervisor for a selected student shall be made formally by the School/ Institutes/departments/Centers/College depending upon the research interest of the student and the availability of a supervisor.
- (ii) Only a full time regular teacher of the working as Professor/Associate Professor of the University with a Ph.D., and at least five research publications in peer-reviewed or refereed journals and permanent faculty members working as Assistant Professors with a Ph.D., and at least three research publications in peer-reviewed or refereed

journals can act as a supervisor. The external supervisors are not allowed. However, Co-Supervisor can be allowed in inter-disciplinary areas from other departments of the same institute or from other related institutions with the recommendation of the Research Advisory Committee and approval by the competent authority.

- (iii) The allocation of Research Supervisor for a selected research scholar shall be decided by the School/Institutes/departments/Centers/College concerned depending on the number of scholars per Research Supervisor, the available specialization among the Supervisors and research interests of the scholars as indicated by them at the time of interview/viva voce.
- (iv) Co-Supervisor(s) from within the same department or other departments of the same institution or other institutions may be permitted with the approval of the competent authority. Adjunct Faculty members shall not act as Research Supervisors and can only act as co-supervisors
- (v) In case of topics which are of inter-disciplinary nature where it is felt that the expertise has to be supplemented from outside, the School/ Institutes/departments/Centers/College may appoint a Research Supervisor from within, who shall be known as the Research Supervisor, and a Co-Supervisor from outside the Department/ Faculty/College/Institution on such terms and conditions as may be specified and agreed upon by the consenting Institutions/Colleges.
- (vi) An eligible Professor/Associate Professor/Assistant Professor can guide up to eight (8) / six (6) / four (4) Ph.D. scholars, respectively, at any given time.

**Note:** A close relative of the candidate cannot function as a Supervisor or Co-Supervisor.

*Close relative shall include father, mother, husband, wife, son, daughter, brother, sister, uncle, nephew, father-in-law, mother-in-law, or any other such relation as may be determined by the competent authority.*

## **6. Admission of International Students in Ph.D. Programme (As per UGC Regulations, 2022)**

- (i) Each supervisor can guide up to two international research scholars on a supernumerary basis over and above the permitted number of Ph.D. scholars as specified in above clause 5(vi).
- (ii) The eligibility criteria shall be the same for the international candidates as mentioned in clause 2 (iv) and the admission of such candidates shall also be done as per the clause 4 of this ordinance. The other rules applicable to international students shall be followed.

**Note:** At any point, the total number of Ph.D. scholars under a faculty member, either as a supervisor or a co-supervisor, shall not exceed the number prescribed in clause 5(vi) and clause 6(i).

## **7. (a) Pre-requisite for the submission of synopsis**

### **Course Work**

All Ph.D. students shall be required to undertake course-work for a minimum period of one semester as a pre-requisite which shall include a course on Research Methodology, review of

published research in the relevant field besides one or more courses from the relevant field/ interdisciplinary area, as may be prescribed by the Supervisors/ Research Advisory Committee/University Research Degree Committee (URDC) as the case may be.

The course work may be carried out by the Ph.D. candidates in sister departments/ institutions either within or outside the University, if recommended by the URDC for which due credit shall be given to them.

#### **8. Credit Requirements, number, duration, syllabus, minimum standards for completion, etc.**

- (a) The Credit requirement for the Ph.D. coursework is a minimum of **12 credits**, including a **“Research and Publication Ethics”** course. The Research Advisory Committee can also recommend UGC recognized online courses as part of the credit requirements for the Ph.D. programme.
- (b) The course work shall be treated as prerequisite for Ph.D. preparation. A minimum of four credits shall be assigned to one or more courses on Research Methodology which could cover areas such as quantitative methods, computer applications, research ethics and review of published research in the relevant field, training, field work, etc. Other courses shall be advanced level courses preparing the students for Ph.D. degree.
- (c) All courses prescribed Ph.D. course work shall be in conformity with the credit hour instructional requirement and shall specify content, instructional and assessment methods. They shall be duly approved by the authorized academic bodies.
- (d) The Department where the scholar pursues his/her research shall prescribe the course(s) to him/her based on the recommendations of the Research Advisory Committee, as stipulated under sub-Clause 10 (a) below, of the research scholar.
- (e) All candidates admitted to the Ph.D. programs shall be required to complete the prescribed course work during the initial one or two semesters.
- (f) Candidates already holding M. Phil. degree and admitted to the Ph.D. programme, or those who have already completed the course work in M. Phil and have been permitted to proceed to the Ph.D. in integrated course, may be exempted by the Department from the Ph.D. course work. All other candidates admitted to the Ph.D. programme shall be required to complete the prescribed Ph.D. course work.
- (g) Grades in the course work, including research methodology courses shall be finalized after a combined assessment by the Research Advisory Committee and the Department and the final grades shall be communicated to the Institution/College.
- (h) A Ph.D. scholar has to obtain a minimum of 55% of marks or its equivalent grade in the UGC 10-point scale (or an equivalent grade/CGPA in a point scale wherever grading system is followed) in the course work in order to be eligible to continue in the programme and submit the dissertation/thesis.

The attendance monitoring shall be done in the same way as envisaged in the ordinance for PG Courses. Teaching and evaluation of Ph.D. course work and subject code will be as follows: -

Sr. No.	Name of the Course	Credits	Assessment Method
1.	Research Methodology	4	Written Exam.
2.	Research and Publication Ethics	2	Written Exam.
3.	Recent Advances in the Specialization	4	Written Exam.
4.	Review of Literature	2	Seminar
<b>Total</b>		<b>12</b>	

### Subject Codes

- (i) The code for Research Methodology shall be **RM-901**
- (ii) The codes for other courses will be based on Alpha-Numeric pattern as under: -  
There will be two alphabets indicating the subject/ Specialization viz.  
EC-Electronics & Communication, CS-Computer Science, ME-Mechanical Engineering BT-Biotechnology, BI-Bio-Informatics, BM-Biomedical Sciences, MG-Management, PS-Pharmaceutical Sciences, MA-Mathematics, PH-Physics, CH-Chemistry, AG-Agriculture and AI-Agri-Informatics, HI-History, ED-Education, EN-English, LW-Law, FC-Fundamentals of Computer Applications and so on.

#### After 2 alphabets, there will be three numbers as under:

- 1<sup>st</sup> number will be 9 indicating a Ph.D. degree.
- 2<sup>nd</sup> number will be either 0 indicating a theory course or 5 indicating a practical course or 8 indicating a seminar course.
- 3<sup>rd</sup> number will be 1 or 2 indicating the number of courses being offered

**For Example-** A code **PS-902** will stand for first Ph.D. Theory Course of Pharmaceutical Sciences to be offered, the second course and a code of **PS-981** will stand for third Ph.D. seminar based course of Pharmaceutical Sciences.

After approval of the synopsis, the candidate shall undertake proposed research work and produce a thesis within a reasonable time as stipulated.

### 9. University Research Degree Committee (URDC)

The University Research Degree Committee (URDC) shall consist of the following members:

- Vice-Chancellor/ Nominee of the Vice-Chancellor: Chairperson
- Director or equivalent of the concerned School: Member
- One Professor/Assoc. Professor (other than the Supervisor(s)), having the knowledge of the research area of the candidate: Member
- Supervisor(s) Member

- Two subject-experts (Professors/ Assoc. Professors/ Readers/ Senior Scientists or equivalent) from any University/ Institution other than Shobhit University, to be nominated by the Vice-Chancellor from the panel submitted by the concerned Director: Member

**Note:** The presence of at least one subject expert is necessary for holding any meeting of URDC

## **10. Duties and Powers of URDC**

(a) The duties and powers of URDC shall be, but not limited to the following:

- URDC shall examine the synopsis (appendix 1 of this ordinance) of the proposed Ph.D. work for registration and shall give a clear report as, “The topic and the synopsis approved/ The synopsis to be submitted again/ Rejected”.
- URDC may monitor the progress of the candidate and give recommendations
- Any such duty as mentioned in the ordinance or otherwise

(b) At least three members shall form the quorum for the meeting of the URDC. However, presence of one of the external experts is essential for holding the meeting.

(c) The minutes of the URDC meeting shall be reported by the Director concerned in the next meeting of the Academic Council for ratification.

## **11. Research Advisory Committee and its functions**

(a) There shall be a Research Advisory Committee comprised of 3 or more members, for each Ph.D. scholar. The Research Supervisor of the scholar shall be the Convener of this Committee. This Committee shall have the following responsibilities:

- To review the research proposal and finalize the topic of research;
- To guide the research scholar to develop the study design and methodology of research and identify the course(s) that he/she may have to do.
- To periodically review and assist in the progress of the research work of the research scholar.

(b) A research scholar shall appear before the Research Advisory Committee once in six months to make a presentation of the progress of his/her work for evaluation and further guidance. The six monthly progress reports shall be submitted by the Research Advisory Committee to the Institution/College with a copy to the research scholar.

(c) In case the progress of the research scholar is unsatisfactory, the Research Advisory Committee shall record the reasons for the same and suggest corrective measures. If the research scholar fails to implement these corrective measures, the Research Advisor Committee may recommend to the university with specific reasons for cancellation of the registration of the research scholar.

## 12. Place of Work

- (a) The School/Institute/Department/Center/College in the University shall be the place of work for the full-time candidates.
- (b) In case of a part-time candidate, a Research Lab/ Institution/ University/ Industry/ Centre where the candidate works and which has the required research facilities and there is formal permission for use of the laboratory to the student for research work, can also be the place of work, subject to approval of URDC.

**Note:** *In case the candidate changes his/her University/ Institution, the work place of the candidate may also change to the new work place of the candidate, if it has the required research facilities. The candidate is required to seek prior approval from the URDC for any such change.*

## 13. Transfers from Other Universities

- (a) A candidate who has been admitted in or has registered for Ph.D. program in any other recognized university and meets the requisite eligibility for admission to the Ph.D. program of this university, may be allowed to transfer his/her admission to the university provided:
  - (i) He/she produces an NOC from previous university
  - (ii) The URDC recommends and the Academic Council approves the transfer
- (b) Further the extent of transfer of credits earned towards the course work, publication and progress of research in the previous university shall be decided by the URDC.
- (c) In such cases of transfer, the date of admission in the university shall be decided by the URDC considering the date of admission/registration in the previous university and the extent of achievements. The candidate shall fulfill the remaining requirements as decided by the URDC.
- (d) In case of relocation of a Ph. D woman research scholar due to marriage or otherwise, the research data shall be allowed to be transferred to the university provided that all other conditions are followed in letter and spirit and the research work does not pertain to the project secured by parent institution/supervisor from any funding agency and due credit is given to parent guide for the part of research already done. The transfer of data is permissible only if it is independent project of the research scholar.\in other cases the data/material shall remain with the parent institution.
- (e) The candidate shall deposit the requisite fee as applicable.

## 14. Duration for submitting Ph.D. Thesis

### (a) Full-time Research Scholars

- (i) A full-time research scholar is not permitted to submit his/her thesis earlier than 36 months from the date of registration, including the duration of the course work. Further he/she shall publish at least **two** research papers related to his/her work in refereed Indian Journals or at least **one** paper in refereed International Journal (preferably SCOPUS indexed), before the submission of the thesis and produce evidence for the same either in the form of an acceptance letter or the reprint of the paper. A review paper published in any journal shall not count towards the above requirement, however, filed/published patents can be considered.
- (ii) The maximum time allowed for submission of the thesis shall be 6 years (72 months)

from the date of registration. This period can be extended by one year by the vice-Chancellor under special and genuine circumstances. No further extension shall be granted and the registration to Ph.D. shall stand cancelled after the expiry of 7 years( 84 months) from the date of registration.

(iii) Vice-Chancellor may permit a candidate to get re-registered on the same topic on payment of a re-registration fee as decided by the University from time to time, for a further period of two years. The requirement of regular attendance shall not apply to such re-registered candidates. In such a case, the candidate shall apply to the University one month before the expiry of the last extension period. If the candidate is unable to submit his/her thesis in the stipulated period, his/her registration shall stand automatically cancelled, and the University shall not be bound to inform the candidate about the cancellation.

**(b) Part-time Research Scholars**

(i) A part-time research scholar is not permitted to submit his/her thesis earlier than 42 months from the date of registration, including the duration of course work. Further he/she shall publish at least **two** research papers related to his/her work in refereed Indian Journals or at least **one** paper in a refereed International Journal (preferably SCOPUS indexed), before the submission of the thesis and produce evidence for the same in the form of an acceptance letter or the reprint of the paper. A review paper published in any journal(s) shall not count towards the above requirement, however, filed/published patents can be considered.

(ii) The maximum time allowed for submission of the thesis shall be 6 years (72 months) from the date of registration. This period can be extended by one year by the Vice-Chancellor under special and genuine circumstances. No further extension shall be granted and the registration to Ph.D. shall stand cancelled after the expiry of 7 years (84 months) from the date of registration.

(iii) Vice-Chancellor may permit a candidate to get re-registered on the same topic on payment of a re-registration fee as decided by the University from time to time, for a further period of two years. The requirement of regular attendance shall not apply to such re-registered candidates. In such a case, the candidate shall apply to the University one month before the expiry of the last extension period. If the candidate is unable to submit his/her thesis in the stipulated period, his/her registration shall stand automatically cancelled, and the University shall not be bound to inform the candidate about the cancellation.

(c) The period for submission of thesis can be reduced by 6 months on the recommendation of URDC if a candidate has published at least 04 (Four) research papers in National/International Journals that are indexed in the SCOPUS/Web of science or other renowned database as applicable.

**Note 1:** *Application for an extension can be considered only when it has the recommendations of the supervisor(s).*

**Note 2:** *Extension of period after 6 years shall not be automatic. Application for extension shall be*



*considered if submitted to the office of the Director of the concerned School/ Institutes/departments/Centers/College 4-6 months prior to the date of expiry of 72 months period, as the case may be.*

**Note 3:** *Maternity Leave/Child Care Leave for up to 240 days in the entire duration of the Ph.D. programme may be provided in case of Female Research Candidate.*

## **15. Change of Supervisor**

### **(a) Supervisor**

- (i) The change of supervisor can be permitted by the Vice-Chancellor subject to ratification by the URDC on production of the No Objection Certificates (NOC) from the Supervisor(s).
- (ii) Vice-Chancellor, subject to ratification by the URDC may permit the supervisor who has left the University or has retired from the university service, to continue as the supervisor if a request to this effect is received from the concerned supervisor. If no such request is received within one month, the supervisor may be removed by the Vice Chancellor.

### **(b) Co-Supervisor**

In case of non-availability of the co-supervisor for any reason, the Vice-Chancellor, subject to ratification by the URDC, can either permit another co-supervisor (under clause 5) or allow the candidate to work and submit the thesis under the Supervisor alone.

## **16. Cancellation of Registration**

The registration of a candidate to a Ph.D. programme may be cancelled on the basis of following.

- (i) Automatically, on the expiry of the period of extension granted by the Vice-Chancellor or the maximum time allowed under Clause 12(a)(iii) or 12(b)(iii), as the case may be, in case the extension has not been sought from the Vice-Chancellor.
- (ii) If the candidate is found involved in an act of gross indiscipline, unlawful activities, plagiarism and/or any such activity that may endanger the peace in the University campus.
- (iii) If the candidate fails to comply the provisions of this ordinance or any other relevant rules pertaining to Ph.D.

## **17. Progress Reports**

- (a) The candidate shall submit a progress report (Annexure –1) every 6 months (not later than 3 weeks of completing 6 months).
- (b) The progress report shall be signed by the candidate and the Supervisor(s).

## 18. Submission of Thesis

- (a) Based upon the research work done, the candidate may modify the synopsis, before three months of the submission of thesis and shall present it to the URDC for approval. Prior to submission of the thesis, the student shall make a pre-submission presentation in the School/Institute/Department/Center/College before a committee constituted by the Dean/Director/Principal and approved by the Vice Chancellor that may be open to all faculty members and research students, for getting feedback and comments, which may be suitably incorporated into the draft thesis under the advice of the Supervisor. This committee shall include, but not limited to the Dean/Director/Principal or as the case may be as Chairperson and supervisor(s) & other relevant persons from or outside as members. The committee will formally submit the report on the performance of the candidate in the pre-submission presentation. The candidate shall be permitted to submit the thesis to the University after incorporating the modifications/ suggestions made by the above committee, if any. The Supervisors shall certify that the modifications/ suggestions made by the above committee have been duly incorporated.
- (b) The University shall seek an assurance with evidence that the thesis is free of plagiarism and other forms of academic dishonesty. While submitting for the evaluation, the thesis shall have an undertaking from the research scholar and a certificate from the Research Supervisor attesting to the originality of the work, vouching that there is no plagiarism and that the work has not been submitted for the award of any other degree/diploma of the University where the work was carried out, or to any other university or institution
- (c) The candidate shall submit to the University the following documents at the time of submission of the Ph.D. thesis.
  - (i) Four copies of the Synopsis approved by the URDC and four copies of the Summary of the thesis.
  - (ii) Four spiral-bound typed (on both sides) copies of thesis. The thesis shall also be accompanied by:
    - (a) A certificate from the candidate (Annexure –2).
    - (b) A certificate from the supervisor (Annexure – 3 & 4).
    - (c) An appendix at the end of the thesis containing reprints of the research papers already published.
    - (d) Self-attested photocopies of the acceptance letters of the research papers accepted for publication.
    - (e) List of communicated research papers along with author(s) name(s), name of the Journal to which the paper has been communicated and the date of communication.
  - (iii) A copy of the receipt of applicable examination fee, along with no dues certificate.

- (iv) A certificate from the Supervisor in terms of Clause 16(a), if applicable.
- (v) A soft copy on CD/ DVD of the items referred to in Clause (i) and (ii) above.
- (vi) An undertaking from the research scholar countersigned by the Supervisor(s) attesting to the originality of the work, vouching that there is no plagiarism.

## 19. Evaluation of the thesis

- (a) The supervisor shall inform through the Director of the School to the Registrar of the University about the intent to submit the thesis two months before its submission along with
  - (i) Four copies of the synopsis, duly approved by the URDC.
  - (ii) Names and contact details of at least eight examiners, not below the rank of an Associate Professor in the research area of the candidate, in a sealed envelope. The list must also include at least two names of examiners who are from outside the State in which the University is located. It may include the names of one or two names of examiners from outside India.

**Note:** *The name of any close relative of the candidate or of the supervisor shall not be included in the panel of examiners (as defined under clause 5)*

- (b) From this panel, the Vice-Chancellor shall appoint **three** examiners ensuring that one of the examiners is from outside the State. One of the Examiners may be appointed from outside the country. The Vice-Chancellor may include any new name.
- (c) The examiners would be requested to evaluate the thesis and submit the evaluation report within three months of the receipt of thesis. In case of inability shown by the examiner for evaluation of thesis, the Vice-Chancellor may appoint alternate examiner(s). In case of delay of more than 3 months in sending the evaluation report by any examiner, the Registrar would request the examiner(s) to send the report at the earliest in the interest of the candidate(not later than one month) failing which the Vice-Chancellor may appoint alternative examiner(s) after intimation to the existing examiner(s).
- (d) For awarding the Ph.D. degree, the thesis must comply with the following conditions:
  - (i) It must be an original piece of research work characterized either by the discovery of new facts or by fresh approach towards the interpretation of the existing facts or theories. In either case, it should evince the candidate's capacity to make critical examination and sound judgment.
  - (ii) It must be satisfactory in language and presentation of the subject matter.
- (f) The examiners shall specifically report on the prescribed proforma whether the thesis fulfils the requirements of the clauses 19(d)(i) and (ii). They shall clearly recommend whether the thesis be:

- (i) Approved as it is,
- (ii) Approved after minor revision,
- (iii) Be resubmitted after major revision with
  - a) Major rewriting  
and/or
  - b) Some extra work,

The examiners shall also answer the following:

- a) Do you agree to re-evaluate the revised thesis? (Yes/No)
- b) If re-evaluation is not needed, should the candidate be allowed to appear in the viva-voce examination with the revised thesis? (Yes/No)
- (iv) Rejected (In such a case, the Examiner should clearly mention the reason(s) for rejection)
- (f)
  - (i) If at least two examiners clearly recommend for the viva-voce examination and award of the degree, then the Ph.D. viva-voce examination shall be held.
  - (ii) If one examiner recommends for the viva-voce examination and the other two suggest modifications, or all the three examiners suggest modifications, then the candidate shall be asked to re-submit the thesis within one year from the date of communication after revising it in the light of modifications suggested by the examiner(s).
  - (iv) The revised thesis shall be sent to the examiner(s) who suggested modifications and accepted to re-evaluate the thesis, for final opinion. If at least two of the examiners recommend for viva-voce examination and award of degree, then Ph.D. viva-voce examination will be held. Otherwise the Vice-Chancellor may refer the case to a high level committee. The decision of the committee will be final.
  - (v) In case, the thesis is recommended by the examiners with minor modifications, the same shall be incorporated in the thesis before the viva-voce examination.
- (g) In case the thesis is recommended, an open viva-voce examination of the candidate shall be held by the viva-voce Board comprising of.
  - (i) One External Examiner who will be one of the thesis examiners. (The name of the external examiner shall be approved by the Vice-Chancellor)
  - (ii) Director of the concerned School.
  - (iii) Supervisor(s)

The suggestion/ modifications suggested by the Examiners and Viva Voce Board should be incorporated in the thesis and four hard-bound copies (print both sides) should be submitted for record.

- (h) The date, time and venue of viva-voce examination shall be notified by the Registrar and the copies of the reports of the Examiners will be provided to the Supervisor(s) in a sealed envelope at least one week in advance. At the time of viva-voce examination, the Viva Voce Board shall be provided copies of the reports of the examiners.

(i) The candidate shall present the work embodied in the thesis before the Board of examiners, members of faculty, research scholars and other persons interested in the subject. After the presentation of the research work, the members of the Board shall ask questions together with the questions, raised in the examiners' reports. After the formal viva-voce is over, the members of the audience can also ask questions.

- (j) The viva-voce Board shall give a final decision and a clear verdict whether the candidate be awarded the Ph.D. degree or be asked to re-appear for viva-voce examination once again. In case of the second verdict, the candidate shall be required to re-appear for viva-voce before the same Board, on a date to be decided by the University.

## **20. Award of Ph.D. Degree**

- (a) After successfully clearing the viva-voce examination, the candidate shall be awarded Ph.D. degree after the approval of the Executive Council.
- (b) The award of Ph.D. degree can be withdrawn by the University in case the thesis submitted by the candidate is found to be a duplication of an old work or pirated research work.

**21.** No research scholar shall join any other course of study or appear at any other examination conducted by any University leading to a degree (except Certificate Course of Languages, Research Methodology, Statistics, and Computer Courses etc).

**22.** The approved thesis shall be published only after obtaining permission from the University and such publication shall state on the title page itself that **this was a thesis approved for the award of the Ph.D. degree of the Shobhit University.**

## **23. Provisional Degree**

The candidate may be issued a Provisional Certificate after successful completion of the examination procedure in accordance with the provisions of the UGC (Minimum Standards and Procedure for Awards of Ph.D. Degree) Regulations 2016 and after the Vice-Chancellor approves the recommendation of the Viva-Voce Board.

## **24. Depository with UGC**

Following the successful completion of the evaluation process and announcement of the award of Ph.D., the University shall submit a soft copy (in the form of CD/DVD) of the Ph.D. thesis to the UGC within a period of 30 days for hosting the same in INFLIBNET to be made accessible to all Institutions/ Universities.

**25.** Notwithstanding anything contained in the Ordinance, all the Ph.D. candidates/ research scholars shall be governed by the rules and procedures prevailing at the time of registration.

**26.** Notwithstanding anything stated in this Ordinance, for any unforeseen issues arising, and not covered by the Ordinance, or in the event of difference of interpretation, the decision of the

Vice-Chancellor shall be final.

## **Appendix – 1**

### **Format of Synopsis**

The synopsis (preferably not exceeding 5000 words) shall contain the following :

- (i) Topic of the research work.
- (ii) Area/Specialization of the research work.
- (iii) Aims and objectives of research work.
- (iv) Methodology of the research work.
- (v) A survey of literature in the area of research.
- (vi) The impact of the research work on academics/industry/society.
- (vii) The proposed plan of work: It will include a tentative schedule of research work.
- (viii) A list of equipments, software and other tools/ facilities, needed for the proposed research as part of the required Lab facility and its availability/ provisions made.
- (ix) Bibliography.
- (x) List of previous publications of the candidates, if any.

## **Annexure-1**

### **Progress Report**

**(To be submitted every 6 months from the date of Registration)**

Name of the School/Centre where registered : .....

1. Name of the Research Scholar : .....

2. Registration No. and the Date of Registration : .....

3. Topic of Research : .....

4. Name(s) of the Supervisor(s) 1) .....

2) .....

5. Period for which the report is being submitted: From.....to.....

6. Report (Brief details of the work done, papers published/ communicated, conferences attended/ paper(s) presented, etc.) ( may use additional sheets, if required)

**Supervisor(s)**

**Research Scholar**

Note : 1. Please attach one copy each of the previous Progress Report(s), if any.

2. Please attach copies of papers published/communicated, if mentioned in the above progress report.

## **Annexure-2**

### **Declaration by the Candidate**

I, hereby, declare that the work presented in this thesis, entitled ..... in fulfillment of the requirements for the award of Degree of Doctor of Philosophy in....., submitted to the School of / Centre for ..... at Shobhit University, Gangoh, Saharanpur is an authentic record of my own research work carried out under the supervision of .....

I also declare that the work embodied in the present thesis

- (i) is my original work and has not been copied from any Journal/thesis/book, and
- (ii) has not been submitted by me for any other Degree or Diploma of any university/ institution.

**Signature of the candidate**



### **Annexure-3**

#### **Certificate of the Supervisor(s)**

This is to certify that the thesis, entitled “.....” submitted by ..... for the award of Degree of Doctor Philosophy in the School of / Centre for ..... of Shobhit University, , Gangoh, Saharanpur is a record of authentic work carried out by him/her under my/our supervision.

To the best of my/our knowledge, the matter embodied in this thesis is the original work of the candidate and has not been submitted for the award of any other degree or diploma of any university or institution.

It is further certified that he/she has worked with me/us for a period of ..... in the School of / Center for ..... , Shobhit University, , Gangoh, Saharanpur.

**(Supervisor)**

## **Annexure-4**

### **Certificate of the Co-Supervisor(s)**

This is to certify that the thesis entitled “.....” submitted by ..... for the award of Degree of Doctor Philosophy in the School of / Center for ..... of Shobhit University, Gangoh, Saharanpur is a record of authentic work carried out by him/her under my/our supervision.

To the best of my/our knowledge, the matter embodied in this thesis is the original work of the candidate and has not been submitted for the award of any other degree or diploma.

It is further certified that he/she has worked with me for a period of ..... in the School/ Center/Institute/College/ Department of .....

**(Co-Supervisor)**

**ORDINANCE**

**For**

**The Degree**

**of**

**Doctor of Philosophy (Ph.D.)**



**Shobhit University**

**Gangoh, Saharanpur**

**2018**

## **Ordinance for the Degree of Doctor of Philosophy (2018)**

All Schools/Institutes/Departments/Centers/Colleges of Shobhit University, Gangoh shall be eligible to offer Ph.D. programmes. None of the School/Institute/Department/Center/College shall conduct any Ph.D. programme through distance mode. These rules shall be applicable to all the new candidates joining Ph.D. programmes of Shobhit University on/ or after July 1, 2018. This ordinance entails all the provisions of the gazette notification of UGC (Minimum Standards and Procedure for Award of Ph.D. Degree), Regulation, 2016, and amendments made there in from time to time.

### **1. Categories of candidates for admission to Ph.D. programmes**

- **Full-time** candidates
- **Part-time** candidates

A **full-time** Ph.D. candidate shall be required to remain present in the University campus till submission of his/her Ph.D. thesis. He/she shall also have to undertake minimum 6 hours per week of academic work load as assigned by the School/Institutes/departments/Centers/College in which, he/she is registered for Ph.D. programme besides the course work and Ph.D. work. Such candidates are eligible to receive assistantship from the University or fellowship from CSIR/UGC or any other funding agency.

A **part-time** Ph.D. candidate can be a regular Shobhit University academic or non-academic faculty/staff member who satisfies the eligibility requirements. Other eligible candidates can be those who are sponsored by Public Sector Undertaking/ Research and Development Organizations/ Private Industries/ Service Sectors/ Educational Institutions/ any other State and Central Government Organization

**Inter-disciplinary Ph.D (IPhD)** is intended for students whose interests cross multiple academic disciplines. Such students who have excellent academic record and clear understanding of their research topic are eligible for this program. The program seeks to offer an intimate and varied community in which the students bring strong individual initiative together with the shared research concerns and expertise of a diverse supervisory committee in diverse studies that cross traditional disciplinary borders.

### **Eligibility**

A candidate seeking registration for the Degree of Doctor of Philosophy (Ph.D.) in Shobhit University must possess the following qualifications:

- (a) Candidates for admission to the Ph D programme shall have a Master's degree or a professional degree declared equivalent to the Master's degree by the corresponding statutory regulatory body, with at least 55% marks in aggregate or its equivalent grade 'B' in the UGC 7-point scale (or an equivalent grade in a point scale wherever grading system is followed) or an equivalent degree/ M.Phil. from a foreign educational Institution accredited by an Assessment and Accreditation Agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country for the purpose of assessing, accrediting or assuring quality and standards of educational institutions.
- (b) Candidates who have cleared the M.Phil. course work with at least 55% marks in aggregate or its equivalent grade 'B' in the UGC 7-point scale (or an equivalent grade in a point scale

wherever grading system is followed) and successfully completing the M.Phil. Degree shall be eligible to proceed to do research work leading to the Ph. D. Degree in the same Institution in an integrated programme.

- (c) A person whose M.Phil. dissertation has been evaluated and the viva voce is pending may be admitted to the Ph.D. programme of the same Institution.
  
- (d) Bachelor's Degree in Engineering with 75 % or more marks or the grade equivalent in relevant field of Engineering/ Technology/ Architecture of a University or its equivalent, with at least five years of experience in Public Sector Undertaking/ Research and Development Organizations/ Private Industries/ Service Sectors/ Educational Institutions/ any other State and Central Government Organizations
  
- (e) A relaxation of 5% of marks, from 55% to 50%, or an equivalent relaxation of grade, may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-abled and other categories of candidates as per the decision of the Commission from time to time, or for those who had obtained their Master's degree prior to 19th September, 1991. The eligibility marks of 55% (or an equivalent grade in a point scale wherever grading system is followed) and the relaxation of 5% to the categories mentioned above are permissible based only on the qualifying marks without including the grace mark procedures.

## **2. Application**

A candidate seeking registration for Ph.D. degree must apply to the University on the prescribed application form. The application form shall be accompanied by:

- (i) Documents supporting all academic qualifications (Self Attested copies of the mark-sheet/ grade-sheet and degree certificates).
- (ii) Documents supporting his/her previous work experience, if any.
- (iii) Prescribed application fee, as applicable.
- (iv) No Objection Certificate (NOC) from the employer, in case the candidate is employed.
- (v) Migration Certificate.

## **3. Admission Procedure**

The university shall notify well in advance in the institutional website and through advertisement in at least two (2) national newspapers, of which at least one (1) shall be in the regional language, the number of seats for admission, subject/discipline-wise distribution of available seats, criteria for admission, procedure for admission, examination centre(s) where entrance test(s) shall be conducted and all other relevant information for the benefit of the candidates.

The eligible candidates shall apply on the prescribed application available in the university or on the website. The duly completed form with the prescribed fee shall be submitted to the Registrar, Shobhit University, Gangoh, Saharanpur-247341 on or before the notified date.

The University shall decide on an annual basis through their academic bodies a predetermined and manageable number of Ph.D. scholars to be admitted depending on the number of available Research Supervisors and other academic and physical facilities available, keeping in mind the norms regarding the scholar- teacher ratio [as indicated in clause 5(v)], laboratory, library and such other facilities. The university shall adhere to the National/State-level reservation policy, as applicable.

The University shall admit candidates by a two stage process through:

(i) An Entrance Test shall be qualifying with qualifying marks as 50%. The syllabus of the Entrance Test shall consist of 50% of research methodology and 50% shall be subject specific. The Entrance Test shall be conducted at the Centre(s) notified in advance (changes of Centres, if any, also to be notified well in advance) at the level of the University and

(ii) An interview/viva-voce to be organized by the University where the candidates are required to discuss their research interest/area through a presentation before a duly constituted Department Research Committee.

The interview/viva voce shall also consider the following aspects, viz. whether:

(i) The candidate possesses the competence for the proposed research.

(ii) The research work can be suitably undertaken at the Institution/College.

(iii) The proposed area of research can contribute to new/additional knowledge.

The University shall maintain the list of all the Ph.D. registered students on its website on year-wise basis. The list shall include the name of the registered candidate, topic of his/her research, name of his/her supervisor/co-supervisor, date of enrolment/registration.

*Note: The candidates who have qualified UGC/CSIR (JRF) examination/ NET/SLET/GATE/GPAT or are holder of teacher fellowship or have passed M.Phil. Degree, from a recognized university may be exempted from the University entrance test. However, they shall be required to appear for personal interview and to discuss their proposed research area(s).*

## **5. Allocation of Supervisor(s)**

The allocation of the supervisor for a selected student shall be made formally by the School/ Institutes/departments/Centers/College depending upon the research interest of the student and the availability of a supervisor.

(i) Any regular Professor of the University with at least five research publications in refereed journals and any regular Associate/Assistant Professor of the university/institution deemed to be a university/college with a Ph.D. degree and at least two research publications in refereed journals may be recognized as Research Supervisor. Provided that in areas/disciplines where there is no or only a limited number of refereed journals, the Institution may relax the above condition for recognition of a person as Research Supervisor with reasons recorded in writing.

(ii) Only a full time regular teacher of the concerned University can act as a supervisor. The external supervisors are not allowed. However, Co-Supervisor can be allowed in inter-disciplinary areas from other departments of the same institute or from other related institutions with the approval of the Research Advisory Committee.

- (iii) The allocation of Research Supervisor for a selected research scholar shall be decided by the School/Institutes/departments/Centers/College concerned depending on the number of scholars per Research Supervisor, the available specialization among the Supervisors and research interests of the scholars as indicated by them at the time of interview/viva voce.
- (iv) In case of topics which are of inter-disciplinary nature where it is felt that the expertise has to be supplemented from outside, the School/ Institutes/departments/Centers/College may appoint a Research Supervisor from within, who shall be known as the Research Supervisor, and a Co-Supervisor from outside the Department/ Faculty/College/Institution on such terms and conditions as may be specified and agreed upon by the consenting Institutions/Colleges.
- (v) A Research Supervisor/Co-supervisor who is a Professor, at any given point of time, cannot guide more than three (3) M. Phil and Eight (8) Ph.D. scholars. An Associate Professor as Research Supervisor can guide up to a maximum of two (2) M. Phil and six (6) Ph.D. scholars and an Assistant Professor as Research Supervisor can guide up to a maximum of one (1) M. Phil and four (4) Ph.D. scholars.
- (vi) In case of relocation of an Ph.D. woman scholar due to marriage or otherwise, the research data shall be allowed to be transferred to the University to which the scholar intends to relocate provided all the other conditions in these regulations are followed in letter and spirit and the research work does not pertain to the project secured by the parent institution/ supervisor from any funding agency. The scholar will however give due credit to the parent guide and the institution for the part of research already done.

**Note:** *A close relative of the candidate cannot function as a Supervisor or Co-Supervisor.*

**Close relative** shall include father, mother, husband, wife, son, daughter, brother, sister, uncle, nephew, father-in-law, mother-in-law, or any other such relation as may be determined by the competent authority.

## **6. Registration and duration of Ph D programme**

(a) Ph.D. programme shall be for a minimum duration of three years, including course work and a maximum of six years.

(b) Extension beyond the above limits will be governed by clause 12 a (ii) & b (ii).

(c) The women candidates and Persons with Disability (more than 40% disability) may be allowed a relaxation of one year for M. Phil and two years for Ph.D. in the maximum duration. In addition, the women candidates may be provided Maternity Leave/Child Care Leave once in the entire duration of Ph.D. for up to 240 days.

## **7. (a) Pre-requisite for the submission of synopsis**

### **Course Work**

All Ph.D. students shall be required to undertake course-work for a minimum period of one semester as a pre-requisite which shall include a course on Research Methodology, review of published research in the relevant field besides one or more courses from the relevant field/

interdisciplinary area, as may be prescribed by the Supervisors/ Research Advisory Committee/University Research Degree Committee (URDC) as the case may be.

However, the NET-qualified/ M.Phil./ M. Tech. / M. Pharm/ MBA candidates may be exempted from one or more courses on the basis of their previously completed coursework and marks/grades obtained in the same, on recommendations of the URDC.

The course work may be carried out by the Ph.D. candidates in sister departments/ institutions either within or outside the University, if recommended by the URDC for which due credit shall be given to them.

### **Credit Requirements, number, duration, syllabus, minimum standards for completion, etc.**

(a) The credit assigned to the Ph.D. course work shall be a minimum of 08 credits and a maximum of 16 credits.

(b) The course work shall be treated as prerequisite for Ph.D. preparation. A minimum of four credits shall be assigned to one or more courses on Research Methodology which could cover areas such as quantitative methods, computer applications, research ethics and review of published research in the relevant field, training, field work, etc. Other courses shall be advanced level courses preparing the students for Ph.D. degree.

(c) All courses prescribed Ph.D. course work shall be in conformity with the credit hour instructional requirement and shall specify content, instructional and assessment methods. They shall be duly approved by the authorized academic bodies.

(d) The Department where the scholar pursues his/her research shall prescribe the course(s) to him/her based on the recommendations of the Research Advisory Committee, as stipulated under sub-Clause 10 (a) below, of the research scholar.

(e) All candidates admitted to the Ph.D. programmes shall be required to complete the course work prescribed by the Department during the initial one or two semesters.

(f) Candidates already holding M. Phil. degree and admitted to the Ph.D. programme, or those who have already completed the course work in M. Phil and have been permitted to proceed to the Ph.D. in integrated course, may be exempted by the Department from the Ph.D. course work. All other candidates admitted to the Ph.D. programme shall be required to complete the Ph.D. course work prescribed by the Department.

(g) Grades in the course work, including research methodology courses shall be finalized after a combined assessment by the Research Advisory Committee and the Department and the final grades shall be communicated to the Institution/College.

(h) A Ph.D. scholar has to obtain a minimum of 55% of marks or its equivalent grade in the UGC 7-point scale (or an equivalent grade/CGPA in a point scale wherever grading system is followed) in the course work in order to be eligible to continue in the programme and submit the dissertation/thesis.

The attendance monitoring shall be done in the same way as envisaged in the ordinance for PG Courses. Teaching and evaluation of Ph.D. course work and subject code will be as under: -



- (i) 1<sup>st</sup> course- Research Methodology: **4 Credits** - Evaluation on the basis of written exam.
- (ii) 2<sup>nd</sup> course- Review of literature: **2 Credits** - Evaluation on seminar basis.
- (iii) 3<sup>rd</sup> course- Recent advances in specialization: **4 Credits** - Evaluation on the basis of written exam.

### Subject Codes

- (i) The code for Research Methodology shall be **RM-901**
- (ii) The codes for other courses will be based on Alpha-Numeric pattern as under: -  
There will be two alphabets indicating the subject/ Specialization viz.  
EC- Electronics & Communication, CS- Computer Science, BT- Biotechnology, BI- Bio-Informatics, BM- Biomedical Sciences, MG- Management, PS- Pharmaceutical Sciences, MA- Mathematics, PH- Physics, CY- Chemistry, AG- Agriculture and AI- Agri-Informatics and so on.  
After 2 alphabets, there will be three numbers as under:
  - 1<sup>st</sup> number will be 9 indicating a Ph.D. degree.
  - 2<sup>nd</sup> number will be either 0 indicating a theory course or 5 indicating a practical course or 8 indicating a seminar course.
  - 3<sup>rd</sup> number will be 1 or 2 indicating the number of courses being offered**e.g.** - A code **PS-902** will stand for first Ph.D. Theory Course of Pharmaceutical Sciences to be offered, the second course and a code of **PS-981** will stand for third Ph.D. seminar based course of Pharmaceutical Sciences.

After approval of the synopsis, the candidate shall undertake proposed research work and produce a thesis within a reasonable time as stipulated.

### 8. University Research Degree Committee (URDC)

The University Research Degree Committee (URDC) shall consist of the following members:

- Vice-Chancellor/ Nominee of the Vice-Chancellor: Chairperson
- Director of the concerned School: Member
- One Professor/Assoc. Professor (other than the Supervisor(s)), having the knowledge of the research area of the candidate: Member
- Supervisor(s) Member
- Two subject-experts (Professors/ Assoc. Professors/ Readers/ Senior Scientists or equivalent) from any University/ Institution other than Shobhit University, to be nominated by the Vice-Chancellor from the panel submitted by the concerned Director: Member

**Note:** The presence of at least one subject expert is necessary for holding any meeting of URDC

### 9. Duties and Powers of URDC

The duties and powers of URDC shall be, but not limited to the following:

- (a) URDC shall examine the synopsis of the proposed Ph.D. work for registration and shall give a clear report as
  - The topic and the synopsis approved.
  - The synopsis to be submitted again.
  - Rejected.
- (b) At least three members shall form the quorum for the meeting of the URDC. However, presence of one of the external experts is essential for holding the meeting.
- (c) The minutes of the URDC meeting shall be reported by the Director concerned in the next meeting of the Academic Council for ratification.

#### **10. Research Advisory Committee and its functions**

(a) There shall be a Research Advisory Committee, for each Ph.D. scholar. The Research Supervisor of the scholar shall be the Convener of this Committee. This Committee shall have the following responsibilities:

- (i) To review the research proposal and finalize the topic of research;
- (ii) To guide the research scholar to develop the study design and methodology of research and identify the course(s) that he/she may have to do.
- (iii) To periodically review and assist in the progress of the research work of the research scholar.

(b) A research scholar shall appear before the Research Advisory Committee once in six months to make a presentation of the progress of his/her work for evaluation and further guidance. The six monthly progress reports shall be submitted by the Research Advisory Committee to the Institution/College with a copy to the research scholar.

(c) In case the progress of the research scholar is unsatisfactory, the Research Advisory Committee shall record the reasons for the same and suggest corrective measures. If the research scholar fails to implement these corrective measures, the Research Advisor Committee may recommend to the university with specific reasons for cancellation of the registration of the research scholar.

#### **11. Place of Work**

- (a) The School/Institute/Department/Center/College in the University shall be the place of work for the full-time candidates.
- (b) In case of a part-time candidate, a Research Lab/ Institution/ University/ Industry/ Centre where the candidate works and which has the required research facilities and there is formal permission for use of the laboratory to the student for research work, can also be the place of work, subject to approval of URDC.

**Note:** *In case the candidate changes his/her University/ Institution, the work place of the candidate may also change to the new work place of the candidate, if it has the required research facilities. The candidate is required to seek prior approval from the URDC for any such change.*

## **12. Transfers from Other Universities**

- (a) A candidate who has been admitted in or has registered for Ph D program in any other recognized university and meets the requisite eligibility for admission to the Ph D program of this university, may be allowed to transfer his/her admission to the university provided:
  - (i) He/she produces an NOC from previous university
  - (ii) The URDC recommends and the Academic Council approves the transfer
- (b) Further the extent of transfer of credits earned towards the course work, publication and progress of research in the previous university shall be decided by the URDC.
- (c) In such cases of transfer, the date of admission in the university shall be decided by the URDC considering the date of admission/registration in the previous university and the extent of achievements. The candidate shall fulfill the remaining requirements as decided by the URDC.
- (d) In case of relocation of a Ph.D woman research scholar due to marriage or otherwise, the research data shall be allowed to be transferred to the university provided that all other conditions are followed in letter and spirit and the research work does not pertain to the project secured by parent institution/supervisor from any funding agency and due credit is given to parent guide for the part of research already done. The transfer of data is permissible only if it is independent project of the research scholar.\in other cases the data/material shall remain with the parent institution.
- (e) The candidate shall deposit the requisite fee as applicable.

## **13. Duration for submitting Ph.D. Thesis**

### **(a) Full-time Research Scholars**

- (i) A full-time research scholar is not permitted to submit his/her thesis earlier than 36 months from the date of registration, including the duration of the course work. Further he/she shall publish at least **two** research papers related to his/her work in refereed Indian Journals or at least **one** paper in refereed International Journal (preferably SCOPUS indexed), before the submission of the thesis and produce evidence for the same either in the form of an acceptance letter or the reprint of the paper. A review paper published in any journal shall not count towards the above requirement.
- (ii) The maximum time allowed for submission of the thesis shall be 6 years (72 months) from the date of registration. This period can be extended by one year by the vice-Chancellor under special and genuine circumstances. No further extension shall be granted and the registration to Ph.D. shall stand cancelled after the expiry of 7 years( 84 months) from the date of registration.
- (iii) Vice-Chancellor may permit a candidate to get re-registered on the same topic on payment of a re-registration fee as decided by the University from time to time, for a further period of two years. The requirement of regular attendance shall not apply to such re-registered candidates. In such a case, the candidate shall apply to the University one month before the expiry of the last extension period. If the candidate is unable to submit his/her thesis in the stipulated

period, his/her registration shall stand automatically cancelled, and the University shall not be bound to inform the candidate about the cancellation.

**(b) Part-time Research Scholars**

(i) A part-time research scholar is not permitted to submit his/her thesis earlier than 42 months from the date of registration, including the duration of course work. Further he/she shall publish at least **two** research papers related to his/her work in refereed Indian Journals or at least **one** paper in a refereed International Journal (preferably SCOPUS indexed), before the submission of the thesis and produce evidence for the same in the form of an acceptance letter or the reprint of the paper. A review paper published in any journal(s) shall not count towards the above requirement.

(ii) The maximum time allowed for submission of the thesis shall be 6 years (72 months) from the date of registration. This period can be extended by one year by the Vice-Chancellor under special and genuine circumstances. No further extension shall be granted and the registration to Ph.D. shall stand cancelled after the expiry of 7 years (84 months) from the date of registration.

(iii) Vice-Chancellor may permit a candidate to get re-registered on the same topic on payment of a re-registration fee as decided by the University from time to time, for a further period of two years. The requirement of regular attendance shall not apply to such re-registered candidates. In such a case, the candidate shall apply to the University one month before the expiry of the last extension period. If the candidate is unable to submit his/her thesis in the stipulated period, his/her registration shall stand automatically cancelled, and the University shall not be bound to inform the candidate about the cancellation.

(c) The period for submission of thesis can be reduced by 6 months on the recommendation of URDC if a candidate has published at least 04 (Four) research papers in National/International Journals that are indexed in the SCOPUS/Web of science or other renowned database as applicable.

**Note 1:** *Application for an extension can be considered only when it has the recommendations of the supervisor(s).*

**Note 2:** *Extension of period after 6 years shall not be automatic. Application for extension shall be considered if submitted to the office of the Director of the concerned School/ Institutes/departments/Centers/College 4-6 months prior to the date of expiry of 72 months period, as the case may be.*

**14. Change of Supervisor**

**(a) Supervisor**

(i) The change of supervisor can be permitted by the Vice-Chancellor on the recommendations of URDC on production of the No Objection Certificates (NOC) from the Supervisor(s).

(ii) Vice-Chancellor, on the recommendations of the URDC may permit the supervisor who

has left the University or has retired from the university service, to continue as the supervisor if a request to this effect is received from the concerned supervisor. If no such request is received within one month, the supervisor may be removed by the Vice Chancellor.

**(b) Co- Supervisor**

In case of non-availability of the co- supervisor for any reason, the Vice-Chancellor, on the recommendations of the URDC, can either permit another co- supervisor (under clause 5) or allow the candidate to work and submit the thesis under the Supervisor alone.

**15. Cancellation of Registration**

The registration of a candidate to a Ph.D. programme may be cancelled on the basis of following.

- (i) Automatically, on the expiry of the period of extension granted by the Vice-Chancellor or the maximum time allowed under Clause 12(a)(iii) or 12(b)(iii), as the case may be, in case the extension has not been sought from the Vice-Chancellor.
- (ii) If the candidate is found involved in an act of gross indiscipline, unlawful activities, plagiarism and/or any such activity that may endanger the peace in the University campus.

**16. Progress Reports**

- (a) The candidate shall submit a progress report (Annexure –1) every 6 months (not later than 3 weeks of completing 6 months).
- (b) The progress report shall be signed by the candidate and the Supervisor(s).

**17. Submission of Thesis**

- (a) Based upon the research work done, the candidate may modify the synopsis, before three months of the submission of thesis and shall present it to the URDC for approval. Prior to submission of the thesis, the student shall make a pre-submission presentation in the School/Institute/Department/Center/College before a committee constituted by the Dean/Director/Principal and approved by the Vice Chancellor that may be open to all faculty members and research students, for getting feedback and comments, which may be suitably incorporated into the draft thesis under the advice of the Supervisor. This committee shall include, but not limited to the Dean/Director/Principal or as the case may be as Chairperson and supervisor(s) & other relevant persons from or outside as members .The committee will formally submit the report on the performance of the candidate in the pre-submission presentation. The candidate shall be permitted to submit the thesis to the

University after incorporating the modifications/ suggestions made by the above committee, if any. The Supervisors shall certify that the modifications/ suggestions made by the above committee have been duly incorporated.

- (b) The University shall evolve a mechanism using well developed software and gadgets to detect plagiarism and other forms of academic dishonesty. While submitting for the evaluation, the thesis shall have an undertaking from the research scholar and a certificate from the Research Supervisor attesting to the originality of the work, vouching that there is no plagiarism and that the work has not been submitted for the award of any other degree/diploma of the University where the work was carried out, or to any other university or institution
  
- (c) The candidate shall submit to the University the following documents at the time of submission of the Ph.D. thesis.
  - (i) Six copies of the Synopsis approved by the URDC and six copies of the Summary of the thesis.
  - (ii) Six hard-bound typed (on both side) copies of thesis. The thesis shall also be accompanied by:
    - (a) A certificate from the candidate (Annexure –2).
    - (b) A certificate from the supervisor (Annexure – 3 & 4).
    - (c) An appendix at the end of the thesis containing reprints of the research papers already published.
    - (d) Self-attested photocopies of the acceptance letters of the research papers accepted for publication.
    - (e) List of communicated research papers along with author(s) name(s), name of the Journal to which the paper has been communicated and the date of communication.
  - (iii) A copy of the receipt of applicable examination fee, along with no dues certificate.
  - (iv) A certificate from the Supervisor in terms of Clause 16(a), if applicable.
  - (v) A soft copy on CD/ DVD of the items referred to in Clause (i) and (ii) above.
  - (vi) An undertaking from the research scholar countersigned by the Supervisor(s) attesting to the originality of the work, vouching that there is no plagiarism.

## **18. Evaluation of the thesis**

- (a) The supervisor shall inform through the Director of the School to the Registrar of the

University about the intent to submit the thesis two months before its submission along with

- (i) Four copies of the synopsis, duly approved by the URDC.
- (ii) Names and contact details of at least eight examiners, not below the rank of an Associate Professor in the research area of the candidate, in a sealed envelope. The list must also include at least two names of examiners who are from outside the State in which the University is located. It may include the names of one or two names of examiners from outside India.

**Note:** *The name of any close relative of the candidate or of the supervisor shall not be included in the panel of examiners (as defined under clause 5)*

- (b) From this panel, the Vice-Chancellor shall appoint **three** examiners ensuring that one of the examiners is from outside the State. One of the Examiners may be appointed from outside the country. The Vice-Chancellor may include any new name.
- (c) The examiners would be requested to evaluate the thesis and submit the evaluation report within three months of the receipt of thesis. In case of inability shown by the examiner for evaluation of thesis, the Vice-Chancellor may appoint alternate examiner(s). In case of delay of more than 3 months in sending the evaluation report by any examiner, the Registrar would request the examiner(s) to send the report at the earliest in the interest of the candidate(not later than one month) failing which the Vice-Chancellor may appoint alternative examiner(s) after intimation to the existing examiner(s).
- (d) For awarding the Ph.D. degree, the thesis must comply with the following conditions:
  - (i) It must be an original piece of research work characterized either by the discovery of new facts or by fresh approach towards the interpretation of the existing facts or theories. In either case, it should evince the candidate's capacity to make critical examination and sound judgment.
  - (ii) It must be satisfactory in language and presentation of the subject matter.
- (e) The examiners shall specifically report on the prescribed proforma whether the thesis fulfils the requirements of the clauses 17(d)(i) and (ii). They shall clearly recommend whether the thesis be:
  - (i) Approved as it is,
  - (ii) Approved after minor revision,
  - (iii) Be resubmitted after major revision with
    - a) Major rewriting  
and/or
    - b) Some extra work,

The examiners shall also answer the following:

- a) Do you agree to re-evaluate the revised thesis? (Yes/No)

- b) If re-evaluation is not needed, should the candidate be allowed to appear in the viva-voce examination with the revised thesis? (Yes/No)
- (iv) Rejected (In such a case, the Examiner should clearly mention the reason(s) for rejection)
- (f) (i) If at least two examiners clearly recommend for the viva-voce examination and award of the degree, then the Ph.D. viva-voce examination shall be held.
- (ii) If one examiner recommends for the viva-voce examination and the other two suggest modifications, or all the three examiners suggest modifications, then the candidate shall be asked to re-submit the thesis within one year from the date of communication after revising it in the light of modifications suggested by the examiner(s).
- (iii) The revised thesis shall be sent to the examiner(s) who suggested modifications and accepted to re-evaluate the thesis, for final opinion. If at least two of the examiners recommend for viva-voce examination and award of degree, then Ph.D. viva-voce examination will be held. Otherwise the Vice-Chancellor may refer the case to a high level committee. The decision of the committee will be final.
- (iv) In case, the thesis is recommended by the examiners with minor modifications, the same shall be incorporated in the thesis before the viva-voce examination.
- (g) In case the thesis is recommended, an open viva-voce examination of the candidate shall be held by the viva-voce Board comprising of.
- (i) One External Examiner who will be one of the thesis examiners. (The name of the external examiner shall be approved by the Vice-Chancellor)
- (ii) Director of the concerned School.
- (iii) Supervisor(s)

The suggestion/ modifications suggested by the Viva Voce Board should be incorporated.

- (h) The date, time and venue of viva-voce examination shall be notified by the Registrar and the copies of the reports of the Examiners will be provided to the Supervisor(s) in a sealed envelope at least one week in advance. At the time of viva-voce examination, the Viva Voce Board shall be provided copies of the reports of the examiners.
- (i) The candidate shall present the work embodied in the thesis before the Board of examiners, members of faculty, research scholars and other persons interested in the subject. After the presentation of the research work, the members of the Board shall ask questions together with the questions, raised in the examiners' reports. After the formal viva-voce is over, the members of the audience can also ask questions.
- (j) The viva-voce Board shall give a final decision and a clear verdict whether the candidate be awarded the Ph.D. degree or be asked to re-appear for viva-voce examination once again. In case of the second verdict, the candidate shall be required to re-appear for viva-



voce before the same Board, on a date to be decided by the University.

**19. Award of Ph.D. Degree**

- (a) After successfully clearing the viva-voce examination, the candidate shall be awarded Ph.D. degree after the approval of the Executive Council.
- (b) The award of Ph.D. degree can be withdrawn by the University in case the thesis submitted by the candidate is found to be a duplication of an old work or pirated research work.

**20.** No research scholar shall join any other course of study or appear at any other examination conducted by any University leading to a degree (except Certificate Course of Languages, Research Methodology, Statistics, Computer Courses etc).

**21.** The approved thesis shall be published only after obtaining permission from the University and such publication shall state on the title page itself that **this was a thesis approved for the award of the Ph.D. degree of the Shobhit University.**

**22. Provisional Degree**

The candidate may be issued a Provisional Certificate after successful completion of the examination procedure in accordance with the provisions of the UGC (Minimum Standards and Procedure for Awards of Ph.D. Degree) Regulations 2016 and after the Vice-Chancellor approves the recommendation of the Viva-Voce Board.

**23. Depository with UGC**

Following the successful completion of the evaluation process and announcement of the award of Ph.D., the University shall submit a soft copy (in the form of CD/DVD) of the Ph.D. thesis to the UGC within a period of 30 days for hosting the same in INFLIBNET to be made accessible to all Institutions/ Universities.

**24.** Notwithstanding anything contained in the Ordinance, all the Ph.D. candidates/ research scholars shall be governed by the rules and procedures prevailing at the time of registration.

**25.** Notwithstanding anything stated in this Ordinance, for any unforeseen issues arising, and not covered by the Ordinance, or in the event of difference of interpretation, the decision of the Vice-Chancellor shall be final.

**Appendix – 1**

**Format of Synopsis**

The synopsis (approximately 5000 words) shall contain the following :

- (i) Topic of the research work.
- (ii) Area/Specialization of the research work.
- (iii) Aims and objectives of research work.
- (iv) Methodology of the research work.
- (v) A survey of literature in the area of research.
- (vi) The impact of the research work on academics/industry/society.
- (vii) The proposed plan of work: It will include a tentative schedule of research work.
- (viii) A list of equipments, software and other tools/ facilities, needed for the proposed research as part of the required Lab facility and its availability/ provisions made.
- (ix) Bibliography.
- (x) List of previous publications of the candidates, if any.

## **Annexure-1**

### **Progress Report**

**(To be submitted every 6 months from the date of Registration)**

Name of the School/Centre where registered : .....

1. Name of the Research Scholar : .....

2. Registration No. and the Date of Registration : .....

3. Topic of Research : .....

4. Name(s) of the Supervisor(s) 1) .....

2) .....

5. Period for which the report is being submitted: From.....to.....

6. Report (Brief details of the work done, papers published/ communicated, conferences attended/ paper(s) presented, etc.) ( may use additional sheets, if required)

**Supervisor(s)**

**Research Scholar**

Note : 1. Please attach one copy each of the previous Progress Report(s), if any.

2. Please attach copies of papers published/communicated, if mentioned in the above progress report.

## **Annexure-2**

### **Declaration by the Candidate**

I, hereby, declare that the work presented in this thesis, entitled  
..... in fulfillment of the  
requirements for the award of Degree of Doctor of Philosophy, submitted in the School of / Centre  
for ..... at Shobhit University, Gangoh, Sahranpur  
is an authentic record of my own research work carried out under the supervision of  
.....

I also declare that the work embodied in the present thesis

- (i) is my original work and has not been copied from any Journal/thesis/book, and
- (ii) has not been submitted by me for any other Degree or Diploma of any university/ institution.

**Signature of the candidate**

### **Annexure-3**

#### **Certificate of the Supervisor(s)**

This is to certify that the thesis, entitled “.....” submitted by ..... for the award of Degree of Doctor Philosophy in the School of / Centre for ..... of Shobhit University, , Gangoh, Sahranpur is a record of authentic work carried out by him/her under my/our supervision.

To the best of my/our knowledge, the matter embodied in this thesis is the original work of the candidate and has not been submitted for the award of any other degree or diploma of any university or institution.

It is further certified that he/she has worked with me/us for a period of ..... in the School of / Center for ..... , Shobhit University, , Gangoh, Sahranpur.

**(Supervisor)**

## **Annexure-4**

### **Certificate of the Co-Supervisor(s)**

This is to certify that the thesis entitled “.....” submitted by ..... for the award of Degree of Doctor Philosophy in the School of / Center for ..... of Shobhit University, Gangoh, Sahranpur is a record of authentic work carried out by him/her under my/our supervision.

To the best of my/our knowledge, the matter embodied in this thesis is the original work of the candidate and has not been submitted for the award of any other degree or diploma.

It is further certified that he/she has worked with me for a period of ..... in the School/ Center/Institute/College/ Department of .....

**(Co-Supervisor)**